BASIC DESIGN STUDY REPORT

ON

THE PROJECT FOR IMPROVEMENT AND EXPANSION OF THE MEDICAL RESEARCH INSTITUTE IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

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JAPAN INTERNATIONAL COOPERATION AGENCY

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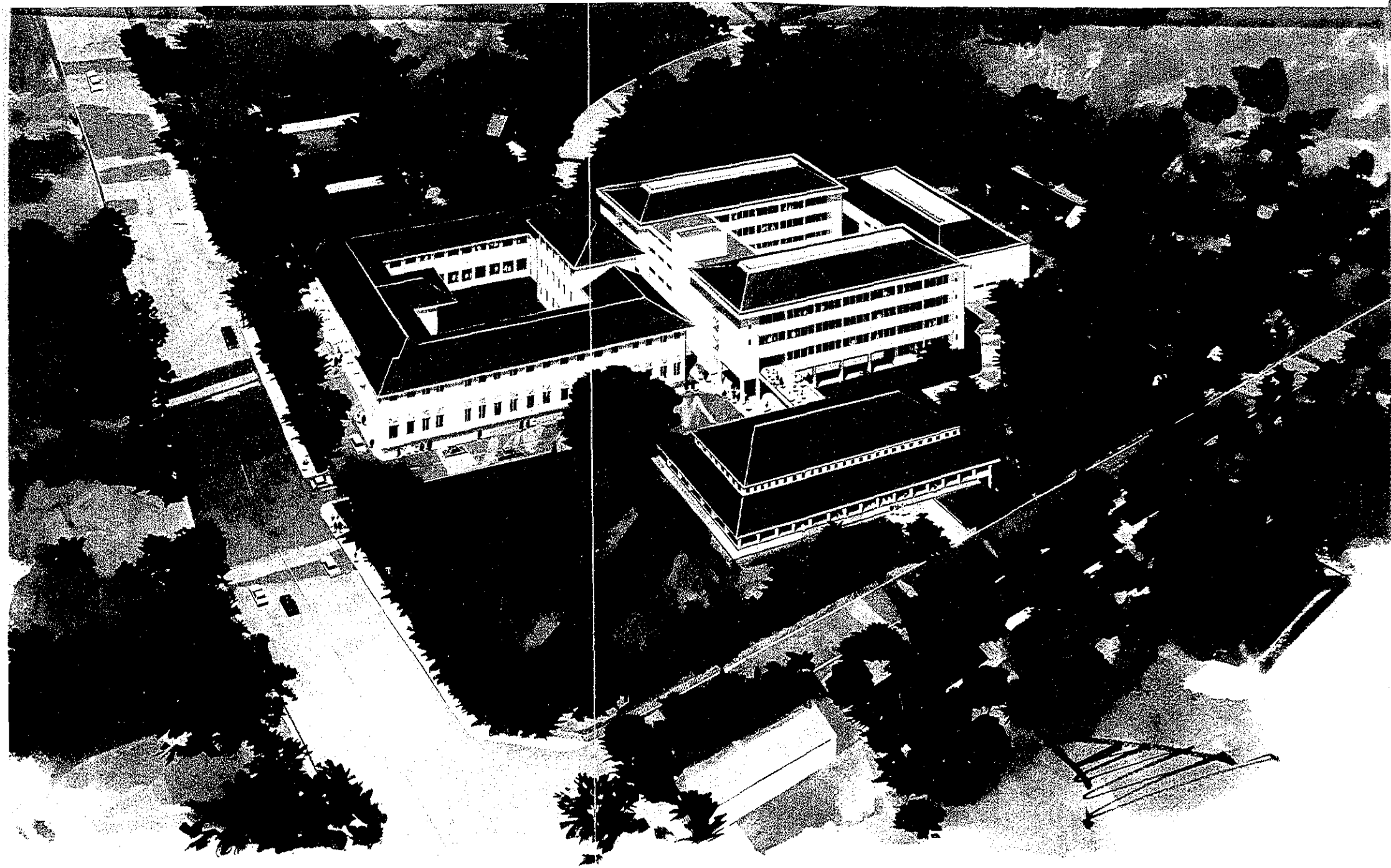


THE MEDICAL RESEARCH INSTITUTE PROJECT
IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

PREFACE

In response to the request of the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan has decided to conduct a Basic Design Study on the Project for Improvement and Expansion of the Medical Research Institute and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Sri Lanka a Basic Design Study Team headed by Dr. Ken-ichi Kojima, Dean, College of Biomedical Technology, Niigata University from August 11th to 31st in 1987.

The team had discussions on the Project with the officials concerned of the Government of Sri Lanka and conducted a field survey in Colombo. After the team returned to Japan, further studies were made and a draft report was prepared and, for the explanation and discussion of it, a mission headed by Dr. Yoshihisa Onishi, Dean, School of Medicine, Niigata University was sent to Sri Lanka from November 12th to 26th in 1987. As a result, the present report has been prepared.

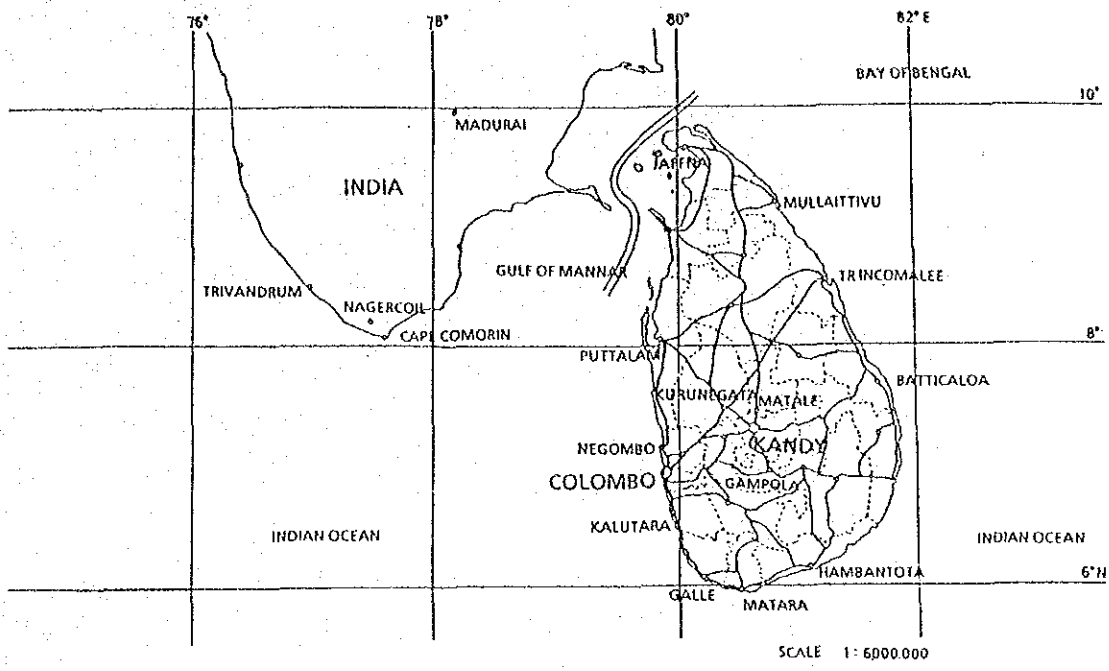
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between the two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Democratic Socialist Republic of Sri Lanka for their close cooperation extended to the team.

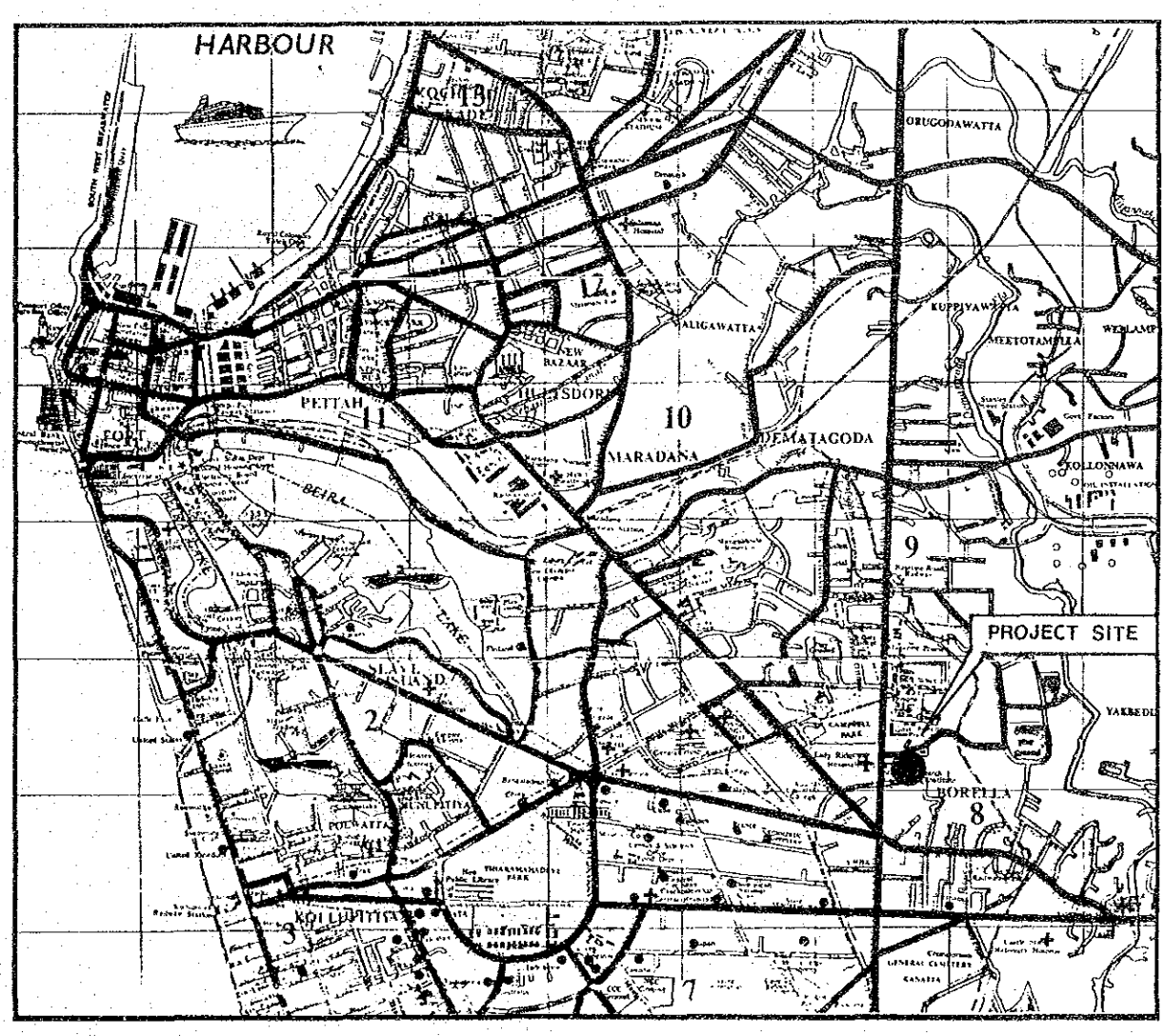
December, 1987

Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency



MAP OF SRI LANKA



MAP OF COLOMBO

SUMMARY

In the Health Charter adopted in February, 1980, the Government of Democratic Socialist Repuboic of Sri Lanka undertakes to "guarantee the satisfactory health for all nationals by the year 2000". As concrete measures to achieve this goal, the Sri Lankan Government has been actively engaged in the provision of equal health care opportunities for all nationals by decentralizing the medical administration and by introducing a systematic national health plan. Moreover, the Government has also been promoting primary health care to reduce the burden on secondary and teritary health care. As 80% of the population live in rural areas and have an extremely low income level, however, these people are forced to visit the free clinics in their vicinity or local hospitals and intestinal infections, tuberculosis (TB), parasitic infections, malnutrition, anaemia and injuries, etc. remain largely untreated. It has been recongnized that full-scale basic research in preventive medicine for basic infections, etc. must be conducted and that medical administration on a scientific basis must be implemented in order to improve health care and preventive hygiene in Sri Lanka.

The Medical Research Institute (MRI) is under the direct control of the Ministry of Health and is the highest organization responsible for basic studies and research. The research facilities of the MRI are, however, deterioriated and there is a shortage of basic research equipment. Against this background, the Sri Lankan Government prepared the Project for the Improvement of the Medical Research Institute to both improve and expand its facilities and equipment and to revitalize its organization and functions and requested the Japanese Government to provide grant-aid for the Project's implementation. In response to this request, the Japanese Government commissioned JICA to send the Basic Design Study Team to Sri Lanka for a period of 21 days, from August 11th to August 31st, 1987.

The objectives of the Basic Design Study were to confirm the requested contents by the Ministry of Health, to examine the suitability of grant-aid cooperation for the Project, to study the Project site, including the location of the current facilities, to study the conditions of the related infrastructure, to plan the sizes and distribution of the new facilities to correspond to the envisaged medical activities and finally, to select the most appropriate machinery and equipment to be granted.

The objective of the Project is to make the MRI effective as a national reference laboratory by improving the quality of the MIR's five types of activities, i.e. diagnosis, survey, production, education and research. In addition, it is also intended to make a general contribution to improving the health of the Sri Lankan people by providing the Sri Lankan medical administration with a scientific basis with basic research on the causal mechanisms of various diseases, particularly infectious diseases, and on preventive and treatment methods for these diseases.

The planned site is located in the Borella District in the eastern part of Colombo. As it faces Baseline Road, one of the city's major roads, the site has fairly good access. It has a total area of 14,500m^2, i.e. 12,000m^2 owned by Ministry of Health where the MRI is currently located and 2,500m^2 owned by the Ministry of Trade, the transfer of which was confirmed during the course of the Study. The area forms a medical complex in the city and is, therefore, a suitable location for a medical research institute. Although the area in general is not yet highly developed, it has been designated as a multistory building area under city planning and development along Baseline Road is expected to take place in the future. While the infrastructure of the area is old, it is basically well developed and is expected to be gradually improved.

The facilities to be constructed in the Project mainly consist of the Laboratory Building, the Animal Center Building, the Medical Training Building, supplememtary facilities and a car park. In addition, the main MRI building which is currently in use will be renovated by the Sri Lankan side for its continued use. The main rooms and areas of the major buildings are as follows.

- Laboratory Building ·····6,849m^2
  Laboratories, Washrooms, Electro-Microscope Room, Consultants' Rooms, Seminar Rooms, Director's Room and Library, etc.
- Animal Center Building ·····1,584m2
  Breeding Rooms, Animal Experiment Rooms, Infected Animal Experiment Rooms, Washroom, Operating Theater and Vet Office, etc.
- Medical Training Building ·····1.359m^2
  Training Laboratory, Lecture Hall, Canteen, Machine Rooms and Pump Room, etc.
- Animal Quarantine Shed ·····99m^2
  Quarantine Room and Large Animal Room, etc.
- Supplementary Facilities
  Bridge, Sewage Treatment Facility, Incinerator and Oil Tank, etc.

Total 9.891m^2

The project cost to be borne by the Sri Lankan side(for the removal of existing buildings, the provision of utilities and exterior work, etc.) is estimated to be approximately Rs. 19 million.

The relevant periods required for the stages of the Project are considered to be 4 months for detail design, 2 months for tender and contract completion and 19 months for construction.

The organization responsible for the execution of the Project on the Sri Lankan side is the MRI which is under the control of the Department of Laboratory Services of the Ministry of Health. The actual execution will be coordinated by the Execution Committee headed by the Secretary of Health. The Director of the MRI is responsible for consultations in regard to the contents of the Project and the coordination of the different opinions and requests of the heads of the MRI's various research departments.

The early execution of the Project is hoped for in view of the fact that the facilities to be newly constructed will play a central role in the primary health care policy which is being promoted by the Sri Lankan Government by means of clarifying the mechanisms of diseases, particularly infectious diseased, and fostering medical laboratory technologists of which there is currently a shortage.

The execution of the Project with the grant-aid of the Japanese Government, in addition to the series of medical assistance afforded to Sri Lanka by Japan, will be highly significant and the further provision of Project-type Technical Cooperation should prove highly effective in terms of the objectives of the Japanese Government's overseas assistance.

CONTENTS

APPENDIX

ABBREVIATION

MRI	:	Medical Research Institute
SMLT	:	School of Medical Laboratory Technologist
MLT	:	Medical Laboratory Technologist
MC	:	Medical Consultant
MO	:	Medical Officer
RO	:	Research Officer
PHI	:	Public Health Inspector
LO	:	Laboratory Orderly
DLS	:	Divisional Laboratory Services
RI	:	Radio Isotope
AEA	:	Atomic Energy Authority
UDA	:	Urban Development Authority
CEB	:	Ceylon Electric Board
WHO	:	World Health Organization
JICA	:	Japan International Cooperation Agency
MOH	:	Ministry of Health

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

1 Background of the Request

The Jayawardene Administration, inaugurated in 1977, has introduced the Health for All 2000 (HFA 2000) Programme to "guarantee the satisfactory health of all nationals by the year 2000" and has been actively promoting primary health care. Due to continuous efforts over the last 10 years, the standard of health care in Sri Lanka has steadily improved and is now one of the highest among developing countries. Nevertheless, the occurrence rates of infections, contagious diseases, parasitic diseases and unknown diseases are still fairly high. In particular, the health problems of rural inhabitants, which account for 80% of the working population, could result in a stagnation of agricultural production, largely affecting the Sri Lankan economy. In addition to the consolidation of the currently implemented medical services in local areas, therefore, it is believed that investigation of the causal relationship of various diseases by the central medical institution and the development of basic research on preventive medicine and therapies are urgently required for the strong promotion of the HFA 2000 Programme in the future.

In principle, the above activities should be carried out by the Medical Research Institute which is under the direct control of the Ministry of Heath and which is the sole central medical research institute in Sri Lanka. However, the Institute's research facilities and laboratory equipment are rather old and cannot be expected to meet the new requirements without improvement.

Against this background, the Sri Lankan Government prepared the Project for the Improvement of the Medical Research Institute to improve and expand its facilities and equipment and to restructure its organization in view of it functioning as a national reference laboratory and subsequently requested the provision of the Grant-aid by the Japanese Government.

2 Dispatch of Preliminary Study Team

On receipt of the Sri Lankan Government's request, the Japanese Government commissioned the Japan International Cooperation Agency (JICA) to send the Preliminary Study Team to Sri Lanka to investigate both the feasibility and suitability of the Project.

As no request for technical cooperation had been made, the Contact Team for Technical Cooperation, led by Dr. Yoshihisa Onishi (Dean, School of Medicine, Niigata

University), was organized and sent to Sri Lanka for a period of 11 days, from February 22nd to March 4th, 1987, to conduct a field survey. Together with this Contact Team, the Preliminary Study Team, led by Dr. Kenichi Kojima (Dean, College of Biomedical Medical Technology, Niigata University), was also sent to Sri Lanka to study the suitability of the Japanese Grant-Aid.

Both Teams reconfirmed the requested contents and conducted detailed surveys on the current facilities and activities and on similar facilities. Based on the survey results and discussions with Sri Lankan officials, the importance and urgency of the Project was subsequently confirmed. The basic agreements were compiled as the Minutes of Discussions dated February 28th, 1987.

With regard to the Technical Cooperation, the Preliminary Study Team, led by Dr. Kenichi Kojima, was sent to Sri Lanka for a period of 14 days, from June 24th to July 7th, 1987 to discuss the fields of cooperation and concrete targets in detail. The basic agreements between the Preliminary Study Team and the related Sri Lankan officials were compiled as the Minutes of Discussions dated July 3rd, 1987 and the Supplementary Notes dated July 5th, 1987 (refer to Appendix and 3-7-1 Details of the Request).

3 Dispatch of Basic Design Study Team

Based on the results of the preliminary studies referred to in 1-2 above, JICA subsequently sent the Basic Design Study Team, led by Dr. Kenichi Kojima, to Sri Lanka for a period of 21 days, from August 11th to August 31st, 1987.

The Team was briefed by Dr.V.T. Vitarana, Director of the MRI, of the background of the Project and on the MRI's current activities and the social necessity and urgency of the Project for Sri Lanka was examined. The Team also interviewed the heads of the MRI's research departments to clarify their respective scopes of research and current activities. The Team then examined the contents of possible improvements based on the survey on the current use of the facilities and equipment.

In addition, related facilities were visited in order that the current research activities could be studied and the Team was briefed by JICA experts and JOCV members on the conditions of health care activities, as well as the conditions of researchers and laboratory technologists, in Sri Lanka. Furthermore, the Team conducted detailed surveys on the proposed Project site, infrastructure conditions and related laws and regulations and collected detailed data through questionnaires, related information and statistical facts for examination.

As a result of the surveys and examinations, it was confirmed that advanced tests and analyses, basic research and the training of medical manpower by a central

institution is essential for the improvement of health care in Sri Lanka. In addition, it was found that the MRI is potentially the most appropriate institution to carry out this work.

The Team also discussed the required facilities, their sizes and accompanying equipment in view of the expected activities of each research department with the department heads.

The basic agreements between the Team and the Sri Lankan side were compiled as the Minutes of Discussions dated August 19th, 1987 and the Notes dated August 20th, 1987.

On its return to Japan, the Team examined the Project contents, size, construction period and Project cost, etc. in detail by analysing the field survey results and the Basic Design Draft Final Report was then compiled.

On results of the Draft Final Report, JICA sent the Draft Final Report Team, led by Dr. Yoshihisa Onishi, to Sri Lanka for a period of 15 days, from November 12th to November 26th, 1987, to confirm the suitability of the basic design. The agreements between the Team and the Sri Lankan officials on the contents of the Draft Final Report were compiled as the Minutes of Discussions dated November 24th, 1987.

This Report compiles the most appropriate basic design, project cost, project execution schedule, project appraisal and suggestions, etc. for the execution of the Project as a result of the development of the Project preparation so far described. The Organization of the Study Team, List of Cooperative Officials in the Survey and Minutes of Discussions are given in Appendix.

CHAPTER 2

PROJECT BACKGROUND

CHAPTER 2 PROJECT BACKGROUND

2-1 Socio-Economic Conditions and Development Programme

Sri Lanka is an island country in the Indian Ocean. It is located in the tropical zone and has a total land area of 65,509 km^2 which is almost equivalent to 80% of Hokkaido's land area. 36% of the land is either forest or conservation areas and 30% is used for agriculture, a half of which is occupied by estates producing tea, rubber and coconuts, the country's main agricultural products, while the remaining half is used for crops for domestic consumption, ,mainly rice.

Sri Lanka is estimated to have a population of 159 million based on 1985 statistics. The population growth rate was 2.3% in the 1960's, dropping to 1.3% in 1983 and it is expected that a population level of 200 million will be reached by 2000. The urban population accounts for 22% of the total (1981) and some 80% of the total population live in rural areas.

The Sri Lankan economy shows a typical monoculture with the three major agricultural products accounting for some 50% of the total export value. This economic structure was largely determined by the colonial policy adopted upto Sri Lanka's independence in February, 1948. Since the colonial trading system where specific agricultural products were exported in exchange for consumption goods (including food) and production goods lasted for a long period of time, the country's industrialization was extremely delayed. Breaking away from the colonial economic structure has, therefore, been the main policy objective since independence. To be more precise, while import substitution has been intended to invest the foreign currency earned from the export of major agricultural products in food production and industrial development, domestic industries have been promoted with the introduction of a projective trade policy. Nevertheless, as the basic economic structure relying on primary products is largely affected by weather conditions and international commodity price fluctuations, the Sri Lankan economy is unstable and it has not been able to rectify the chronic deficit in the international balance of payments.

In regard to economic policies, a fairly centralized policy stressing on welfare was implemented by the Bandaranaike Administeration prior to 1977. In comparison, the Jayawardene Administration inaugurated in July, 1977 adopted a more open and liberal policy for the promotion of economic development, aiming at the expansion of imployment opportunities, improvement of the standard of living and the long-term improvement of the international balance of payments. This new policy has been very successful and has brought about the high growth of the Sri Lankan economy. The

Table 2-1 (a) National Indices (1984~1985)

Item	Sri Lanka	Bangladesh	India	Pakistan	Thailand	Malaysia
I. Area & Population						
1) Area (1,000Km2)	66	144	3,288	804	514	330
2) Population (Miln)	15.84	98.66	750.90	96.18	51.30	15.2
3) Anual Growth Rate (%)	1.8	2.5	2.3	2.9	2.2	2.4
4) Life Expectancy · M (Year)	68	50	56	52	62	66
5) Life Expectancy · F (Year)	72	51	55	50	66	71
II. National Income						
6) GDP (Miln US$)	5,430	12,230	162,260	27,730	41,960	29,280
7) GDP Growth Rate (%)	4.1	3.1	3.6	4.4	4.0	2.8
8) Consumer Price Growth Rate (%)	1.4	10.7	5.6	5.8	2.4	0.3
III. National Accounts						
9) Trade Balance (Miln US$)	△657	△1,300	△4,098	△3,277	△1,344	3,672
10) Budget Balance (Miln US$)	△556	△578	△1,953	△1,106	△1,547	△669
11) Foreign Savings (Miln US$)	451	337	6,420	807	2,190	4,912
IV. Education · Health						
12) Litaracy (%)	87.1	337	43.5	29.6	91.0	73.4
13) Urban Population Rate (%)	21	18	25	29	18	31
14) Calorie per day	2,217	1,878	2,088	2,236	2,319	2,557
15) Doctor per 10,000 population	1.31	1.12	3.93	3.15	1.46	3.06

Table 2-1 (b) Transition of Investment Amount by Sectors

	1983-1987	1984-1989	1986-1990
Agriculture	49,968	36,330	26,946
Mahaweli	29,900	21,187	15,151
Plantation	5,490	5,057	2,070
Industry	2,251	280	452
Housing, Water Supply & Urban Development	12,345	7,796	6,749
Housing	3,208	2,925	2,790
Water supply	6,368	3,306	1,969
Ecomomic Infrastructure	28,522	29,700	23,944
Transport	6,042	5,505	9,631
Power	7,557	9,037	7,660
Posts & telecommunications	4,393	2,471	3,734
Social Infrasturcturre	9,800	5,894	9,642
Education	5,167	3,046	5,130
Health	4,374	2,304	3,798
New Projects*	26,499	18,261	17,052

* Included in values pof specific sectors.

operation rates of companies have been increased and the agricultural sector has been improved despite the fact that self-sufficiency has not yet been reached. This liberalization and internationalization of the economy, however, has resulted in inflation due to overseas factors, in turn resulting in price increases and development cost increases. As a result, the completion of development targets has been delayed or targets have been revised.

The racial conflict which commenced with the riots in 1983 and which is still continuing has resulted in a large decline in the number of tourists, a critical decrease in foreign investment and the acceleration of domestic inflation, causing severe damage to the Sri Lankan economy. Particularly in FY 1986, the military and security cost in regard to anti-terrorist measures accounted for 16.5% of the total ordinary expenditure. Although the situation has somewhat stabilized since the Peace Agreement between Sri Lanka and India in July, 1987, large funding will be required in the coming years to restore the economic infrastructure.

Due to the unstable circumstances described so far, the Economic Development Programme has been revised every year to reflect the political, as well as economic, conditions of the particular time. The development of the following fields /projects is stressed in the seventh Public Investment plan (1985-1989) of the present Administration.

1) Projects which are difficult to implement by the private sector and where production can immediately commence for export expansion and import substitution
2) Important social infrastructural fields, such as power, irrigation, transport and communications.
3) Fields requiring urgent development such as health, education, housing and nutrition improvement.

2-2 Health and Medical Care Conditions in Sri Lanka

2-2-1 State of Health and Medical Care

1. Facts on Diseases

Health conditions in Sri Lanka have conspicuously improved due to continuous efforts in the 40 years since independence. The rate of death declined from 8.6 (in 1,000) in the 1960's to 5.9 in 1981 and the life expectancies for men and women are currrently 68 and 72 years respectively, both the highest figures among developing countries.

The number of cases of tuberculosis, malnutrition, anaemia and parasitic diseases, etc. have decreased in the last 20 years while cases of cardiac diseases and cancer have increased due to the improved living conditions resulting from socio-economic development and the aging of the population due to the improved life expectancies. In addition, the increased number of accidents and poisoning cases has presumably resulted from the modernization of transportation and agricultural /industrial activities. Cases of polio, diphtheria, tetanus and pertussis, etc. have been drastically reduced by the Government's promotion of preventive measures.

Table 2-2-1 (a) Trends in Hospitalization and Hospital Deaths (per 100,000 population)

Diseases	Cases			Deaths		
	1965	1975	1985	1965	1975	1985
International Infections	1,157.9	969.8	849.1	21.9	18.6	7.3
Tuberculosis (All forms)	120.3	114.1	74.0	8.7	8.3	3.9
Diphtheria	11.3	2.3	0.1	1.4	0.3	0.0
Whooping Cough	19.3	9.9	3.4	0.1	0.1	0.0
Measles	18.7	37.0	59.3	0.0	0.0	0.1
Viral Hepatitis	46.5	109.8	41.9	1.1	1.4	0.4
Malaria	0.4	800.3	437.1	0.0	0.9	0.2
Helminthiasis	616.6	230.5	112.0	5.3	1.6	0.4
Nutritional Deficiencies	173.3	197.7	109.2	2.4	10.4	1.3
Anaemias	424.3	430.8	277.5	5.2	9.4	2.2
Hypertensive Disease	129.1	121.6	186.8	3.8	6.0	4.5
Ischemic Heart Disease	....	76.4	163.9	....	7.6	15.9
Abortions	179.9	196.3	207.1	0.5	0.3	0.1
Normal Delivery	....	1,768.1	1,712.6	....	0.1	0.0

Source : Annual Health Bulletin Sri Lanka 1985

In comparison however, cases of enteric infections, viral hepatitis and malaria, etc. have not decreased and although cases of tuberculosis, malnutrition, anaemia and parasitic diseases have decreased as described earlier, their occurrence rates are still high. Those infectious diseases common in tropical agricultural countries are presumably caused by the climatic conditions and poor living conditions and threaten some 80% of Sri Lanka's population which live in rural areas. These diseases can, however, be prevented and gave already been brought under control in advanced countries. As the statistics on causes of death clearly show (Table 2-2-1 (a)), the medical treatment and death rates (in terms of 100,000 people) are still high and pose a serious problem in terms of the health and hygiene of the Sri Lankan people.

Table 2-2-1 (b) Hospital Morbidity and Mortality (per 100,000 population)

Broad Disease Groups (International Classification of Diseases)	Cases			Deaths		
	1965	1975	1985	1965	1975	1985
1. Infectious and parasitic diseases	2,633.3	2,703.0	2,080.5	48.9	42.1	19.1
2. Neoplasms	126.8	155.7	121.3	8.3	8.8	7.4
3. Endocrine, Nutritional and Metabolic diseases	359.1	330.8	222.5	6.3	15.9	3.5
4. Diseases of Blood and Blood Forming Organs	664.8	450.9	287.1	8.3	10.5	2.5
5. Metal Disorders	145.7	174.3	207.0	1.0	1.5	1.1
6. Diseases of the Nervous System and Sense Organs	435.6	350.3	408.5	10.8	7.1	6.7
7. Diseases of the Circulatory System	536.4	574.9	658.8	32.0	42.1	38.4
8. Diseases of the Respiratory System	3,500.9	2,341.2	2,180.1	31.8	30.5	17.1
9. Diseases of the Digestive System	935.0	899.7	613.0	10.6	12.5	8.4
10. Diseases of the Genito Urinary System	510.3	577.1	610.5	5.1	4.8	3.1
11. Complications of Pregnancy, Childbirth and the Puerperium	3,126.2	2,988.0	2,719.3	6.6	2.4	1.1
12. Diseases of the Skin and subcutaneous Tissue	540.1	711.4	535.2	0.5	1.2	0.4
13. Diseases of the Musculoskeletal and Connective Tissue	488.7	350.4	398.6	0.4	0.2	0.2
14. Congenital Anomalies	22.4	34.0	24.2	2.4	5.7	2.2
15. Certain conditions originating in the perinatal period	152.1	89.6	72.2	23.8	17.7	18.2
16. Symptoms, signs and ill defined conditions	278.8	920.4	1,277.7	11.6	15.6	11.4
17. Injury and Poisoning	1,654.8	1,750.7	1,699.4	20.6	21.2	25.9
Total	16,113.1	15,412.5	14,085.7	229.1	239.8	166.6

Source : Annual Health Bulletin Sri Lanka 1985

2. Problems of Infectious Diseases

As statistics show, preventable infectious diseases have not yet been controlled in Sri Lanka and are a major obstacle to the qualitative improvement of the health and hygiene level. To overcome this obstacle, the Sri Lankan Government has introduced a wide range of measures in regard to its medical administration with the result that the death rate of each disease has steadily declined. The medical treatment rate, however, particularly for infectious diseases, has remained almost unchanged, indicating that while the medical treatment of patients has achieved its objectives, preventive measures have not yet been successfully developed.

Preventive measures should be introduced nation-wide to solve the problem of infectious diseases due to the very nature of these diseases. A national network should be established based on the development of local administrative organs and a thorough preventive system must be established. Moreover, the diagnostic function of each medical institution should be improved and the epidemiological survey function established to raise the standard of medical services. The causative study of infectious diseases and the study of the effective prevention and /or treatment of these diseases must be carried out at the main and local institutions should be provided with the study results so that measures backed by scientific facts can be implemented.

As the Sri Lankan Government is already implementing the promotion of primary health care, a corresponding national network has been established. In addition, priority is given to health-related projects in public investment plans due to their urgent requirement.

(100,000 population)

Sri Lanka [1] (1982)		Thailand (1981)		Indonesia (1980)		Philippine (1979)		Japan (1980)	
Circulatory	39	Ill defined	247	Infectious	137	Respiratory	137	Cerebral	140
Infectious	24	Injury	68	Respiratory	149	Infectious	135	Neoplasms	139
Injury [2]	23	Circulatory	46	Circulatory	75	Circulatory	107	Nucleus	106
Respiratory	21	Infectious	40	Digestive	40	Ill defined	58	Pneumonia	34
Pregnancy	19	Neoplasms	25	Nervous	37	Pregnancy	52	Senility	28
Ill defined	12	Digestive	23	Ill defined	36	Injury	43	Accident	25
Digestive	9	Respiratory	21	Pregnancy	29	Neoplasms	33	Suicide	18
Nervous	8	Nernous	12	Inury	26	Digestive	26	Hepatitis	14
Neoplasms	7	Urinary		Neoplasms	26	Metabolic	23	Hy-tention	14
Nutritional	4	Pregnancy				Urimary	13	Infectious	10
All death	174.1		504.2		746.3		657.9		618.2
Infectious per all death	13.8%		7.9%		38.7%		20.5%		1.6%

1) Government hospital census only

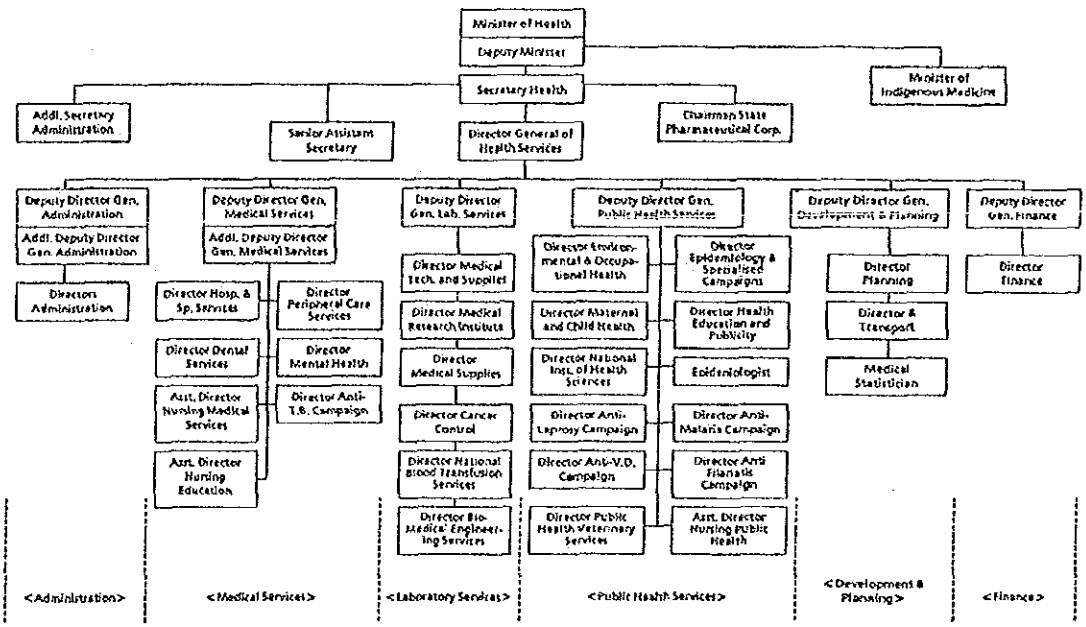
2) Including murder and suicide

2-2-2 Medical Administration

The Medical administration in Sri Lanka is entrusted to the Ministry of Health and the Ministry of Women's Affairs and Teaching Hospitals. In addition, the Ministry of Indigenous Medicine is engaged in the promotion of Sri Lankan indigenous Medicine which is based on traditional Indian medicine.

The Ministry of Health is the central organization responsible for health, hygiene and medical services in Sri Lanka. In 1983, 7 main hospitals engaged in the training of doctors and medical staff were transferred from the jurisdiction of the Ministry of Health to that of the Ministry of Women's Affairs and Teaching Hospitals in order to achieve a qualitative improvement of the medical services. Now, the Ministry controls 11 teaching hospitals throughout the country and provides high level medical services and the training of medical staff.

Fig. 2-2-2 (a) Organization Chart of Ministry of Health

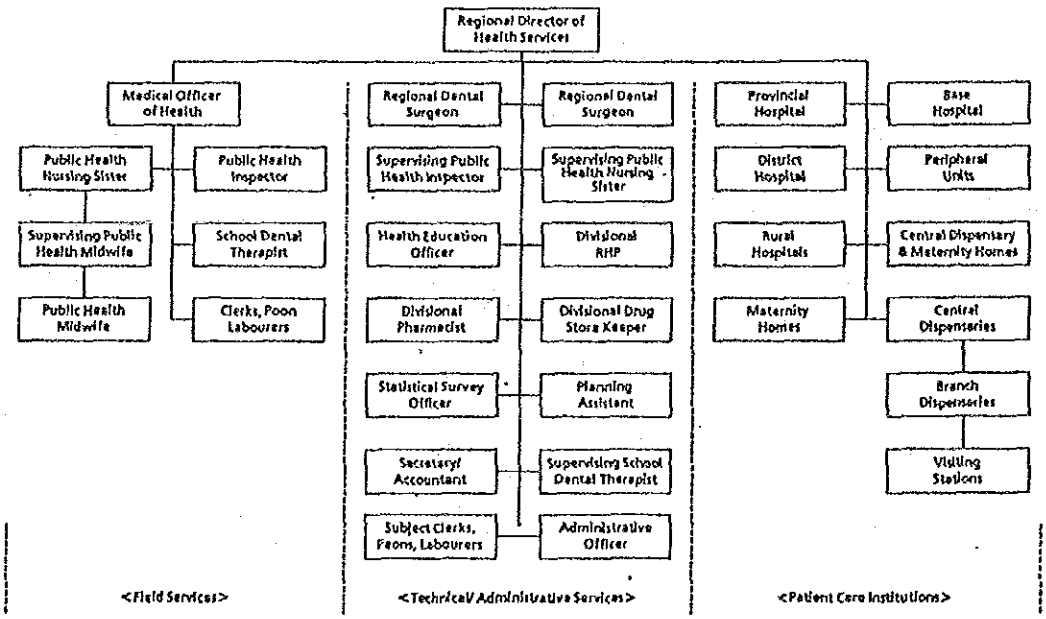


The Ministry of Indigenous Medicine has 36 Ayurvedic hospitals throughout the country and provides indigenous medical services, the training of indigenous medical staff and relevant research through the Ayurveda Research Institute and many clinics.

As shown in Fig. 2-2-1 (a), the Ministry of Health consists of 6 departments, 3 of which (i.e. Administration, Development and planning, Finance) indirectly support the medical services. The Department of Medical Services provides direct medical services centering on medical treatment while the Department of Laboratory Services is responsible for inspection and research work. The Department of Public Health Services conducts diseases prevention and survey activities, provides education on sanitation and carries out various campaigns.

The 6 departments are under the control of the Director General of Health Services who also controls the local medical institutions shown in Fig. 2-2-1 (b).

Fig. 2-2-2 (b) Organizaiton of Regional Health Services



2-2-3 Medical Facilities and Staff

1. Medical Facilities

The medical facilities in Sri Lanka are either governmental or private. The private facilities center on treatment and are mostly located in Colombo and other major cities. While there are fewer private facilities than governmental facilities, some 40% of all treatment is conducted by the former as even though they impose treatment fees while medical care is provided free by the Government, they provide qualitatively better care.

In the case of governmental medical facilities, stress is given to the provision of medical services in local areas with varying scopes and medical levels. According to 1985 statistics, there are 479 hospitals /clinics with approximately 40,000 beds. Colombo has a population per bed ratio of 334 persons /bed while the lowest rate of 667 persons /bed is recorded for Trincomalee, showing a relatively small gap between different locations. The bed occupancy rate of clinics, however, is very low at around 20% compared to the average of 87% at teaching hospitals. The unpopularity of clinics illustrated by this low bed occupancy rate can be explained by their inadequate provision of equipment and the shortage of doctors. Consequently, most people prefer to visit large hospitals which have better equipment and which provide better treatment by specialized doctors, therefore resulting in congestion and a low bed turnover rate at these hospitals.

1) Teaching Hospitals

Teaching hospitals in Sri Lanka are relatively well equipped as they have been transferred from the jurisdiction of the Ministry of Health in order to more advanced medical services and for the training of medical staff.

Table 2-2-3 (a) Teaching Hospitals

Name	No. of Beds	Bed Occupancy Rate (%)
General Hospital, Colombo	2,332	110
Lady Ridgeway Hospital for Children, Colombo	614	77
Eye Hospital, Colombo	471	73
De Soysa Maternity Hospital for Women, Colombo	353	78
Castle Street Hospital for Women, Colombo	353	72
General Hospital, Kandy	1,370	118
General Hospital, Peradeniya	541	75
Colombo North Benerral Hospital, Ragama	742	78
General Hospital, Galle	991	99
General Hospital, Jaffna	1,015	89
Sri Jayawardenepura Genral Hospital	1,001	-

There are a total of 11 teaching hospitals with some 10,200 beds. 7 of these with some 5,900 beds are located either in or near Colombo. Teaching hospitals have specialized departments and are capable of conducting pathological and other tests.

2) Provincial Hospitals

There are 7 provincial hospitals with some 4,900 beds in the provincial capitals, covering 14 Districts together with the teaching hospitals. They have specialized departments and carry out pathological and other tests.

3) Base Hospitals

There are 20 base hospitals with some 5,900 beds in local cities. Each hospital has 150-200 beds and 1 or 2 specialized departments in addition to their pathological testing capability.

4) District Hospitals

There are 109 district hospitals with some 11,300 beds throughout the country. The hospital size varies from 20 to 300 beds and 1 or 2 medical officers and several practitioner are assigned to each hospital.

5) Peripheral Units

There are a total of 117 units with some 5,000 beds. Each unit has 30-100 beds and 1 medical officer or practitioner.

6) Other Health Units

There are 118 rural hospitals with some 20 beds each, totalling approximately 3,000 beds. In addition, 88 maternity homes and central dispensaries with some 10 beds each provide some 1,000 beds. 1 practitioner provided for each facility.

2. Health Care and Hospital Staff

Table 2-2-3 (b) shows the current and required number of medical staff as of 1984. There is a total of 1,667 medical officers compared to the fixed number for this position of 2,270, showing a shortage of 603. In view of the requests made by various institutions, 2,416 medical officers will be required in 1989, therefore necessitating the training of 749 new officers in the 5 year period between 1984 and 1989 (150 officers /year).

There is an average medical officer /population ratio of 1 in 8,330, approximately one-tenth of the current ratio in Japan. The actual ratio, however, largely varies from place to place and while the ratio in Colombo is 1 in 2,770, showing a slightly excessive concentration, there is one particular isolated area where the ratio is only 1 in 43,500.

The medical staff shortage is caused by the insufficient capacity of the training institutions and the outflow of these staff to foreign countries. Although the main reason for this outflow lies with the income level, working conditions and status are also high on the list of reasons in the case of medical officers. The disproportionate concentration of medical officers in Colombo mentioned earlier can be explained by the inadequate provision of medical equipment at local medical facilities. If medical officers cannot find jobs in Colombo, they appear to prefer to seek employment abroad.

Table 2-2-3 (b) Number of Medical Staff and Recuritment Plan (1985-1989)

(Unit: person)

Category	Present (1984)			Recruitment Plan (5 Years)	
	Fixed No. of potitions	Positions Filled	Deficit	Required No.	No. to be Recurited
Medical Officers	2,270	1,667	603	2,416	749
Asst. medical Prac. Reg. Medical Prac.	1,179	1,115	64	1,443	328
Medical Laboratory Technicians	550	483	67	1,144	661
Staff Nurses	8.013	7,597	416	12,500	4,903
Midwives	4,800	4,314	486	7,767	3,453
Public Health Inspectors	1.097	917	180	2,020	1,103
Hospital Attendats	5,435	3,756	1,671	9,249	5,493

Source: Health Manpower Situation in Sri Lanka, 1986

This concentration of medical staff in Sri Lanka's major cities poses a major obstacle for the nation-wide implementation of the health improvement programme. Therefore, the Sri Lankan Government has been trying to increase the number of staff by increasing the enrollment at each training /education institute. The number of trainees (students) at such institutes in 1985 was as shown in Table 2-2-3 (c).

Table 2-2-3 (c) Basic Training of Health Personnel

	Training Capacity		Period of Training
Medical Officers	90 150 70 70 100	Peradeniya Colombo Galle Jaffna Gampaha	5 years
A.M.P	60 60 60 30	Peradeniya Colombo NIHS, Kalutara Jaffna	3 years
Dental Surgeons	50	Peradeniya	4 years
M.L.TT	50	M.R.I.	2 years
P.H.I	40	Institute of Hygiene, Kalutara	1 year
Physiotherapists	25	G.H.C.	2 years
Radiographer	30	G.H.C.	2 years
Nurses	450	(6 NTS)	3 years
Pharmacists	60	(Colombo)	1 year
Midwives	600	Provincial Hospitals	1 1/2 year

SOURCE : Health Manpower Situation in Sri Lanka 1986

2-2-4 National Health Care Programme

The Sri Lankan Government's health policy is based on its 1977 election manifesto to "restore the high standards of health care and disease prevention ... by further improvements in our health service ... through both the Ayurvedic and Western systems". This committment was reaffirmed in February, 1980 when the Charter for Health Development to provide "Health for All by the Year 2000" was signed.

Based on the above described spirit, the Health for All 2000 plan (HFA2000) was formulated and the following measures implemented during the 5 year plan (1984-1988), mainly to establish a health care system and to consolidate its basis.

1) Establishment of a national health development network to ensure intasectoral and intersectoral coordination for health development activities.
2) Greater emphasis on the decentralization of health administration.
3) Priority identification of primary health care (PHC) components and the development of an implementation model for application on a national scale.

The Government has also been carrying out administrative reforms and the consolidation of the health care base with the understanding that primary care should be given priority in order to improve the health care standard in rural areas.; Moreover, based on the recommendations of an international conference held in 1978, improvement activities have been in progress in 17 areas, including the improvement of nutrition and water, maternal care, prevention of infectious diseases and improved immunization, early treatment of common diseases and injuries, and health control at schools and places of work, etc.

Fig. 2-2-4 (a) PHC DELIVERY AND SUPPORT SYSTEM

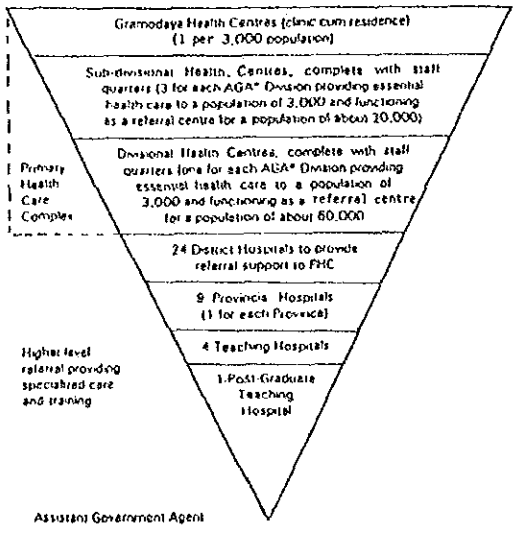
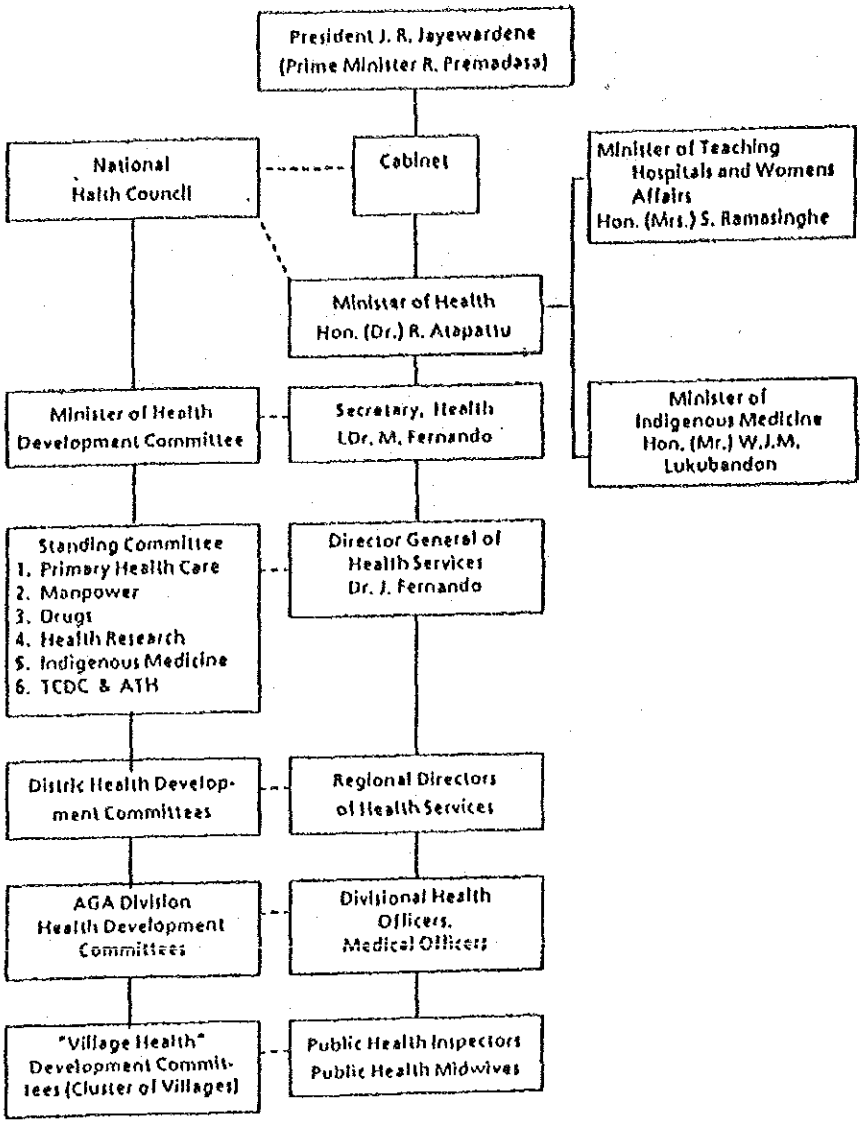


Fig. 2-2-4 (b) National Health Development Network



The following improvement activities have also been in progress to consolidate the medical administration system.

1) Generation of political leadership through seminars and conferences for Ministers, Members of Parliament and Members Local Authorities.

2) Establishment of health sub-committees of District Development Councils, Pradeshiya Mandalayas and Gramodaya Mandalayas.

3) Mobilization of more resources to raise the percentage health expenditure to 5% of the GNP (currently 4%).

4) Formulation of a programme for the infrastructure development of the periphery below the level of district hospitals and its adoption by the Government.

5) Development of a programme to improve and strengthen the main referral hospitals (district and provincial) and the teaching hospitals of Sri Lanka.

6) Increase of the capacity of training facilities for critical categories of health manpower.

7) Development and improvement of essential support systems to provide essential drugs, logisitc support and storage facilities in the context of PH.

8) Formulation of a course of action for the development of the indigenous medical system and its coordination in the general health services of the country.

Each medical institution has been reorganized into the system shown in Fig. 2-2-4 (a) with a divisional health center and a small clinic being provided for each 60,000 and 3,000 people respectively. These 2 kinds of facilities comprise the primary health care group. In comparison, district hospitals and teaching hospitals, etc. form a higher level health care group engaged in special care and training. In this group some 30 hospitals will be subject to improvement and reorganization.

2-2-5 Acts and Ordinances on Health Care

The Ministry of Health is responsible for the enactment, revision and enforcement of acts and ordinances are announced in the official Gazette after being attested to by the Cabinet.

(1) Health Administration

1) Medical Ordinance (Chapter 105)
2) Medical Amendment) Act (No. 30 of 1987)
3) Medical (Amendment) Act (No. 10 or 1979)
4) Health Services Act (Chapter 219)
5) Nursing Home (Regulation) Act (Chapter 220)
6) Medical Wants Ordinance (Chapter 226)
7) Corneal Grafting Act (Chapter 221)
8) Mental Diseases Ordinance (Chapter 227)

(2) Infectious Diseases Control

1) Quarantine and prevention of Diseases Ordinance (Chapter 222)
2) Contagious Diseases Ordinance (Chapter 223)
3) Venereal Diseases Ordinance (Chapter 224)
4) Diseases Among Labourers Ordinance (Chapter 225)
5) Lepers Ordinance (Chapter 228)
6) Vaccination Ordinance (Chapter 229)
7) Malathion control Act (No. 22 of 1985)

(3) Foods and pharmaceuticals

1) Food and Drug Act (Chapter 216)
2) Food Act (No. 26 of 1980)
3) Bread Ordinance (Chapter 217)
4) Poisons, Opiums and Dangerous Drugs Ordinance (Chapter 218)
5) Cosmetics, Devices and Drugs Act (No. 27 of 1980)

(4) Environmental Hygiene

1) Nuisances Ordinance (Chapter 230)
2) Cemeteries Ordinance (Chapter 231)
3) Wells and Pits Ordinance (Chapter 232)
4) Surburban Dairies and Laundries Ordinance (Chapter 234)
5) Municipal Dairies and Laundries Ordinance (Chapter 234)
6) National Environmental Act (No. 47 of 1980)

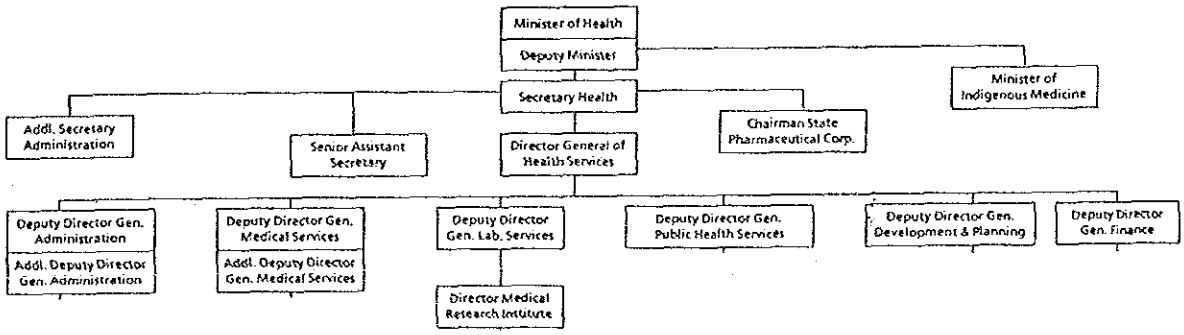
CHAPTER 3
CURRENT CONDITION OF THE MEDICAL RESEARCH INSTITUTE

CHAPTER 3. CURRENT CONDITION OF THE MEDICAL RESEARCH INSTITUTE

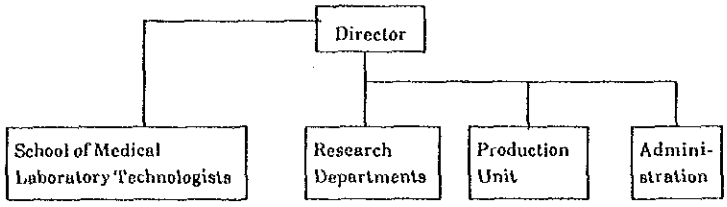
3-1 Organization and Activities

The Ministry of Health is composed of the Vice-Minister's Secretariat and six departments. Of these six departments, three, excluding the Administration Department, Finance Department and Development and Planning Department undertake service activities for the Ministry of Health: they are the Medical Services, Laboratory Services, and Public Health Services which are respectively responsible for medical services, testing and research services and public health activities.

The Medical research Institute which is under the jurisdiction of the Laboratory Services Department is the central medical research laboratory of the Ministry of Health and the only comprehensive medical research institution in Sri Lanka. The MRI's activities may be likened to the combined functions of the National Institute of Health and the National Hygienic Laboratory of Japan.



Although subject to change from time to time, the MRI's organization consists of some twenty research departments, in addition to which the School of Medical Laboratory Technologists is attached and operated.



The MRI's activities in general may be broadly classified into the following six functions.

a) Routine tests and diagnosis

The MRI's accepts a large volume of specimens for routine laboratory tests as local hospitals lack such testing function. It also undertakes tests on patients who have come with an introduction. The MRI's is the only testing organization in virology, mycology, leptospirosis and toxoplasma in the entire country.

b) Nucleus testing center

The MRI's undertakes the more complex and specialized tests as the National Reference Laboratory. It also produces and supplies reagents for laboratory tests and promotes quality control in collaboration with W.H.O.

c) Disease surveillance and other public health activities

The MRI's is engaged in nutritional, entomological and virological surveillance programmes in examination of dog brains for the rabies control programme and in testing of food and water samples for contamination. It also participates in the campaigns sponsored by the Ministry of Health and W.H.O., such as their epidemics control programme and the programme of promoting preventive inoculation.

d) Production of vaccines, etc.

The MRI's is engaged in production, safety testing and distribution of anti-typhoid vaccine, anti-Cholera vaccine, anti-rabies vaccine, etc. It also prepares and distributes distilled water for laboratory tests, physiological saline, sodium bicarbonate solution, glucose solution, etc.

e) Teaching and training

The MRI's is responsible for the administration and operation of the Medical Laboratory Technologists' School annexed to it. Each of its research departments accepts second year students for practical technical training and lectures. It also offers lectures and training to medical students, interns and researchers.

f) Research

Each research department participates in various projects ranging from studies on preventive medicine to basic medicine.

At present, many of the departments place priority on routine diagnosis, tests and assays while some, because of their nature, place emphasis on surveillance, public health services or research activities. But each respective department carries out its activities independently and what the Institute as a whole lacks is total controle. This may be attributed to the singularity of Sri Lanka's policy on health administration and the historical background of the Institute.

Everyone involved in healthcare in Sri Lanka, however, is well aware of the importance of reducing the workload of such service activities as routine tests and diagnosis and of gradually shifting the priority to basic medical research. Since the MRI's has a high technological potential the said shift is considered realizable if stepwise improvement measures are implemented.

3-2. Historical Background

In order to understand the MRI's complicated organizational system and activities, it is necessary to touch on its historical background. Since its opening as the Bacteriological Institute in 1900, the Institute's activities have continued expanding briskly according to social needs and by the emergence of brilliant researchers. Despite the rapid advances made in modern medicine, however, both its organization and facilities have been left without improvement or, in other words, the Institute has been left behind the times.

1900 Opening of the De Soysa Bacteriological Institue based on donations (the existing building on the corner)

1903 Appointment of Dr. A. Castellani (the discoverer of Trypanosomes) as the first Director of the Institute

1090 Establishment of the Vaccine Unit (to manufacture small pox vaccine and T.A.B.)

1918 Opening of the Pasteur Institute (Across the road from the Bacteriological Institute)

1922 Opening of the new Entomological and Mycological Laboratories

1925 Starting of training of laboratory assistants

1936 Amalgamation of the Pasteur Institute and the Vaccine Unit with the De Soysa Bacteriological Institute

1937 Completion of the new laboratory building (the two storeyed portion of the existing MRI's building)

1938 Establishment of the Department of Nutrition

1940 Establishment of the Pharmaceuticals Preparation Department

1942 Establishment of the Parasitology Department

1944 Establishment of the Department of Serology

1944 Commandeering of a part of the premises as a temporary food supplying centre for the Civil Defence Commissioner, and later taken over by the Marketing Department.

1946 Renaming of the Bacteriological Institute as the Medical Research Institute

1951 Establishment of the Diagnostic Virology Department

1959 Starting of training of medical laboratory technologists

1959 Completion of extension work (the three-storeyed portion of the existing MRI's). The ground floor for animal house, the first floor for indigenous drugs research and the third floor for vaccine preparation.

1964 Establishment of extension work (the three-storeyed portion of the existing MRI's). the ground floor for animal house, the first floor for indigenous drugs research and the third floor for vaccine preparation.

1964 Establishment of a new department for research on medicinal plants

1968 Opening of the Virus Laboratory at the Colombo South Hospital premises.

No change since.

3-3. Activities of Each Department

(1) Department of Entomology

It is actively engaged in aedes surveillance and research activities with the cooperation of W.H.O. It also participates in the Anti-Malaria Campaign and Anti-Filariasis Campaign, and carries out ecological and cytogenetic studies on mosquito and on insecticide residue.

(2) Department of Parasitology

It extensive carries out routine tests on amebic dysentery, filariasis, toxoplasma, etc. Research activities have been suspended ever since the former head of the Department moved out as a professor, but investigation and research on intestinal parasites are important as they are common diseases among developing agricultural countries and considered to be the primary cause of mulnutrition.

(3) Department of Pathology

Routine services including histopathological investigations and ordinary blood tests account for most of its workload. Research activities are under way on mammary gland diseases, hemolytic diseases, chronic liver diseases, etc. The Department ought to shift ordinary blood and urine tests to some other department and concentrate its efforts on pathologic morphology (bacteriology, biopsy, and autopsy).

(4) Department of Nutrition

It carries out field studies on various untritional problems, participates in relevant committees and makes recommendations. At present, collaborative research projects on iodine deficiency and iron deficiency anemia are under way.

(5) Department of Biochemistry

It carries out a great deal of routine tests in diverse fields. Biochemical analyses and other studies on diabetes, lipid metabolism, liver diseases, thyroid function, etc. are its fields of research. The Nuclear Medicine Unit is currently a part of this Department. The quality control project in clinical chemistry is also being implemented with the help of W.H.O.

(6) Department of Pharmacology

It carries out pyrogen tests and hormone tests as routine work. A part of its research concerns a project on male infertility among patients treated at the Family Planning Association undertaken in collaboration with the Bio-chemistry Department. The patients are tested for their level of serum and urinary hormones before and after treatment.

(7) Department of Natural Products

It extracts substances from medicinal plants (and also from microbes and mosquitoes) considered useful by Sri Lanka's traditional medicine with the intention of launching on the study to determine their structures and pharmacological efficacies. It also produces sodium bicarbonate for the use of government hospitals.

(8) Department of Bacteriology-I

The Department's routine work consists of bacteriological tests, antibiotic sensitivity tests, preparation and distribution of certain discs for testing, efficacy tests of disinfectants, etc. Its field of research is isolation identification and classification of pneumonia pathogens.

(9) Department of Bacteriology-II

The Department is comprised of 4 sub-departments and carries out various tests and assays.

i) Enteric Bacteriology

Identification of enteric bacterial pathogens, searching for bacterial pathogens during epidemics of diarrhoeal diseases, production of necessary antisera.

ii) Anaerobic Bacteriology

Anaerobic cultures from wound swabs anaerobic cultures and identification from other specimens.

iii) Sterility Testing

Examination of contamination within hospital, tests on function of sterilisers, investigation of the degree of contamination in the special medical environment.

iv) Quality Control

Potency testing of antibiotics and sterility tests of medical supplies.

(10) Department of Mycology

This Department diagnoses, offers referenece services and studies mycological specimens. Patients may come with an introduction. Research is clinically oriented.

(11) Department of Leptospirosis

The Department diagnoses leptospirosis by carrying out serological tests, culture, animal inoculation, etc.

(12) Department of Food and Water Bacteriology

The Department tests food and water for microbiological contamination.

(13) Media Section

This Section produces test liquids for testing laboratories, liquids for preparing vaccines and media for culturing bacteria.

(14) Department of Virology-I

The Department investigates antibodies infected by virus as routine work. The number of speciments investigated is quite large. The Department also implements various research projects with the support of mainly W.H.O. as well as other overseas organizations.

(15) Department of Virology-II, (Colombo South Virus Laboratory)

The Department has a laboratory at the Colombo South Hospital premises and carries out isolation of virus from specimens taken from patients. The laboratory which also serves as the influenza center of W.H.O. is primarily engaged in

laboratory diagnosis and survey of epidemics. It does not have any spare capacity to carry out basic research.

(16) Department of Rabies Diagnosis and Research

As the only facility of its kind in Sri Lanka, the Department undertakes diagnosis of rabies as routine work. It has undertaken research on wild life reservoir of rabies and on dosage of vaccine. It also participates in the rabies control campaign.

(17) Department of Vaccines

The Department manufactures anti-rabies vaccine for treatment, and anti-typhoid vaccine and anti-Cholera vaccine for protective inoculation, and carries out sterility testing of clinical reagents. It also participates in the vaccination campaign.

(18) Animal House

The Animal House raises and controls animals for experiments. It has a detachment at the Colombo South Hospital. Animals larger than rabbit are purchased from domestic animal dealers.

(19) School of Medical Laboratory Technologists

The School rents a part of the Children's Hospital of the General Hospital of Colombo and offers two-year training. In the first year, it offers courses on basic science relevant to clinical examination and on theories and practices of examination techniques. In the second year, it offers practical training and lectures at the MRI's, the General Hospital of Colombo and other places. Students are qualified as laboratory technologists if they pass the final examination. The fixed class size had been 45 students, but starting from the end of 1986, two classes with 90 students in total began to be admitted in compliance with the request of the Ministry of Health.

3-4 Condition of Existing Facilities

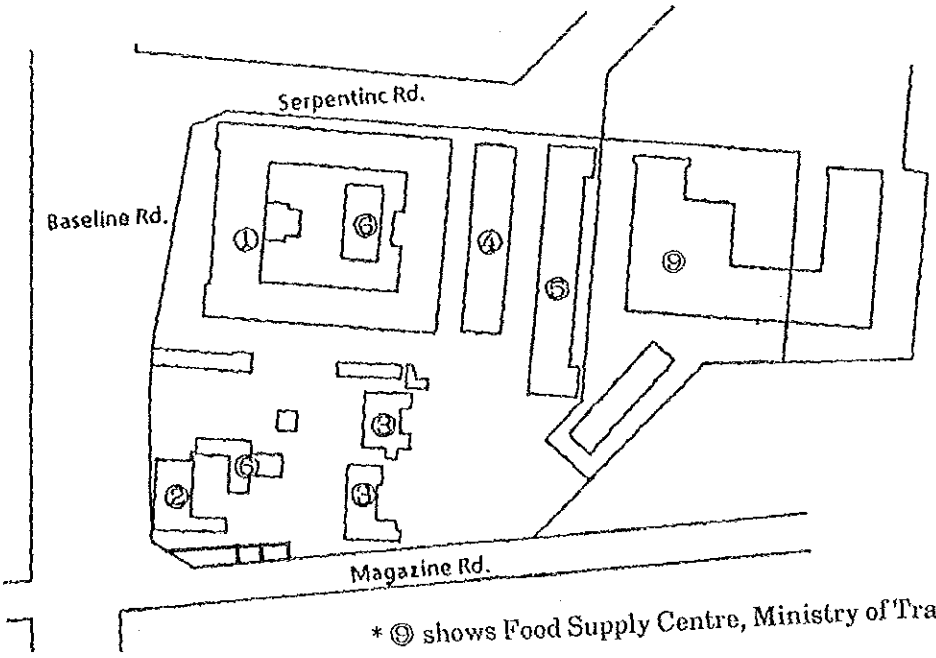
3-4-1 Scales of Facilities

The Medical Research Institute in located in the Borella District east of Colombo, Sri Lanka. Its premises cover an area of about 12,000m^2 at present, on which are two laboratory buildings and other ancillary facilities. The Department of Virology-II has a laboratory on the Colombo South Hospital premises, and the School of Medical Laboratory Technologists rents as classroom the room of the Children's Hospital opposite the Institute.

The scale of the respective facility is as follows:

		floor area
① Main Building	two-storeyed and three-storeyed	about 3,900m^2
② Annex Building (old Bacteriological Institute)	two-storeyed	380m^2
③ MLT Dormitory (for staff on duty)	single-storeyed	400m^2
④ Animal House	single-storeyed	450m^2
⑤ D.L.S. Stores (which belongs to other)	single-storeyed	450m^2
⑥ Others (storage, mess hall, garage, etc.)	single-storied	600m^2

Fig. 3-4-1. Existing Facilities, MRI



* ⑨ shows Food Supply Centre, Ministry of Trade

Besides the above, the MRI's has the following facilities:

⑦ The Virus Laboratory (in the Colombo South Hospital) about 600m²

⑧ The School of Medical Laboratory Technologists (in the Children's Hospital) about 240m²

At present, the net floor area allocated to each department is as follows:

1) Administration		202m²
2) Common facilities (conference rooms, library, etc.)		220m²
3) Storage		230m²
4) Research departments		
— Entomology (Annex Bldg.)	200m²	
— Parasitology	133m²	
— Pathology	63m²	
— Nutrition	91m²	
— Biochemistry-I,II	126m²	
— RI Diagnostics (Annex Bldg.)	90m²	
— Pharmacology	113m²	
— Natural Products	192m²	
— Bacteriology-I	92m²	
— Serology	45m²	
— Bacteriology-II	136m²	
— Mycology	60m²	
— Leptospirosis	23m²	
— Food and Water	47m²	
— Media Preparation	117m²	
— Virology-I	134m²	
— Virology-II (Colombo South Hospital)	360m²	
— Rabies Diagnoses	58m²	
— Common facilities (dark room, refrigerator room, etc.)	99m²	
5) Vaccine Production Unit		212m²
6) Animal House		548m²
— Ground floor, Main Bldg.	148m²	
— Colombo South	400m²	
7) Education Department (MLT School)		240m²
Total		3,601m2

3-4-2 Present use of facilities

The research departments housed in the Main Building (to ① of fig. 3-4-1) seem to be overcrowded already. In some departments, however, space is taken up by unused equipment and apparates. Also, for the size of the rooms the number of researchers is small, with the result that the population density per research room is low. Hence, it is necessary to remove the unused equipment and apparates and rearrange the rest for more functionally efficient use. The Administration Division is cramped for space. It seats about 25 persons with desks in an office of about 60m^2. An Audio-Visual Hall of about 60m^2 is located on the first floor, where M.L.T. students can attend lectures. Armchairs to seat 45 students fully occupy the space. No textbooks are used, but students cannot take notes as there are no desks.

The ground floor of the Annex Building (to ②) houses the RI Diagnostics Department. It is a newly established department and has very few equipment as yet so that it looks spacy. The Entomology Department is located on the first floor. Besides the research and laboratory rooms, it has a preparation room for field survey, an insectory and a study space for trainees cum exhibition room. The attached building (to ⑥) is used as a warehouse where a large quantity of old instruments for field survey and furnitures are stored. The front entrance of this building is unusable because of the brick wall which has to be moved inward as a result of the widening of the road. A canteen is located next to the building but is poorly built, its structure consisting of brick fence with a suspended roof over the walls.

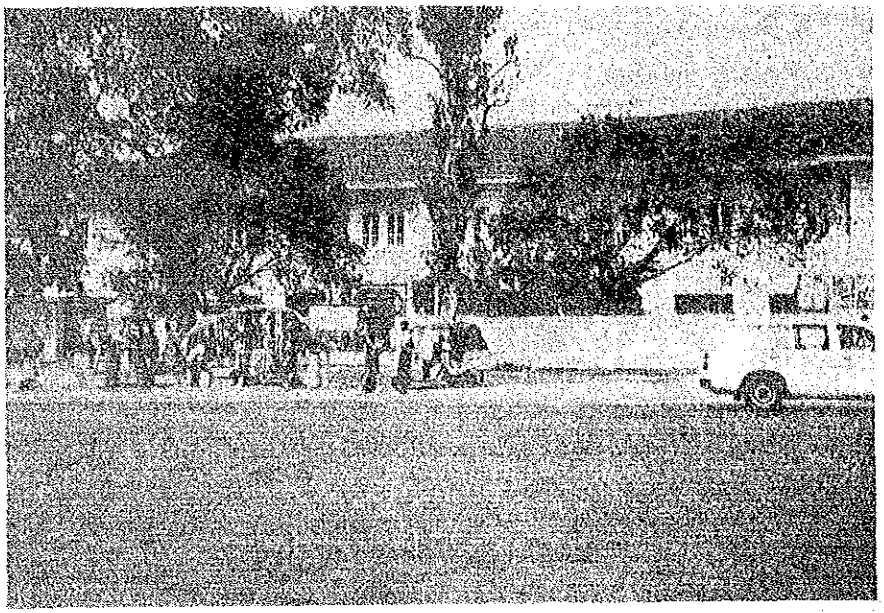
Along the outside wall are a garage which can be approached from the Magazine Road and the office of a women's movement organization.

Two duplex staff houses (to ③) stand on a height, where three families now live. Each house consists of two bedrooms and a dining kitchen. The staff who reside here are clinical technologists who are in charge of accepting specimens and patients during night and communicating with the researchers and also responsible for the keys of laboratory rooms on a weekly shift.

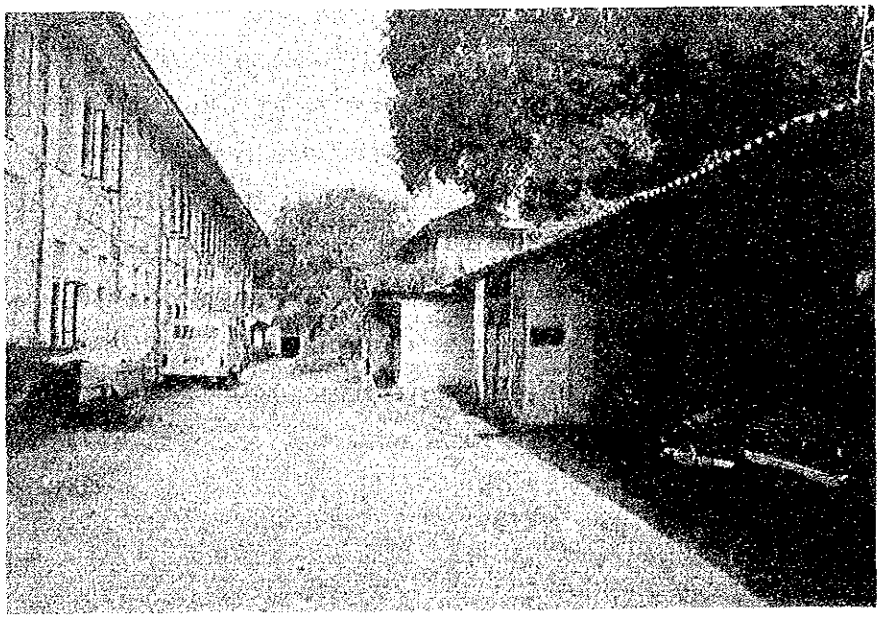
The Animal House (to ④) is located at the back of the Main Building. Cages of monkeys, goats, geese, chickens and dogs are placed under the eaves of the House. The Animal House itself is not used at present because of contaminations between animals. The D.L.S.Stores (of the Divisional Laboratory Services to ⑤) is located further back. All of the space excluding the office and the space for receiving and issuing is taken up by racks for storing large quantities of medical supplies.

The Virus Laboratory in the Colombo South Hospital is relatively well managed. The animal house attached to it is partly two-storeyed and supplies animals for experiment to the MRI's, too.

The Medical Laboratory Technologists' School within the Children's Hospital has the Principal's Office, a practice laboratory and a classroom only. One more class was added at the end of 1986 to admit 90 students every year but it does not seem large enough to accommodate that much students. Unless the School's facilities are improved, it will invite the deterioration of the quality of the students.



Front view from Baseline Rd.



Side view and elevated land

3-4-3 Condition of the facilities

Every building is old and generating various problems. Its wooden fittings lack air-tightness, and electric wiring and utility piping are exposed. In addition, there are too many human traffic lines due to the complicated organizational structure of the Institute which make the buildings susceptible to contamination by saprophytic bacteria from the outside. In such a situation, it is difficult to maintain the laboratories in a sterile condition or in a state of high cleanliness which are naturally demanded of all laboratories. In the existing environment, it seems almost impossible to carry on accurate examinations and tests or to maintain purity and safety of vaccines and antisera.

In order to realize the required laboratory environment at the existing facilities, the following modification work is necessary.

1) Roof tiles and waterproofing layers must be repaired and the ceilings replaced in order to prevent infiltration of saprophytic bacteria from above.

2) All fitting must be replaced with aluminium ones to keep air-tightness.

3) Electric wiring and utility piping must be embedded to protect them from dust.

4) All unused equipment and apparates should be removed from the laboratories.

5) The existing organizational structure must be restructured and the layout of research departments rearranged according to the required level of cleanliness.

6) The clinic for outpatients should be placed near the entrance so that patients who come with an introduction are not ushered into the laboratory offices.

7) The research departments should be divided among a number of areas, each according to the required level of cleanliness. Also a dressing room for putting on white robes, outer and under garments, and room shoes should be provided stepwise for each department.

It would seem impossible to pursue medical research with the existing facilities unless these drastic reforms are implemented.

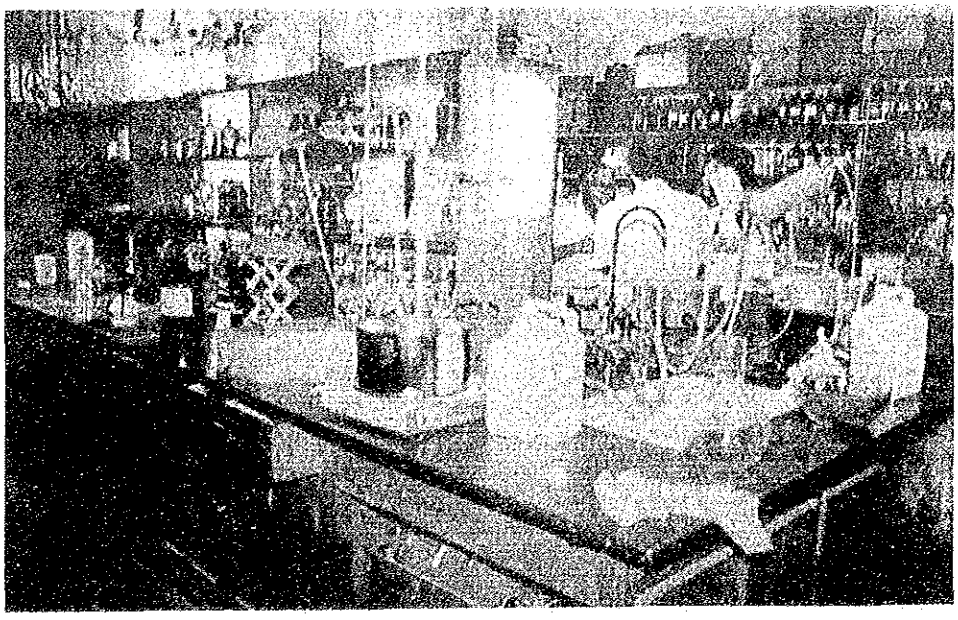
3-5. Condition of existing equipment

All of the equipment and apparates are of the outdated types of 10 to 15 years ago. Many of them are lying idle in want of repairs due to lack of replacement parts of inability to make repairs. Obsolete equipment and apparates which no longer function are left abandoned under laboratory tables, atop shelves or in the corridors. But there is evidence here and there of efforts having been made to restore the laboratory with the most basic of equipment, such as the water distillation unit made of flask and gas burner or the fume food made of glass-paned wooden frame.

Some new types of equipment have also been induced. They are protected with cases of vynil or acrylic plate boxes. The new types of equipment have been induced mostly by the departments which are active whereas only a few have been induced by the dormant ones. Or, they are seen mostly in the departments whose research activities demand accuracy whereas the departments which do not require accuracy still depend on timeworn methods and apparates.

The "List of Equipment to be Relocated" which was obtained as the data for the current study included equipment of the 1980s and 1970s. This list is shown in the Appendix-4.

As described above, the present condition is that besides the old facilities, the equipment and apparates, too, have far exceeded their respective depreciable life. In such an environment, various efforts of the researchers to pursue modern medicine are in evidence, but fruition of their efforts may be claimed to be impossible without a drastic improvement.



Inside view of typical labo.

3-6. Operating System and Budget

The current manpower of the MRI's is composed of 183 research staff, 27 administrative staff and some 50 orderlies, altogether about 260 persons.

Fig. 3-6 (a). Manpower Composition of the MRI's (Research Departments only)

As of September, 1987

	Research staff			Assistants	Technologists	Helper	Total
	MC	MO	RO	EA., PHI	MLT	LO	
Existing	8	18	8	16	59	74	183
Cadre	—	22	17	—	77	64	—

MC : Medical consultant
MO : Medical Officer
RO : Research Officer
EA : Entomological Assistant
PHI : Public Health Inspector
MLT : Medical Laboratory Technologist
LO : Laboratory Orderly

Of the above, 34 research staff members hold responsible posts and assume leading roles in their respective departments. When compared to the cadre, there is still a shortage of 7 MOs and 9 ROs as research personnel and also 18 MLTs. Personnel shortage is a national problem attributable to the deficiency of educational institutions and exodus of talented human resources.

The age group composition of the research personnel is as summarized in the following table. As young researchers are few among MOs and ROs, it is probably time for a change of generations.

Fig. 3-6 (b) Age Group Composition of Research Personnel

(units in persons)

Age group	MC	MO	RO	Sub-total
Over 60	2	1	1	4
50s	4	1	2	7
40s	2	—	4	6
30s	—	7	1	8
20s	—	9	—	9
Sub-total	8	18	8	34
Average age	54.4	34.4	47.6	45.5

The MRI's annual budget has been steadily increasing as follows:

Fig. 3-6 (c) The MRI's Annual Budget

(Units in Rp.)

Year	MRI	DLS (MRI)	MLT School
1987	13,013,500	20,500,000	1,723,300
1986	10,986,117	17,400,000	1,689,910
1985	6,255,910	17,420,000	970,450
1984	5,262,550	5,755,000	293,075
1983	4,587,000	1,250,000	856,648
1982	4,701,600	2,600,000	362,600

MRI : Medical Research Institute
DLS : Divisional Laboratory Services Stores
MLT : School of Medical Laboratory Technology

Of the above, the budget for the DLS Stores is mostly for medical supplies, glass wares and equipment, and half of the budget for the latter two is for the MRI. The repair and maintenance expenses of the MRI's buildings are also included in this category. In 1986, the share of this budget appropriated for the MRI was 5,150,000 Rp.

The budget for the MLT School covers personnel expenses and purchase cost of books. Purchase cost of practice materials and equipment are not budgeted. The students are trainees of the Ministry of Health, and their stipends are presumably included in the personnel expenses. With the two class system having been adapted since 1986 by adding the budget one more class (with 45 students) the budget has been increased to 1.7 times the 1985 level.

3-7. Circumstances and Contents of the Request

3-7-1. Circumstances of the request

In the light of the foregoing situation, the Government of Sri Lanka formulated the "Medical Research Institute Improvement and Expansion Project" for the following purposes and requested the Government of Japan for the provision of facilities and equipment necessary for the implementation of said project under its Grant Aid Programme.

1) Rehabilitate and improve the existing MRI which is functionaly inoperable by constructing modern medical research facilities that will enable it to play the role of a national reference laboratory.

2) Amplify the educational facilities for the development of medical laboratory technologists which had been deficient in order to be able to cope with the growing demand for technologists.

3) Upgrade the levels of research activities and testing techniques by realizing the dispatch of trainees to Japan and dispatch of experts from Japan under Japan's technical cooperation.

In response to the aforesaid request, the Japan International Cooperation Agency (JICA) dispatched the following survey teams in order to study the propriety and feasibility of said expansion project.

Contact Mission (on technical cooperation)	February 22 to March 14, 1987
Preliminary Survey Team (on grant aid)	Simultaneously with the above Mission
Preliminary Survey Team (on technical cooperation)	From June 24 to July 7, 1987
Short Term Expert Team (on technical cooperation)	From August 6 to August 21,1987

Based on the results of surveys conducted by those teams,it was judged possible and appropriate to extend Japan's Technical Cooperation for the period of five years in order to strengthen and improve the MRI's activities in the five areas of diagnostic function, reference service function, education and training at the MLT School, production

function and research function. In connection with the Grant Aid Cooperation, the improvement and expansion of existing antiquated laboratory facilities and equipment were also considered important and urgent. The Government of Sri Lanka requested for the early implementation of Japan's Technical Cooperation and Grant Aid.

Regarding changes in the contents of the request, the Technical Cooperation was not requested for initially, but as the need for it was confirmed during the discussion with the Contact Mission, the Sri Lankan Government submitted a new written request accordingly., and at the same time, requested for grant aid in detail by specifying the names of various rooms in the laboratory building, their floor areas and the required equipment. Furthermore, assistance for the production of antivenin was additionally requested according to the strong desire of the Ministry of Health. This field being new to the Sri Lankan side, the Team considered that a study by an expert on snake poison and by an expert on animal breeding would be necessary, so that two long-term experts were subsequently dispatched from Japan.

Based on the preparatory discussions of the Contact Mission and the surveys conducted by the Preliminary Survey Teams, JICA dispatched the Basic Design Study Team for the period form August 11 to August 31, 1987 in order to acquire a grasp of the contents and the background of the request for said improvement and expasion project examine its effects and propriety as a Grant Aid Cooperation project of Japan, determine the contents and scale of cooperation necessary and most suitable to the project and prepare the Basic Design accordingly.

3-7-2 Contents of the request

The contents of the request of the Government of Sri Lanka which were confirmed by this study team are as follows:

Project Name : The Medical Research Institute Improvement and Expansion Project

Executing Agency : The Medical Research Institute, The Department of Laboratory Services, Ministry of Health

Project Objectives :

1) To make the MRI's function more effectively as the national reference laboratory by improving the quality of its present diagnostic and research activities.
2) Production of improved types of vaccins and inducement of the production technologies for new types of vaccines and sera shall also be included in this project.
3) To reinforce the current research, reference, diagnostic, and vaccine production activities.
4) To improve and reinforce the education and training facilities.

Requested Facilities

1) Research and experiment facilities (including the Center for Medical Instrumentation)
2) Animal Center
3) Biological production facilities
4) The Medical Laboratory Technologists' School
5) Lecture hall
6) Quarters for live-in medical laboratory technologists (four units)

Requested Equipment (deemed necessary for the foregoing facilities)

1) Research and experiment equipment
2) Educational equipment
3) Other equipment

In view of the site condition for this project and the nature of the grant aid cooperation of the Government of Japan, the intentions of both parties on the following matters were exchanged as notes.

Intentions of the Japanese side:

1) The laboratory building shall house the library, rooms for the senior staff and the Director's room.
2) The stable for horses for the production of antivenin shall be constructed by the Sri Lankan side.
3) The construction of temporary quarters for MLTs may be considered if the Sri Lankan side is able to secure a temporary material stock yard outside the site for this project.
4) Regarding expansion of the research and experiment rooms and provision of the lecture hall (seating 150 persons) and conference room (seating 20 persons), the Study Team will coordinate with the concerned parties upon its return to Japan.

Intentions of the Sri Lankan side:

If the following facilities are not included in the scope of the grant aid cooperation, the required space for them shall be reserved the site for this project.

1) Site for the quarters of medical laboratory technologists (four units)
2) Space for garage or parking lot (for 35 cars)
3) Guard house
4) Space for snake breeding room (within the Animal House) and space for stable (for eight horses)
5) Space for auditorium and conference room.

CHAPTER 4

CONTENTS OF THE PROJECT

CHAPTER 4. CONTENTS OF THE PROJECT

4-1. Objectives of the Project

In the Health Charter adopted in February, 1980, the Sri Lankan Government undertakes to "guarantee the satisfactory health of all nationals by the year 2000". As concrete measures to achieve this goal, the provision of equal health care opportunities for all nationals by decentralizing the medical administration and by introducing a systematic national health plan. Moreover, the Government has also been promoting primary health care to reduce the burden on secondary and tertiary health care. As 80% of the population live in rural areas and have an extremely low income level, however, these people are forced to visit the free clinics in their vicinity or local hospitals and intestinal infections, tuberculosis (TB), parasitic infections, malnutrition, anaemia and injuries, etc. remain largely untreated in these rural areas. Full-scale basic research in preventive medicine for these basic infectious diseases, etc. must be carried out, therefore, in order to improve health care and preventive hygiene in Sri Lanka.

The Medical Research Institute (MRI) is under the direct control of the Ministry of Health and is, therefore, the highest organization responsible for this basic research. In reality, however, the MRI's service work of the routine testing for local health organizations has been increasing annually due to the inadequate testing capabilities of the local health organizations. Furthermore, the MRI is overloaded with various work, including the manufacture and inspection of testing reagents and vaccines. In principle, such measures as the commissioning of the routine testing to major hospitals and the transfer of the vaccine manufacture to another organization should be taken in order that the MRI's research activities can be strengthened in view of its proper position as the country's central research institute. In view of the weak testing capabilities of local hospitals at present, however, this transfer or commissioning of various work cannot be recommended to avoid confusion in the overall medical system.

The MRI should rather stress on manpower development by means of fostering medical technologists, the number of which is currently far below the satisfactory level, and training medical students based on a strong awareness that it is the highest responsible organization for health car of the Ministry of Health. With the successful implementation of these educational and training efforts , a supply of medical technologists and the improvement of medical techniques at local hospitals will become possible, in turn alleviating the burden on the MRI to provide these hospitals with various services. At the same time, the national networking of medical institutions should be conducted to establish a national reference and surveillance system. The

improvement of preventive hygiene and health care in Sri Lanka will not be achieved unless the current situation at local hospitals, where the causes of diseases or death are not specified and where the labelling of test specimens is inaccurate, etc., is improved.

In view of the above, the Project should not be simply understood as a project to strengthen the research functions of the MRI but should rather be considered as a step of a long-term programme to gradually rectify the distortions in the MRI's current activities against the background of a unique medical administration in Sri Lanka.

In the testing and research fields, the required level of accuracy is rising every year due to the rapid advancement of modern medicine in recent years. In particular, the provision of appropriate laboratories is indispensable for effective basic research in infectious diseases. Unfortunately, however, the MRI's current facilities and equipment have already exceeded their life expectancies and, accordingly, the implementation of research activities requiring a high level of accuracy and cleanness cannot be hoped for.

The objectives of the Project are the actual implementation of the following measures with the grant-aid cooperation of the Japanese Government.

1) Expansion and improvement of the MRI's facilities which are not properly functioning at present to those capable of testing and research activities at the standard required by modern medicine to revitalize the various functions of the MRI.

2) Provision of proper facilities and active efforts to foster and train laboratory technologists (MLTs) and medical students while the routine testing and production of testing reagents and vaccines, etc. is continued for some time.

3) Improvement of the testing and diagnosis capabilities of local hospitals in the future based on the newly strengthened manpower through the above, gradually reducing the amount of service work provided by the MRI.

4) Establishment of a system for the effective implementation of basic research in the fields of preventive medicine and infectious diseases within the MRI, which is the sole medical research institute in Sri Lanka, by centralizing researchers. The research result must be applied to improve the overall medical situation of the country.

4-2. Examination of the Sri Lankan Request

4-2-1. New Structure of the Departments

The Sri Lankan request consisted of the construction of a new modern laboratory complex on elevated land to the south of the current research building to house the educational, administrative and maintenance sections with the main purpose being facility modernization by trasferring 20 current research and testing sections to the new building. The Preliminary Study Team, however, pointed out that the present organizational structure of the MRI is too complicated to implement modern medical research activities and that rational reorganization will be required to achieve a functional improvement of the MRI, including interdisciplinary effects. The Team subsequently proposed the new organizational structure given below and this proposal was agreed to by the Sri Lankan side. It was further confirmed that the improvement plan to be prepared would be based on this new structure.

Proposed New Structure of the MRI

1. Department of Entomology and Parasitology
2. Department of Clinical Pathology and Immunology
3. Department of Nutrition and Biochemistry
4. Department of Pharmacology and Medicinal Plant
5. Department of Virology
7. Department of Biological Production
8. Center for Medical Instrumentation
9. Center for Education and Training
10. Animal Center
11. Administration
12. Library

4-2-2. Examination of Facilities

The current health care and public health conditions in Sri Lanka and related activities were studied during the field survey and the most urgently required measures were discussed. In addition, the primary role to be played by the MRI and its future prospects were examined. The results of the above discussions and examinations are as follows.

(1) Facility Size

The total floor area requested for the Laboratory Complex, Biological Production Unit and Animal center was approximately 7,250m^2. An additional facility request made after the Preliminary Study Team's return to Japan, however, increased the requested floor area to approximately 7,860m^2. When the corridors, stairs and mechanical rooms, etc. are taken into consideration, some 11,000m^2 appears necessary, an increase of 50% on the original size. The requested size is, therefore, an increase of 260% on the net floor area of the present research facilities of approximately 3,000m^2.

The Study Team decided to try to reduce the required floor area for the research section in the Project based on the following understanding.

1) In the case of the present facilities, old equipment is scattered around the laboratories, showing an inefficient use of the space. In the new laboratories, functional use of the available space will be possible, reducing the required area for each laboratory.

2) There is currently a total of 183 staff, i.e. 34 researchers and 59 laboratory technologists (MLTs) and it appears that the doubling of this staff level will take a long time given Sri Lanka's current manpower shortage in the medical field. Moreover, a large increase in the number of supporting staff will not be as rapid as anticipated by the MRI.

3) Some facilities and equipment are duplicated by departments or laboratories in the Sri Lankan request. Their integration or common use should be encouraged based on their functions and frequency of use.

While the modernization and functionalization of the research facilities and equipment will be conducted, the common use of washing, sterilization, storage and other places, as well as large equipment, will contribute to the reduction of the overall facility size, particularly the amount of space required for maintenance and administration. The facility plan will be prepared to easily allow expansion work based on the understanding that the Project is the first step of the master plan for the MRI to be implemented in the future.

(2) Utilization of Existing Building

Although the Project intends the consolidation of the functions of each department based on the reorganized structure, it should also clearly present the utilization plan for the existing building as part of the master plan. The original Sri Lankan request anticipated keeping some research facilities in the existing building. However, the existing building is deteriorated to such an extent that its restoration in view of providing a suitable environment for research appears almost impossible. Accordingly, there is concern that the research of those departments which may remain in the existing building may not be able to deep up with the future progress in their respective fields. The Project, therefore, anticipates the transfer of all departments to the new building.

In regard to public health activities, surveillance activities, the reception of specimens for testing and the diagnosis of outpatients introduced to the MRI, etc. will involve many visitors who may carry bacilli in or out of the building. In view of this, those sections dealing with these activities will be housed in the existing building.

(3) Outline of New Facilities

1) Laboratory Complex

While the consolidation of the research functions of the newly introduced 7 departments under the new organizational structure is aimed at, the duplicated facilities and equipment in the original request will be jointly used by different departments, by those located on the same floor or by all the research departments.

2) Animal Center

The research results based on animal experiments must be improved by raising the accuracy of these experiments through the provision of healthy animals. 24 hours artificial control of the environmental conditions of the breeding room and the production room will be required to achieve this improvement.

3) Biological Production Unit

The safe production of vaccines must be secured by a high degree of cleanness and high work precision. Accordingly, the maintenance cost will

significantly increase from the present level. A the unit production cost largely depends on the size of production, the price competitiveness of MRI products vis-a-vis imported products will pose a problem.

Either the introduction of a full-scale production plant or total dependence on imported products should be decided in the future, at which time the MRI's vactine production facilities should be converted to those capable of developing new vaccines and conducting inspection work.

4) School of Medical Laboratory Technology

The original request anticipated housing 2 lecture rooms, both with a seating capacity of 60, in the hall. However, these lecture rooms could be housed in the existing building as they do not require a high level of cleanness. It is of crucial importance that the theories and actual handling of medical instruments and methodological research manners be taught. As a result, the construciton of only a teaching laboratory with equipment is included in the Project.

5) Lecture Hall

The Sri Lankan side intends to use the new lecture hall not only for the MLT but also as a general purpose hall for various health campaigns, public health activities and the presentation of research results. In view of the MRI's activities, the construction of this lecture hall under the Project should prove very useful for use by both insiders and outsiders. As the maximum number of students at the SMLT is 180, hall should be able to seat at least 200.

6) New Flats for MLT

At present, 4 flats exist on the premises and 3 laboratory technologists (2 of them with families) are living in these flats. These laboratory technologists alternatively conduct the night-time reception of testing specimens and patients and the unlocking in the morning and locking in the evening of the laboratories on weekly shifts. If these flats are removed under the Project, new flats will not be allocated by the Ministry of Health, necessitating the construction of new flats as part of the Project. However, as the size of the premises is rather limited and as the nature differs from that of the research facilities, the Sri Lankan side has been requested to consider the construction of the flats outside the premises. As a result, the construction of only a night-watchman's room is included in the Project.

A strong request was also made for the construction of the following facilities.

7) Library

In general, the library is an extremely important facility for researchers in regard to collecting information, etc. The present library, however, is rather small and dark. The requested size of the library is that it be large enough to keep some 20,000 books. The request for the construction of a separate library for the students of the SMLT was also expressed.

8) Canteen

The present canteen simply consists of brick walls with galvanized sheet steel roofing. Although it was previously planned to move the canteen to construct a new canteen as part of the Project in view of it having a different character from the other facilities in the existing building.

4-3. Outline of the Project

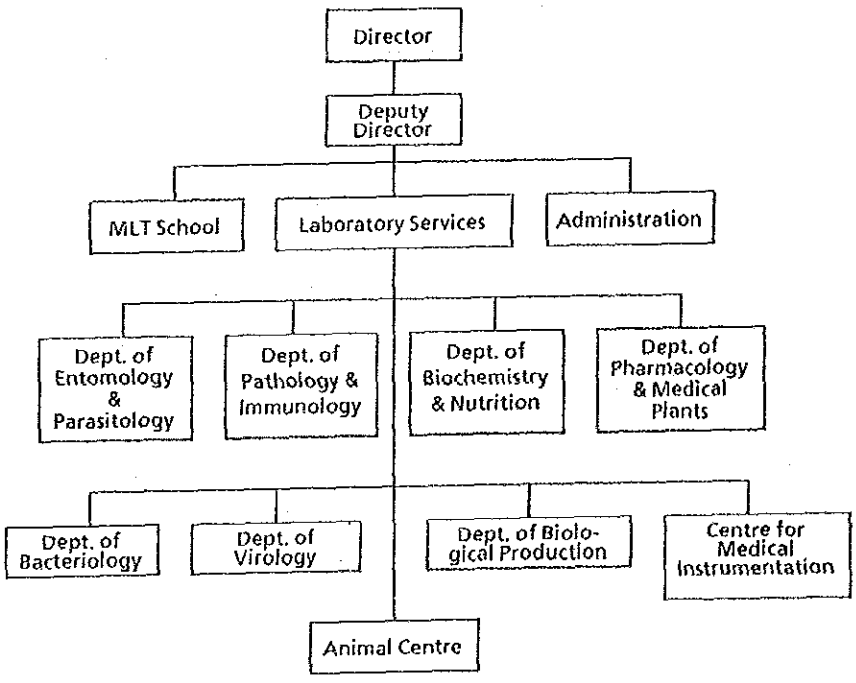
4-3-1. Management System and Recruitment Plan

As already stated in 3-1, the MRI belongs to the Laboratory Services of the Ministry of Health and the Project will be implemented by the Project committee led by the Secretary of the Ministry of Health. The Director of the MRI, however, who is responsible for the technological aspects of the Project also has the direct responsibility for the Project implementation.

(1) Management System

A management plan based on the new organizational structure will be indispensable for the smooth management of the Project. This new organizational structure is expected to stimulate the interdisciplinary development of the MRI's research based on cooperation between different research departments. Although the Biological Production Unit is functionally divided, the achievements of basic research must be reflected on epidemiological research and preventive medicine. In the case of the Center for Medical Instrumentation, a system permitting researchers to work safely and efficiently should be established by means of the thorough main-

Fig. 4-3-1 (a) Organization Chart of New MRI



tenance and regular checks of large equipment and precision equipment by engineers. A management system which guarantees the supply of healthy animals should be established for the Animal Center so that precise and efficient animal tests can be safely conducted. With regard to the Library, a place for efficient information collection should be created which is easily accessible by researchers and students based on appropriate book classification and management by capable librarians.

In view of the necessity of securing special techniques for the maintenance and management of the constructed facilities and testing equipment included in the Project, maintenance engineers must be provided to maintain the precision and safety of tests and research. Given the character of the MRI, the provision of full-time engineers is strongly hoped for. This preference is also supported by the possibility of them being engaged in manpower development at the MRI.

(2) Staff Recruitment Plan

The table below shows the MRI's recruitment plan based on the questionnaire survey results. As the questionnaire was given to each department, the planned recruitment largely varies for each department. In general, the demand for assistants (MLT) is large for those departments which have a large volume of routine work. However, MRI will start with 336 staffs from 1990.

Fig. 4-3-1 (b) Staff Recruitment Plan

	Research Officers (MC, MO, RO)	Assistants (MLT, etc.)	Supporting Staff (LO)	Others (AD)	Total
1987 (Existing)	34	75	74	27	210
1990 (New MRI)	58	113	113	52	336
1995 (5 Years)	74	143	137	52	406
2000 (10 Years)	80	159	144	52	435

(SMLS not included)

The detail of staff level at the time of the foundation of the new MRI will be as follows.

Fig. 4-3-1 (c) Detail of Staff (1990)

		Research Officers			Assistants		Supporting Staff	Others	Total
		MC	MO	RO	EA,PHI	MLT	LO	LA	
Testing / Research	1. Entomology & Parasitology	1	2	5	(EA) 8	9	17	2	44
	2. Clinical Pathology & Immunology	1	3	2	–	10	8	2	26
	3. Nutrition & Biochemistry	2	2	7	(PHI) 6	15	8	1	41
	4. Pharmacology & Medicinal Plant	-	1	7	–	5	6	–	19
	5. Bacteriology	3	6	4	–	24	17	2	56
	6. Virology	3	2	1	–	15	10	–	31
	7. Biological Production	1	3	1	–	15	16	4	40
Common Use	8. Center for Medical Instrumentation								16
	9. Animal Center		(Vet) 1		(Ass) 4	2	20		27
	10. Administration								31
	11. Library								5
	TOTAL	11	20	27	18	95	102	11	336

MC : Medical Consultant
MO : Medical Officer
RO : Research Officer
EA : Entomology Assistant
PHI : Public Health Inspector
MLT : Medical Laboratory Technologist
LO : Laboratory Orderly
LA : Laboratory Administration
ASS : Assistant
VET : Veterinary Surgeon

4-3-2 Research Activity Plan

1. Department of Entomology and Parasitology

1-1 Entomology

(1) Research Activities

a. Study of insect-borne infections.
b. Study of Japanese encephalitis vectors.
c. Study of mosquito breeding method and its biological control.
d. Cytophysiological study of mosquitoes.
e. Survey on residual insecticide in vectors.

(2) Research Method

Entomology, particularly the study of mosquitoes, is of crucial importance in Sri Lanka. Physiological and ecological studies have been conducted by means of field research and artificial breeding/propagation, etc. Joint research with virology, bacteriology and micology is hoped for in view of the further investigation of the breeding mechanism of mosquitoes in regard to the occurrence of infectious diseases.

1-2 Parasitology

(1) Research Activities

a. Epidemiological studies, mainly dealing with parasitic infections.
b. Study of the mechanism of nematode infections through contact with soil, their symptoms and prevention measures.
c. Study of amoebic dysentry, malaria, filaria and toxoplasma.
d. Study of intestinal parasitic infections and various parameters (socio-economic conditions, physical growth, anaemia and allergies, etc.)

(2) Research Method

Intestinal parasitic infections are very common in developing countries and since they are considered to be the main element in malnutrition, the survey and study of these infections is extremely important. the study of the infection mechanism in terms of the host specificity and locations of parasitism (organs or tissues) is currently in progress.

2. Department of Clinical Pathology & Immunology

2-1 Clinical Pathology

(1) Research Activities

a. Study of diseases from the viewpoints of cytopathology, histopathology and clinical pathology.

b. Study of haemolytic diseases (abnormal haemoglobin and G_6PD deficiency).

c. Study of causes of breast adenomas in Sri Lanka.

d. Study of infections from the viewpoint of the immunological system.

(2) Research method

While the causal investigation of diseases using clinical tests is the main activity at present the gradual introduction of cytopathological and immunal-histopathological techniques is required.

2-2 Immunology

(1) Research Activities

a. Immunological study of infections.

b. Study of parasitic allergies.

c. Study of diagnostic techniques for abnormal immune /globin and auto-immune diseases.

d. Study of partial immunity.

(2) Research Method

Rapid advancements in immunology have made many positive contributions to revealing disease mechanisms, their treatment and prevention. New techniques developed in this field must be introduced in Sri Lanka so that the research system for the immunity mechanism of local infectious diseases can be quickly established. The achievements of immunological research will largely affect not only the advancement of the general medical research standards, including virology and bacteriology, but also the study of antiserum and its quality control in cooperation with the Biological Production Unit.

3. Department of Nutrition and Biochemistry

3-1 Nutrition

(1) Research Activities

a. Long-term study of causes of malnutrition in Sri Lanka.
b. Nutritional surveys in specific areas (blood lipid content).
c. Nutritional study of diarrhoeal diseases.
d. Study of roles played by foods in causing coronary problems.

(2) Research Method

As the question of nutrition is very important in any developing country, study based on surveillance is required. In addition, the cooperation of the Biochemistry department should be enlisted for the testing of specimens. Joint research with other departments is also necessary to investigate the causes of malnutrition.

3-2 Biochemistry

(1) Research Activities

a. Study of biochemical diagnosis and analysis of various diseases.
b. Statistical analysis of biochemical data and study of the relationship between this data and the actual diseases.
c. Study of quality control technique for clinical chemistry.
d. Study and introduction of biochemical diagnosis technique for abnormal metabolism of newborn babies.

(2) Research Method

At present, a larger number of biochemical tests are accepted. This section should, however, take a leading role in conducting the biochemical analyses required by other departments by reinforcing its functions. As biochemical tests play a significant role in the diagnosis or study of diseases, a statistical analysis technique using various data should be established with the introduction of a computer.

3-3 RI Diagnosis

(1) Research Activities

a. Study of abnormal secretion of female hormones.

b. Study of RIA diagnosis technique for hypo /hyperthyroidism.

(2) Research Method

A field survey on the inhabitants of those areas where struma is endimic should be carried out using the RIA kit and the normal values of T3, T4 and TSH should be determined.

4. Department of Pharmacology and Medicinal Plant

4-1 Pharmacology

(1) Research Activities

a. Study of pharmacological effects on heart and circulatory systems.

b. Study of regulatory effects of internal medicines on heart and coronary arteries.

c. Study of pharmacological effects of extracts or isolated agents from medicinal plants.

d. Study of effectiveness and safety of pharmaceuticals.

(2) Research Method

The fields of research cover the detection and verification of pharmacological ingredients, their chemical analysis tests and their biological, as well as microbiological, verification, etc. Identification of effective agents after their extraction from medicinal plants and refinement will be subject to joint research in the future.

4-2 Medicinal Plant

(1) Research Activities

a. Study of pharmacological effects of medicinal plants and their chemical analysis.

b. Study of chemical structures of antibiotics extracted from microbes.

c. Extraction of mosquito pheromones and analysis of their properties.

e. Study of effective compounds of natural origin.

(2) Research Method

Compounds should be extracted from those medicinal plants (as well as microbes an mosquitoes) which are considered to have pharmacological effects in folk medicine and their structures and pharmacological effects should be analyses. Morphological research centering on their classification, pharmacological-chemical analysis involving extraction, isolation, drying and refinement, pharmacological research involving animal tests and pathological research to check the medicinal effects and safety will be indispensable to determine the pharmacological effects of these compounds.

5. Department of Bacteriology

5-1 Bacteriology- I

(1) Research Activities

a. Study of simple detection method (compared to culture method) for osteomyelitis bacillus.

b. Study of identifying A-type streptococcui from throat swabs.

c. Study of acute respiratory infections caused by bacilli (pertussis, etc.)

d. Study of identification and classification of bacilli causing pneumonia.

e. Study of relationship between phagedaena and

f. Study of skin suppurative germs.

g. Study of bacterial diarrhoea.

(2) Research Method

A wide rage of microbiological research, from the basic study of pathogenic microbes to applied research for clinical and preventive purposes, is required. In addition, animal tests and tissue culture tests should be conducted. The preparation of appropriate culture media, culture, isolation, identification and fungi typing must be carried out with high accuracy for the improvement of study results.

5-2 Bacteriology-II

(1) Research Activities

a. Enteric Bacteriology

Studies concerning the identification of enteric bacilli, the separation of bacilli causing diarrhoea and the haematological identification of bacilli causing salmonella and dysentery.

b. Anaerobic Bacteriology

Study of infection routes via operation traumas, traumatic infections (gas gangrene, tetanus and botulism, etc.) and anaerobic bacilli causing diarrhoea.

c. Sterility Testing

Inspection of the degree of contamination at hospitals, operating theatres and other medical facilities and the performance testing of sterilizers.

d. Leptospirosis

When it is suspected that a patient may be suffering from leptospirosis, a

serological diagnosis based on the agglutination lysis test and culture isolation in media or animals must be made.

e. Food and Water Bacteriology

The assigned work includes the wager quality testing of service water to prevent diarrhoea, bacterial contamination testing of fresh foods (particularly marine products) and the adjustment/distribution of antiserum for the identification of salmonella and dysentery bacillus type.

f. Quality Control

The quality testing of antibiotics and titer verification, etc.

(2) Research Method

In most developing countries, those infections caused by enteric bacteria and anaerobic are ranked very high, indicating the importance of research work in these fields. The research method to be employed is almost the same as that described in 5-1 above.

5-3 Mycology

(1) Research Activities

a. Etiological study of mycotic infections.
b. Separation of pathogenic fungi from soil and their study
c. Study of dermatophytosis.
d. Study of bronchial asthma caused by mycotic infections and respiratory allergies.

(2) Research Method

Mycotic infections, such as alternate fungi or opportunistic infections, occur fairly frequently. The research method to be employed is almost the same as that described in 5-1.

6. Department of Virology

6-1 Virology

(1) Research Activities

a. Study of diarrhoea caused by enteroviruses.
b. Study of arboviruses (Japanese encephalitis, dengue fever and chikungunya, etc.)
c. Study of respiratory diseases of viral origin.
d. Study of rickettsial and chlamydial infections (typhus and scrub typhus, etc.)
e. Study of acute and chronic viral hepatitis.
f. Study of congenital viral infections.
g. Study of symptomatic haemorrhage fever.
h. General study of viruses, mycoplasma and pathogen of psittacosis.
i. Reference and study of oncogenic viruses (EB, etc.)

(2) Research Method

a. Physical and morphological study of viruses by radio-immunossay.
b. chemical study of viral genes and biochemical study to reveal the antigen structure.
c. Identification of infectious diseases by fluorescent antibody test and EIA.
d. Biogenetic study of virus propagation.
e. Immunological study of host-virus relationship using monoclonal antibodies.
f. Pathological study of viral infections using animals.

6-2 Rabies Diagnosis

(1) Research Activities

a. Study of wildlife hosts of rabies.
b. Study of required dosage of rabies vaccine.

(2) Research Method

This section is the only section capable of conducting rabies diagnosis. The rabies vaccine is produced by the MRI's Biological Production Unit. the section is actively participating in the view of the eradication, prevention and treatment of rabies. In addition, it provides the general public with information on rabies.

7. Department of Biological Production

(1) Research Activities

1) Diagnostic Sera and Labo Pharmaceuticals

a. Preparation of clinical pharmaceuticals, including media (physiological saline solution, sodium bicarbonate solution and sodium citrate solution, etc.) currently used for biological production.

b. Preparation of fluids used for vaccine production.

2) Anti-Venin, Snake

a. Study of venin of 4 poisonous snakes in Sri Lanka.

b. Study of production method and effectiveness of anti-venin sera.

c. Test production of anti-venin sera and safety tests using animals.

d. Quality control of imported antisera.

3) Bacterial Vaccines

a. Development and manufacture of anti-typhoid and anti-cholera vaccines for preventive injection.

b. Reconstruction of tuberculin.

c. Sterile tests of diagnosis sera and vaccines.

4) Viral Vaccines

a. Development and manufacture of anti-rabies vaccine for treatment.

b. Research and development of viral vaccines based on tissue culture.

c. Research and development of inactive viral vaccines (polio and measles).

(2) Research Method

a. Joint work and tests with the Departments of Immunology and Virology will be indispensable for the research and development of biological production.

b. Such techniques as the separation and refinement of venin, deactivation of refined venin specimens and the separation of anti-venin globulin will be required for the research and development of anti-venin in Sri Lanka, experimental research and development should be firstly conducted.

c. A mass culture technique for tissues and a refining technique for viruses and virus antigens will be required for the research and development of tissue culture vaccines.

d. The decision of whether vaccines should be domestically produced or imported is basically a question of Sri Lanka's administrative policy. In view of the financial, as well as population, size of Sri Lanka, however, the import of perfected vaccines from advanced countries should prove more advantageous. In addition, given the character of the MRI, the manufacture of vaccines should be entrusted to the State Pharmaceutical Corporation. Therefore, it is recommended that the future functions of this Department be as follows.

i) Establishment of control standards for and quality control of biological pharmaceuticals.

ii) Research and experiments on dose methods, schedules and dosage.

iii) Improvement of injection rate to make the inocculation effort effective throughout the country and study of maintaining vaccine safety by the introduction of the cold-chain.

iv) Study of methods for the national control of infections by predicting their outbreaks through the measurement of antibody titer.

4-3-3 Common Use Plan

(1) Center for Medical Instrumentation

1) Activities

a. Effective use and centralized maintenance of large research instruments and precision instruments.

b. Spread of advanced technologies to all departments through common use.

c. Interdisciplinary development based on joint research.

d. centralized control of research instruments owned by individual departments.

e. Preparation of scientific photographs and audiovisual materials for teaching purposes.

2) Research Instruments for common Use

a. Electron microscope and peripheral equipment for the morphological study of such ultra small objects as viruses and bacteria.

b. Ultra centrifuge, high speed liquid chromatograph, gas chromatograph and amino acid analyzer for separation and identification at the molecular level.

c. Fluorescent infrared spectrophotometer, atomic absorption spectrophotometer and visible ultraviolet spectrophotometer for spectroscopic analyses.

d. Electronic balance for precise measurements.

e. Multi-purpose computer for various data analyses.

f. Various machine tools, circuit testers, voltmeters, oscilloscopes and tools for the maintenance and repair of research instruments.

g. Micro /macro photographs devices, slide preparator, darkroom processor and enlarger for the preparation of scientific photographs.

(2) Animal Center

1) Activities

a. Breeding of healthy animals.

b. Quarantine and observation of purchased medium and large size animals.

c. Control of animals for testing and disposed animals.

d. Control of animals for vaccine manufacture tests.

e. Breeding of sterile insects.

2) Contents of Animal Experiments

a. Propagation of microbes where artificial culture is impossible and measurement of pathogen virulence.

b. Verification of the biological immunity of pharmaceuticals and vaccines, etc.

c. Pathological tests using infection models.

d. Biochemical and pharmacological tests centering on phrogenetic tests.

e. Adjustment of antisera manufactured by the Department of Biological Production.

f. Propagation, bloodsucking and disposal tests of insects.

g. The animals used for different purposes are listed in Table 4-3-3.

Fig. 4-3-3 Kinds of Animals for Experiments

Unit / Dept.	Mice	Rat	Guinea Pig	Hamster	Rabbit	Monky	Sheep	Goat	Fowl Chick	Geese Turky	Fly	Mos-quito
Entomology	O		O						O		O	O
Parasitology	O	O			O							
Pathology	O						O			O		
Immunology			O	O	O	O	O					
Nutrition		O										
Biochemistry	O		O		O							
RI Diagnosis												
Pharmacology	O	O	O		O							
Medicinal Plant												
Bacteriology	O		O	O	O							
Virology	O		O	O	O		O					
Biological Production	O		O		O			O				

4-3-4 Education and Training Plan

(1) School of Medical Laboratory Technology

a. The School is the only institution in Sri Lanka training medical laboratory technologists (MLT). The training lasts for 2 years and 90 students (2 classes) are accepted a year.

b. The required enrollment qualifications are between 17and 25 years of age and passes at the Ordinary Level of the General Certificate of Education. In addition, applicants must pass the School's entrance examination held by the Ministry of Health (success full applicant ratio: 1 in 50).

c. Those students recommended by the following are also accepted.

i) Ministry of Indigenous Medicine

ii) Ministry of Defence, Armed Forces and Police.

iii) Ministry of Local Government; Major Municipal Governments

Moreover, those students who are specially recommended by the private sector and WHO, etc. are accepted.

d. Curricula (see Table 4-3-4 for details)

1st Year: Basic sciences (anatomy and physiology, etc.) relating to clinical tests. Theory and application of clinical testing techniques.

2nd Year: Laboratory practices and lectures at the MRI and Columbo General Hospital.

e. Tutors (6 Full-Time Tutors)

Microbiology (2), Chemical Pathology (1), Histopathological techniques and Laboratory and Animal House Control (1), Parasitology and Medical Entomology (1), Haematology and Blood Transfusion (1).

(2) Training Activities

a. Tutorial and practical training for medical trainees and interns in the laboratories of the MRI's departments.

b. Fostering of middle-standing researchers.

c. Practical training (2nd year) for Medical Laboratory Technologists in each department.

d. Training of special techniques for public health and various surveillance staff.

e. Technical cooperation of and joint research with visiting researchers from foreign countries.

f. Technical and information exchanges through international academic conferences.

Table 4-3-4 Disciplines Taught at the SMLT

1. Microbiology
(400 Hours Theory and 450 Hours Practical)

(a) Bacteriology –
Sterilization methods, staining methods, preparation of commonly used culture media, including selectiv, indicator and enrichment media. Determination and adjustment of pH. Culture methods. Systematic, clinical and public health bacteriology. Bacterial and viral vaccines. Sensitivity tests and MIC.

(b) Viroloty – theory and virological techniques.

(c) Medical Mycology

2. Parasitology, Etc.
(90 Hours Theory and 100 Hours Practical)

(a) Medical Protozoology and Helminthology

(b) Medical Entomology

(c) Animal Technology

3. Chemical Pathology
(350 Hours Theory and 400 Hours Practical)

Chemical examination of urine, CSF, faeces, blood chimistry and blood electrolytes. Frnction tests - kidneys, liver, pancreas and enzymes.

4. Haematology and Blood Bank Serology
(350 Hours Theory and 400 Hours Practical)

(a) Collection of blood and preparation of blood films. Haempoiesis - erythropoiesis and leucopoesis. Enumeration of red cell, white cell, differential, reticulosytes, platelets and cosinophils. Normal and abnomal red and white cell identification. Haemoglobinometry. Erythrocyte sedimentation rate. Investigation of clotting disease. Bone marrow smears and myelograms.

(b) ABO and Rh grouping techniques. Antibody identification methods, preparation, collection and storage of type sera and glood for transfusion.

5. Histopathological Techniques and Laboratory Management
(175 Hours Theory and 100 Hours Practical)

(a) Fixation, dehydration, clearing, wax embedding techniques and decalcification. Theory of section cutting and practice of staining techniques. Exfoliative cytology. Museum techniques and frozen section cutting.

(b) Administration and discipline, reception and recordingof specimens. Maintenance of laboratory records. Dispatch of laboratory specimens by post. Safety precautions. First aid treatment after accidents. Use, care, cleaning and sterilization of new, used and soiled or infected glassware, culture media, dangerous chemicals, gases and gas cylinders. General physics and chemistray. Care, structure and maintenance of laboratory apparatus.

(3) Information and Management Activities

a. Reference, collection and provision of information concerning surveys and research in the health care and public health fields.

b. Editing, printing and issue of public relations magazines and research papers.

c. Information exchanges with related organizations.

d. Arrangement and storage of various data using a computer system.

e. Administrative work for the entire Institute.

f. Accounting work, including budget preparation, cash handling, settlement of accounts and procurement, etc.

g. Maintenance and management of all facilities.

4-3-5 Outline of Facilities and Equipment

(1) Outline of Facilities

In consideration of the MRI's Research Activity Plan and Staff Recruitment Plan, the Basic Design Study Team decided on the following outline of the facilities to be expanded or newly constructed in the Project based on consultations with the Sri Lankan officials.

i) New Laboratory Complex, including the Center for Medical Instrumentation
ii) Animal Center
iii) Biological Production Unit
iv) Medical Training Unit
v) Lecture Hall
vi) Canteen

Sine 4 flats as MLT quarters on the Request consists of family flats, they are not included in the Project due to the site limitations. The provision of a night duty's room is, however, included. With regard to other facilities, these will be examined in terms of their operation, maintenance and control after the completion of the above facilities and planned technical cooperation. The provision of various auxiliary facilities, including electrical facilities, water supply / discharge facilities, air-conditioning facilities and other special facilities, will be planned for the efficient operation of the main facilities.

(2) Outline of Equipment

The contents of the equipment required in the Project for the expansion and uitalization of the MRI's functions and for the smooth, as well as effective. It was subsequently agreed that the following equipment should be provided.

i) Laboratory Equipment
ii) Training Equipment
iii) Other Equipment

Medical instruments and animal test equipment are included in item i) above. The requirement for a vehicle to transport test specimens is confirmed to be part of item iii) above. Of the instruments and equipment currently in use at the MRI, those which are found to be transferable will be utilized, and the duplication of new equipment will be avoided as much as possible by encouraging the common use of equipment.

4-4 Proposed Construction Site

4-4-1 Location and Current Conditions of the Site

(1) Location

The proposed site is located in theBorella District in the eastern part of Colombo city, Sri Lanka's capital, and consists of the current MRI premises owned by the Ministry of Health and additional land provided for the project by the Ministry of Trade. The site faces Baseline Road, a major road running in the north-south direction across Colombo. The expansion of this road was completed recently, making access to the site from both the city center and from outside Colombo fairly easy.

The Colombo General Hospital, the Colombo Maternity Hospital, the Eye Hospital and the Children Hospital are located to the immediate west of the site, forming a medical complex. The site is, therefore, situated in an ideal location for a medical research institute. Although various facilities, such as a government printing house, a prison and Borella market, are located along Baseline Road, the area in general is not yet highly developed. However, the area has been designated as a multistory building area under the city planning and development along the road is expected to take place in the future.

(2) Current Conditions of the Site and Existing Facilities

The site faces 3 roads, i.e. Baseline Road to the west (main access to the site), Serpentine Road to the north and Magazine Road to the south. It has a total area of approximately 14,500m^2, of which some 12,000m^2 forms an almost square shape (about 117m in the north-south direction and about 100m in the east-west direction) and some 2,500m^2 forms extended land for the Project.

The 2-story (3-storys in part) main building of MRI with a quadrangle is located in the northern part of the site and the ground and 1st floors have an area of some 2,100m^2 each while the 2nd floor has an area of approximately 340m^2, totalling 4,560m^2. The single-story MRI warehouse of some 340m^2 is located in the quadrangle.

The Animal House of some 47m in length and the DLS Store of some 60m in length are located side by side to the east of the main building with a total floor area of some 1,300m^2. The site elevation of these 2 buildings which stretch in the north-south direction is the same as that of the main building.

The 2-story building constructed at the time of the merger between the

Bacteriology Institute (the predecessor of the MRI) and the Pasteur Institute, the elevated water tank and the staff flats are located in the southern part of the site which has an elevation of some 5m higher than the northern part and a total floor area of some 1,200m^2. The garage and pump house for pressurizing the city gas, etc. are located in a semi-basement style between the above 2 levels of the site.

The elevation of the extended land to the east of the current site is some 1m lower than that of the main building site and the Food Supply Center of the Marketing Department is currently located here. A warehouse is located to the south-east of the extended land, beyond which a new residential area has been developed by filling in the low ground.

Given the above, the site is rather small and gives many constraint if the construction of the planned facilities in the Project is to be carried out without touching the existing main building. Moreover, there is virtually no space for the temporary facilities required for the construction work. It will also be extremely difficult to secure space on the site for the construction of the staff flats and the stabling for 8 horses (and the exercise ground for these horses) which have been additionally requested by the Sri Lankan Government.

(3) Earthquakes

As Sri Lanka is not within the Pan-Pacific Earthquake Belt or the Alps-Himalayan Earthquake Belt, the earthquake activity level is extremely low and no reports of damage due to earthquakes have been recorded.

(4) Climate

The characteristics of Colombo's climate are as follows.

1) The mean annual temperature is around 27°C. While the mean maximum temperature of some 31°C is recorded between January and May, the mean minimum temperature of some 23°C is recorded between November and February. The highest maximum and lowest minimum temperatures recorded in the last 65 years are 36.2°C (February) and 15.2°C (January) respectively.

2) The mean humidity is 82% in the morning (8:30) and 75% in the afternoon (17:30).

3) A north-easterly wind prevails between November and February and a south-westerly wind prevails between April and October.

4) There is heavy rainfall between April and June and between October and November with a monthly average of 300mm. The dry season is between

December and March with average monthly rainfall of less than 100mm. The heaviest rainfall recorded in the last 85 years is 289.6mm (May).

5) There is a lot of thunder in March and April.

Fig. 4-4-1 Climatological Table of Observatories in Colombo

Station: COLOMBO – Lat:06°54'N – Long:79°52'E Barometer:24ft. – Anemometer:20ft. I=0830 S.L.S.T. – II=1730 S.L.S.T.

Month		Mean sea Level pressure mb.	Dry bulb temp. °C	Relative humidity %	Mean daily max. temp. °C	Mean daily min. temp. °C	Mean wind speed at hour kmph.	Mean daily wind speed kmph.	Prevailing wind direction	Month-ly rain-fall mm.	Number of rainy days	No.of hrs of sunshine per day	No.of days of thundar
January	I	1013.0	24.5	81	30.3	22.2	8.7	9.0	NE	87.9	8	7.5	3
	II	1009.2	27.6	70			11.9		N				
February	I	1012.7	24.9	82	30.6	22.3	6.6	7.6	NE	96.0	7	8.2	5
	II	1009.0	28.1	72			11.1		NW				
March	I	1012.1	26.4	83	31.0	23.3	5.3	6.9	E	117.6	11	8.8	11
	II	1008.4	28.8	72			9.7		W				
Apil	I	1011.2	27.3	84	31.1	24.3	6.3	7.4	E	259.8	18	7.9	19
	II	1007.8	29.1	74			8.6		SW				
May	I	1009.9	27.8	83	30.6	25.3	8.4	10.0	SW	352.6	23	6.2	9
	II	1007.1	28.7	78			10.1		SW				
June	I	1010.3	27.5	82	29.6	25.2	9.8	10.8	SW	211.6	22	6.0	2
	II	1007.9	28.0	78			10.9		SW				
July	I	1010.5	26.9	82	29.3	24.9	8.9	10.0	WSW	139.7	15	6.1	1
	II	1008.2	27.6	78			10.0		SW				
August	I	1010.7	27.1	81	29.4	25.0	9.7	10.5	SW	123.7	16	6.5	2
	II	1008.1	27.6	77			10.8		SW				
September	I	1011.5	26.9	81	29.6	24.7	8.7	10.0	SW	163.4	17	6.4	2
	II	1008.5	27.6	77			10.3		SW				
October	I	1012.0	26.5	83	29.4	23.8	6.8	8.0	Calm	354.1	21	6.2	8
	II	1008.6	27.2	78			8.7		SW				
November	I	1012.1	25.8	83	29.6	22.9	6.1	6.9	NE	324.4	19	6.8	10
	II	1008.8	27.1	77			8.0		NW				
December	I	1012.6	26.1	81	29.8	22.4	8.2	8.6	NE	174.8	12	6.9	8
	II	1008.8	27.1	74			10.3		N				
Annual	I	1011.6	26.4	82	30.0	23.9	7.7	8.9	–	2395.6	188	7.0	80
	II	1008.4	27.9	76			10.0		–				
Period of data (years)		30	25	26	30	30	25	30	10	30	30	25	10

MAX SPEED OF WIND – 72Min (1) 1945-JUNE9
1967-March