No.

MINISTRY OF HEALTH, NUTRITION & WELFARE, THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA (MOH)

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MASTER PLAN STUDY FOR STRENGTHENING HEALTH SYSTEM IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

SUPPORTING DOCUMENT III
MAPS

HEALTHY & SHINING ISLAND IN THE 21ST CENTURY

FINAL REPORT

NOVEMBER 2003
PACIFIC CONSULTANTS INTERNATIONAL

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Master Plan
Health Ma

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The following foreign exchange rate is applied in the study:
US$ 1.00 = 95 Sri Lanka Rupees (as of November 2003)

Message from Vice President,
Japan International Cooperation Agency (JICA)

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to provide technical cooperation for establishing of a health master plan which will be effective for the next decade for the improvement of the health system in Sri Lanka. JICA selected and dispatched the study team headed by Dr. Katsuhide Nagayama of Pacific Consultants International to Sri Lanka between March 2002 and November 2003.

I am pleased that the Health Master Plan, presented herewith by Ministry of Health, Nutrition and Welfare, was a fruit of close collaboration with the Study Team. I hope the Health Master Plan, whose ownership is assured by Ministry of Health, Nutrition and Welfare, will contribute to the promotion of the health system in Sri Lanka.

Finally, I wish to express my sincere appreciation to all the officials concerned of the Government of Sri Lanka for their enthusiastic effort exhibited in the process of formulating the Health Master Plan.

November 2003

Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency

November 2003

Mr. Kazuhisa MATSUOKA
Vice President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

Dear Sir,

We are pleased to formally submit herewith the Final Report of “The Master Plan Study for Strengthening Health System in the Democratic Socialist Republic of Sri Lanka.”
This report compiles the results of the Study which was conducted from March 2002 through November 2003 by the Study Team organized by Pacific Consultants International under the contract with JICA.
The report compiles the Sri Lanka Health Master Plan covering both reform and development of the health sector in Sri Lanka. The plan consists of 1) vision, goals and objectives; 2) overall basic strategies; 3) frameworks for health sector reform and development; and 4) priority programmes.
We would like to express our sincere gratitude and appreciation to the officials of your agency and the JICA advisory Committee. We also would like to send our great appreciation to all those who extended their kind assistance and cooperation to the Study Team, in particular to the Ministry of Health, Nutrition & Welfare and provincial/district health officials concerned.
We hope that the Master Plan will be able to contribute significantly to the improvement of the health sector and development in Sri Lanka.

Very truly yours,

Katsuhide NAGAYAMA, Ph.D
Team Leader,
Master Plan Study for Strengthening Health System in
the Democratic Socialist Republic of Sri Lanka

PREFACE

The outcomes of the Sri Lanka Health Master Plan Study, for which efforts were made from November 2001 through September 2003, are complied in six volumes of reports prepared by the JICA Study Team in close collaboration with Ministry of Health, Nutrition and Welfare.

The Health Master Plan addresses government polices and strategies based on such a long-term vision that the health service delivery system shall be improved for all people in Sri Lanka, regardless of sex, age, ethnicity and economic class. Necessary actions are delineated to achieve the vision in forms of programs and projects in the next decade time horizon. The Master Plan espouses the slogan *"Healthy & Shining Island in the 21st Century"*. This implies a hope that Sri Lanka will become a healthier, more secure and more liveable nation where all people can enjoy their vividly shining lives, overcoming latent constraints and difficulties lying on the currently transitional health situation in terms of demography and epidemiology. To this end, the Master Plan underlines an innovative challenge required by not only the government sector but also each community and individual.

This section provides with a general insight into the basic structure of the Master Plan, explaining:

- Structure of the Final Report;
- Synopsis of the Strategic Framework; and
- Profile of the Health Master Plan Study.

A. STRUCTURE OF THE FINAL REPORT

Health Master Plan (HMP). The HMP is composed of three volumes and three supporting documents (Table A.1).

Table A.1 Six Documents of the Health Master Plan

Volume Number	Title
I	HMP Summary
II	HMP Analysis, Strategies, and Programmes
III	HMP Project Profiles
Supporting Document I	HMP Situational Analysis
Supporting Document II	HMP Surveys and Study Datasets
Supporting Document III	HMP Maps

Volume I

This volume contains the main message of the Health Master plan (2004-2015). It summarizes the analytical framework of the health sector, the identified issues based on the analysis of the situation, the planning framework, the strategic objectives and approaches, and the policy recommendation for the implementation of the Health Master Plan.

Volume II

This volume presents the direction of the health sector of Sri Lanka by the strategic framework and describes the strategies and programmes/projects to achieve the strategic objectives of the health sector in the next 11 years. The aim of this particular discussion is to serve as a guide to future health development efforts.

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The Basic Frame of the HMP Volume II;

Introduction:	**Key Principles in the Institutional Reform and in the Service Delivery Reform,**
Part 1:	**Situation Analysis and Identified Institutional Challenges, Future Perspective of Health Needs and Demands, and**
Part 2:	**Strategic Framework and Programs, and**
Part 3:	**Principles towards Implementation.**

Introduction: Key Principles in the Institutional Reform and in the Service Delivery Reform, discusses the future direction of the health sector in this country based on the global trends and experiences and lessons learned in other countries. The analyses lay out the scientific evidence of health transition along with the demographic, social and economic transition happening in this country, and also points out the fact that Sri Lanka is now at the turning point of low-cost service demands to high-cost service demands at the turn of the 21st century. The country's health services will soon face enormous financial gaps and their manipulation by any self-coping mechanisms would inevitably fail.

Part 1: Situation Analysis and Future Perspective of Health Needs and Demand, shows the evidences to prove the conclusion of the first part.

Part 2: Strategic Framework, discusses the strategic objectives of the health sector in the next 11 years and shows the strategic approaches to achieve these objectives by coming up with Strategic Programs. The Strategic Programs are divided into five areas, namely: Health Service Delivery, Community Empowerment and Client Satisfaction, Human Resource Development, Financing, Resource Allocation & Utilisation, and Stewardship & Management of the Health Sector. In each area, comprehensive programs are formed to achieve each sub-sector objectives.

Part 3: Principles Toward Implementation, lays out the steps towards implementation after drawing up the HMP. The steps are Platform Building for Political Endorsement of Policy Recommendations, Institutionalisation for the Master Plan, Social Mobilisation/Sensitisation, Formulation of Action Plan for Priority Programs/Area, Political Decision-making for the Implementation, Capacity Building for Program Management, Resource Mobilisation, Program Implementation, Monitoring/Supervision of the Implementation, and Evaluation. In Chapter 14, the policy recommendations as a base of implementation are spelled out in detail.

The HMP is a rolling plan and a midterm review will be necessary to evaluate the output of activities and make corrections on the plan according to the evaluation. Priority Projects are identified in the first five-year timeframe to achieve the five-year objectives in the long-term perspective of 10 years. The first mid-term review is expected to take place in 2006.

Volume III

The priority projects mentioned in Vol. II above are the subject of this volume. The profile for each project provided herein contains a Project Summary and the following items:

1) Project Title
2) Project Number
3) Project Priority
4) Focal Point
5) Implementing Agencies
6) Starting Fiscal Year
7) Project Duration
8) Target Areas and Beneficiaries
9) Justification

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10) Important Assumptions/Risks/Conditions
11) Project Objective – including indicators and means of verification
12) Project Output/product – including indicators and means of verification
13) Related Projects – including ongoing projects and projects under the Health Master Plan
14) Relevant Agencies to be Coordinated
15) Monitoring and Evaluation
16) Major Activities – including expected results and process indicators

Supporting Document I

Supporting Document I, Situational Analysis, contains the review and analysis of present conditions of health sector in Sri Lanka. The structure of the volume is as follows.

1) Situation Analysis: Its Framework

This chapter describes "research issues" which lead to the discussion of the following chapters.

2) The External Environment and its Effects on Health and Health System

This chapter analyses various external environments and their effects on health in this country. These external environments are geography, socio-cultural environment, politics, policies and government, economics, and various marginalised groups.

3) Health system Activities

This chapter analyses the existing activities of the public allopathic sector and indigenous systems of medicine and private sectors. It encompasses the broad spectrum of activities - preventive, promotive, curative, rehabilitative and social services.

4) Management of Resources for Health

This chapter examines the management of the following resources: Human Resources, Drug, Medical Equipment, Physical Facility, Funds, and Foreign Aid.

5) Stewardship of the Health Sector

This chapter deals with the stewardship function of the MoH. These functions are policy formulation, planning, priority-setting and resource allocation, regulation, legislation, accountability, M&E, coordination, public/private partnership, information generation, dissemination and use, and resource and research management.

6) North and East Provinces

This chapter looks into the situation of health in N&E Provinces. The existing issues and the transitional strategies are identified.

7) Assessment of the Health System

This chapter analyses and assesses the health sector from the various dimensions of health outcome, responsiveness and patient satisfaction, fairness in financing and equity, quality and safety, and efficiency.

8) Health Transition and Future Health Needs and Demands

The chapter discusses the demographic transition and health transition in Sri Lanka and their implication on the service demands. In addition, the future health expenditures are projected by macro and micro approach for the next 10 years.

9) Opportunities for Consensus Building

This chapter discusses the consensus building within and without the health sector which is a key element in the implementation phase of the master plan. In order to do this, the planners need to consider the following: 1) Lessons learned from previous health sector program, 2) the stakeholders' involvement, and 3) public opinion.

10) Conclusions

This chapter provides answers to the "Research Issues" described in Chapter 1.

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Supporting Document II

Supporting Document II: Surveys and Study Datasets, contains the activity records and outputs of surveys/review works/consultation meetings with stakeholders.

Twenty-five (25) surveys were carried out during the first phase of the study and the survey results are summarized in this volume.

Supporting Document III

Supporting Document III, HMP Maps, compiles Maps of GIS (Geographic Information System) database on health facilities and health indices, and the Dataset.

B. SYNOPSIS OF THE STRATEGIC FRAMEWORK

The major planning issues are:

1) Incomplete decentralization of the health sector
2) Lack of Monitoring & Evaluation mechanism
3) Insufficient management capacity at all levels
4) Compartmentalized functions at the central MoH
5) Weak intersectoral coordination on some important health issues
6) Weak coordination mechanism with other health sectors such as private sector and Indigenous Medicine sector
7) Weak coordination mechanism of Human Resource Development Functions at the central MoH level
8) No integration of curative and preventive services at any levels
9) No mechanism for people to participate for monitoring of services
10) Financial constraints in preventive services and primary level health care services.

The Vision, Mission and Goal of the Master Plan are:

VISION:

A healthier nation that contributes to its economic, social, mental and spiritual development

MISSION:

To achieve the highest attainable health status by responding to people's needs, working in partnership, to ensure access to comprehensive, high quality, equitable, cost-effective and sustainable health services

GOAL:

A strengthened health system that strives for excellence to improve the health outcomes of the people in Sri Lanka

The vision of improving the health status of the people will be achieved through addressing the following strategic objectives:

1. **To improve comprehensive health services delivery and health actions, which reduce the disease burden and promote health;**
2. **To empower community towards more active participation in maintaining and promoting their health;**
3. **To improve the management of human resources for health;**
4. **To improve health finance mobilisation, allocation and utilisation; and**
5. **To strengthen stewardship and management functions of the health system.**

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Figures B.1 and B.2 are diagrammatic representations of the dynamic relationships among the Strategic Objectives.

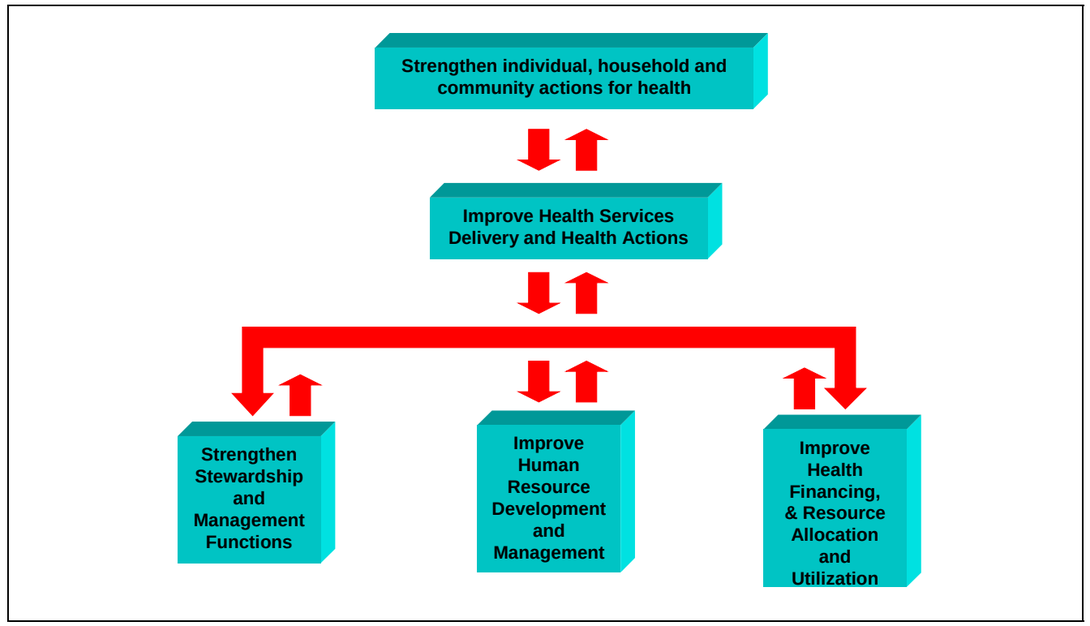

Figure B.1 Inter-relationships among the Five Strategic Objectives

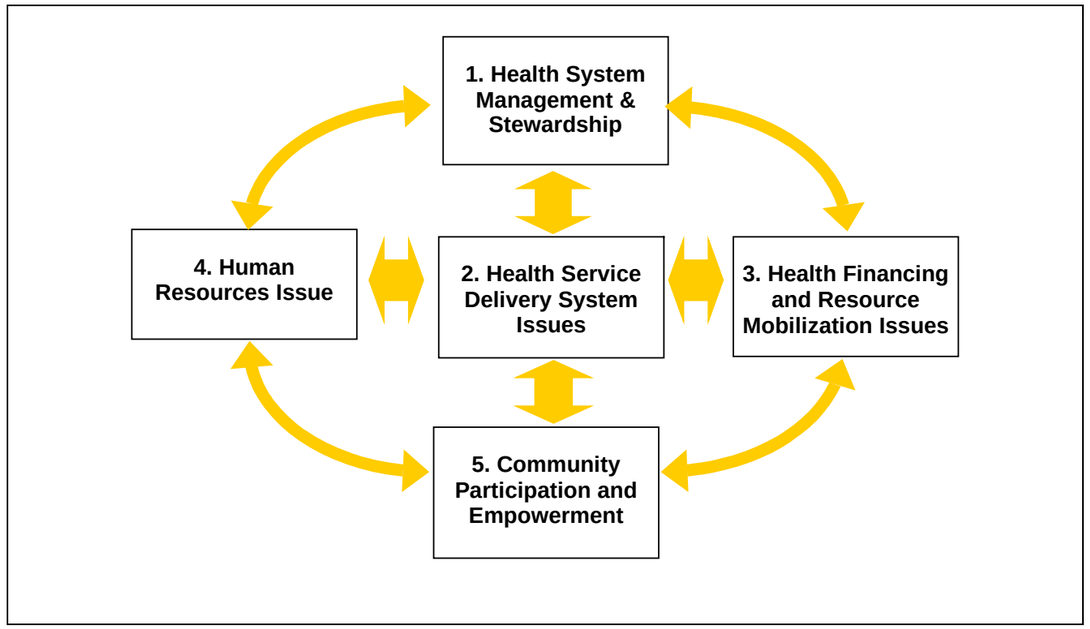

Figure B.2 Inter-relationships among the Five Strategic Objectives

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C. PROFILE OF THE HEALTH MASTER PLAN STUDY

(1) Background

In response to the request of the Government of Democratic Socialist Republic of Sri Lanka (hereinafter referred to as “GOSL”), the Government of Japan (hereinafter referred to as ”GOJ”) decided to finance a “Master Plan Study for Strengthening of the Health System in the Democratic Socialist Republic of Sri Lanka” (hereinafter referred to as “the Study”).

The Japan International Cooperation Agency (hereinafter referred to as “JICA”) is the official agency responsible for the implementation of technical cooperation programs of the GOJ. On November 9, 2001, it undertook the Study in close cooperation with GOSL authorities based on the Scope of Work agreed upon between the JICA Preparatory Study Team and the GOSL, represented by the Ministry of Health, Indigenous Medicine and Social Services. According to the official regulations on consultant procurements, JICA selected Pacific Consultants International for the Study Team, headed by Dr. Katsuhide Nagayama, and dispatched the Study Team to Sri Lanka.

The Ministry of Health, Nutrition & Welfare (hereinafter referred to as “MoH”) acts as the Counterpart Agency for the Study Team on behalf of the GOSL. The MoH is responsible for coordinating the implementation of the Study with other related government agencies, international donor agencies and international non-governmental organizations.

In the past, while the government of Sri Lanka pursued a policy of economic growth, equity has been emphasised as one of the primary concerns together with self-reliance. Even under the new economic policy the political commitment to equity remains.

The public health sector has provided not only basic but also higher-level health services and has built up an extensive network of health facilities. At the same time, private health providers have increased and flourished by attracting relatively affluent people residing in the greater Colombo area. As a result, Sri Lanka has achieved better health indicators than other comparable lower-middle income countries with relatively few resources.

However, it has become increasingly difficult to maintain this high performance with growing financial constraints and escalating prices for goods and services. The good performance contributed to the epidemiological transition; statistics show that more and more people are suffering from chronic diseases. With continuously declining mortality rates in association with lowered fertility, the national average life expectancy is expected to be at the level of the industrial countries by 2020. The rapid increase of the ageing population will necessitate public health policy change

In light of these trends past health policies must be reviewed and new policies issued to facilitate the country’s continued progress in health in the opening decades of the 21st century.

(2) Study Objective

The objective of the Study is to formulate a Master Plan for strengthening and improving the health system in Sri Lanka, by 2015.

(3) Study Approaches

The Master plan Study has used four main approaches, to develop its work.

Locally-Initiated and Owned

The formulation of master plan was initiated by the Government of Sri Lanka asking the Government of Japan to give technical support in the process. The major steps to be taken to formulate the master plan were discussed and decided between MoH coordinators and JICA Study Team members. The question of fostering ownership has been discussed from the beginning of the study in order to ensure the Master Plan is adopted, advocated and implemented. This approach has been adopted throughout the planning work and promotes

PREFACE

active participation of the MoH in the study. In conclusion, MoH and JICA have agreed to give authorship of the Master Plan to the Sri Lankans to increase the ownership and hopefully implementation of the plan.

Sector-Wide and Participatory

The planning process adopted a sector wide and participatory approach in order to solicit various stakeholders' opinions and ideas. The Study Team held various meetings and workshops to involve all health sector stakeholders from the beginning of the study. These stakeholders represent not only the national level MoH, but also different levels of sub-national health officials, private sector medical practitioners, traditional medicine sector, researchers and professional groups, other Ministries such as Ministry of Finance, other donor agencies, NGOs and communities. The issues existing in the health sector were widely discussed among stakeholders; the process of discussion was organized in a systematic way to improve the efficiency of the study process

Building on Achievements and Lessons Learned

In the 1990's, there were several health policy formulation exercises. Several different levels of plans were formulated, however, none of them have been implemented with any degree of consistency.

Lessons learned from the previous policies and plans are many. First, it is essential to involve key stakeholders in health sector in the planning process. Key stakeholders in health not involved in the planning would not be interested to implement the plans.

Second, previous experiences have taught that discussion and a participatory process are the best ways to address any significant policy changes. Again the discussions among key stakeholders are important because each stakeholder has different interests and information. There is a need to identify these differences in opinion and information and build consensus through further discussion. Without deep and serious discussion to minimize the conflict over policy issues, naturally it will not be easy to implement plans.

Third, it is necessary to have a proper monitoring system to ensure implementation. Measurable indicators of performance should be developed during the planning stage. The monitoring unit should be close to the planning unit and their activities need to be connected through a common flow of information

Evidence-Based Strategic Planning

The Study team collected most of the existing secondary data and literature. The Study team also conducted over 20 surveys and studies of various health sector issues. The situation of the health sector was analysed by looking at the physical reality, by analysing existing data and information, and by analysing data that came out of extensive field surveys. The plan has been designed based on scientific evidence and data

The Study team found out that some concerns are not covered by any data collection or have poor quality data in the existing MOH information system. These findings are important as they identify aspects that need to be strengthened in the existing information system so that ongoing evidence-based decision-making becomes possible.

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(4) Phases of the Study

The Study for formulating the Health Master Plan was divided into three phases, namely:

Phase I: Review and Baseline Surveys of the Health Sector
(April, 2002-September, 2002, 6 months)

Phase II & III: Formulation of a Master Plan
(October 2002-August 2003, 10 months)

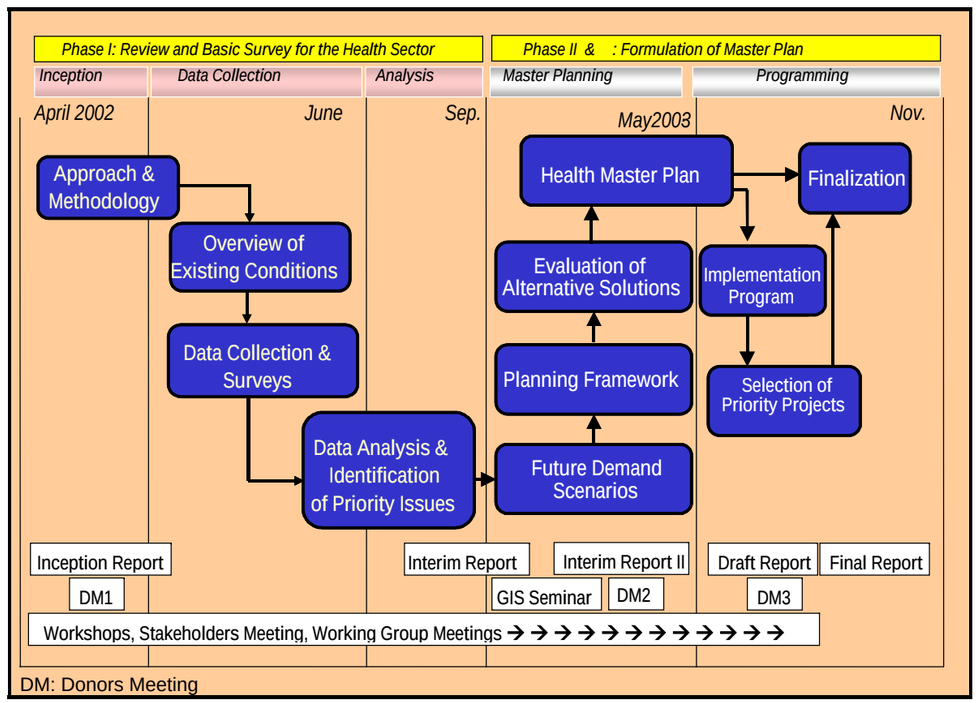

Figure C.1 Phases of the Study

MAP OF SRI LANKA

LIST OF ABBREVIATION AND ACRONYM

ACCDC	All Ceylon Community Development Council
ACD	Ayurvedic Classification of Diseases
ADB	Asian Development Bank
AHPB	Ayuveda Health Promotion Bureau
AHPO	Ayurvedic Health Promotion Officer
AIDS	Acquired Immune Deficiency Syndrome
ALOS	Average Length Of Stay
AMO	Assistant Medical Officer
AMP	Assistant Medical Practitioner
ANC	Ante Natal Care
ARF	Ayurveda Research Fund
ARI	Acute Respiratory Infections
ARTI	Acute Respiratory tract infection
BAMS	Bachelor of Ayurvedic Medical Science
BC	Before Christ
BES	Bio-Medical Engineering Services or BMES
BH	Base Hospital
BMARI	Bandaranayakie Memorial Ayurveda Research Center
BMES	Bio-Medical Engineering Services or BES
BOI	Board of Investment
BS	Birth Spacing
BSMS	Bachelor of Siddha Medical Science
BUMS	Bachelor of Unani Medical Science
CADR	Cardiographer
CBO	Community Benefit Organization
CBO	Community Based Organization
CBR	Crude Birth Rate
CC	Conciliation Committee
CD	Compact Disc
CD	Central Dispensary
CD & MH	Central Dispensary and Maternity Home
CDD	Control of Diarrhoeal Diseases
CDDA	Cosmetics, Devices and Drugs Act
CDR	Crude Death Rate
CEA	Central Environmental Authority
CFR	Case Fatality Rate
CFS	Consumer Finance Survey
CHDR	Child Health Development Record
CIC	Ceylinco Insurance Co, Ltd.
CIC-E	CIC Eagle Insurance Co. Ltd.
CIGAS	Computerised Integrated Government Accounting System
CME	Continuous Medical Education
CMR	Child Mortality Rate
COHRD	Council on Health Research for Development
CPC	Committee for Planning and Cooperation
CPD	Continuous Professional Development
CWC	Ceylon Workers Congress
D/MTS	Director Medical Technology and Supplies
DALY	Disability Adjusted Life Year
DDHS	Divisional Director of Health Services
DDT	Dichlorodiphenyltrichloroethane
DGHS	Director General of Health Services
DH	District Hospital
DHO	District Health Office
DM	Diabetes Mellitus
DMO	District Medical Officer
DoA	Department of Ayurveda
DP	Divisional Pharmacist
DPMU	Drug Processing and Manufacturing Unit
DQAL	Drug Quality Assurance Laboratory
DRA	Drugs Regulatory Authority
DS	Dental Surgeon
DS	Divisional Secretariat
D-SNO	Staff Nursing Officer working in District Hospitals
DTRU	Demography, Demographic Training and Research Unit, University of Colombo
ECCD	Early Childhood Care and Development
EmOC	Emergency Obstetric Care
ENHR	Essential National Health Research
EPDP	Eelam People’s Democratic Party
EPF	Employees Provident Fund

LIST OF ABBREVIATION AND ACRONYM

EPI	Expanded Programme of Immunization
EPR	Emergency Preparedness & Response
ETU	Emergency Treatment Unit
EU	European Union
FA	Field Assistant
FAO	Food and Agricultural Organization of the United Nations
FHB	Family Health Bureau
FP	Family Planning
F-PHM	Field Public Health Midwife
GAHR	Government Ayurvedic Health Resort
GAP	Good Agricultural Practices
GDCF	Gross Domestic Capital Formation
GDP	Gross Domestic Product
GFCP	Good Field Collection Practices
GFR	Gross Fertility Rate
GH	General Hospital
GMOA	Government Medical Officers Association
GMP	Good Manufacturing Practices
GNP	Gross National Product
GOSL	Government of Sri Lanka
GP	General Practitioner
G-SNO	Staff Nursing Officer working in General Hospitals & Base Hospitals
GST	General Sales Tax
GTZ	German Technical Cooperation Agency
GWAI	Gampaha Wickramarachchi Ayurveda Institute
HC	Health Centre
HCW	Health Care Worker
HDR	Human Development Report
HEB	Health Education Bureau
HIS	Health Information System
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HRD	Human Resource Development
HSPI	Health Service Providing Institute
HSR	Health Systems Research
HVC	Health Vigilance Committee
IA	Impact Assessment
ICSL	Insurance Corporation of Sri Lanka
ICU	Intensive Care Unit
IDRC	International Development Research Center (Head Office locates in Ottawa, Canada)
IEC	Information, Education and Communication
InEC	Institutional Equipment Committee
IHD	Ischaemic Heart Disease
IIM	Institute of Indigenous Medicine
IK	Indigenous Knowledge
IMMR	Indoor Morbidity, Mortality Return
IMPA	Independent Medical Practitioners Association
IMR	Infant Mortality Rate
IP	Industrial Package
IPD	In Patient Department
I-PHM	Public Health Midwives working in hospitals
IPR	Intellectual Property Rights
IPS	Institute of Policy Studies
IPS HPP	IPS Health Policy Programme
ISM	Indigenous System of Medicine
JE	Japanese Encephalitis
JEDB	Janatha Estate Development Board
JICA	Japan International Cooperation Agency
JMO	Jurisdictional Medical Officer
JOCV	Japan Overseas Cooperation Volunteers
JVP	Janata Vimukti Peramuna
KAP	Knowledge, Attitudes and Practices
LAN	Local Area Network
LMP	Licensed Medical Practitioner
LSSP	Lanka Sama Samaja Party
LTTE	Liberation Tigers of Tamil Eelam
MC	Municipal Council
MCH	Maternal and Child Health
MCHC	Maternal and Child Health Centre
MDPU	Management Development and Planning Unit of MoH

LIST OF ABBREVIATION AND ACRONYM

MICR	Microscopist
MIM	Ministry of Indigenous Medicine
MIS	Management Information System
MLT	Medical Laboratory Technologist
MO/ MCH	Medical Offer, Maternal and Child Health
MoF	Ministry of Finance
MOH	Medical Officer of Health
MoH	Ministry of Health
MOHIM	Ministry of Health and Indigenous Medicine
MOMCH	Medical Officer for Maternal and Child Health
MoU	Memorandum of Understanding
MP	Medicinal Plants
MPCA	Medicinal Plant Conservation Area
MSD	Medical Supplies Division
MSF	Medicins Sans Frontieres
MSU	Medical Statistical Unit
MTIP	Medium Term Investment Programme
NA	Needs Assessment
NADCDA	National Ayurvedic Drugs, Cosmetics and Devices Authority
NAHF	National Ayurvedic Hospital Formulary
NEM	New Economic Mechanism
NEP	North and East Province(s)
NGO	Non Governmental Organization, (= NGOO)
NHA	National Health Accounts
NHC	National Health Council
NHE	National Health Expenditures
NHSL	National Hospital of Sri Lanka (formerly known as Colombo General Hospital)
NIC	National Insurance Corporation
NID	National Immunization Day
NIE	National Institute of Education
NIHS	National Institute of Health Science
NISD	National Institute of Social Development
NITM	National Institute of Traditional Medicine
NMR	Neonatal Mortality Rate
NNP	National Nutrition Programme
NO	Nursing Officer
NQAL	National Quality Assurance Laboratory
NSC	National Statistical Centre
NTRB	National Traditional Resource Bureau
OLS	Ordinary Least Square
OPD	Outpatient Department
ORS	Oral Rehydration Salt
ORS	Oral Rehydration Solution
ORT	Oral Rehydration Therapy
PA	People's Alliance
PAEHS	Planters Association Estates Health Scheme
PBN	The Post-Basic School of Nursing
PC	Provincial Council
PDHS	Provincial Director of Health Services
PEM	Protein Energy Malnutrition
PERC	Provincial Equipment Review Committee
PG	Post Graduate
PH	Provincial Hospital
PHA	Provincial Health Authority
PHAR	Pharmacist
PHC	Primary Health Care
PHCU	Primary Health Care Unit
PHI	Public Health Inspector
PHM	Public Health Midwife
PHNO	Public Health Nursing Officer
PHNS	Public Health Nursing Sister
PHO	Provincial Health Office
PHYS	Physiothetrapist
PIP	Public Investment Programme
PMEU	Planning Monitoring and Evaluation Unit
PMS	Performance Management System
PMU	Project Management Unit
PNC	Post Natal Clinic
PPO	Programme Planning Officer
PR	Proportional Representation

LIST OF ABBREVIATION AND ACRONYM

PR	Progress Review
PTC	Provincial Training Center
PTF	Presidential Task Force
PTF1	1992 Presidential Task Force on National Health Policy
PTF2	1997 Presidential Task Force on National Health Policy
QCS	Quality Control Specifications
RADI	Radiographer
RCS	Rehabilitative Care Services
RDF	Revolving Drug Fund
RE	Regional Epidemiologist
RH	Reproductive Health
RMO	Registered Medical Officer
RMSD	Regional Medical Supplies Division
RTC	Regional Training Center
SCFA	Save the Children Fund Australia
SHS	Superintendent of Health Service
SIDA	Swedish International Development Agency
SJGH	Sri Jayawardanapura General Hospital
SLAAS	Sri Lanka Association for Advanced Science
SLADC	Sri Lanka Ayurvedic Drugs Corporation
SLAMA	Sri Lanka Ayurveda Medical Association
SLFP	Sri Lanka Freedom Party
SLIC	Sri Lanka Insurance Corporation Ltd.
SLMA	Sri Lanka Medical Association
SLMC	Sri Lanka Muslim Congress
SLNHA	Sri Lanka National Health Accounts
SLSPC	Sri Lanka State Plantations Corporation
SNO	Staff Nursing Officer
SOP	Standard Operating Procedures
SPC	State Pharmaceutical Corporation
SPMC	State Pharmaceutical Manufacturer Corporation
SPHM	Supervising Public Health Midwife
SSO	Survey Statistical Officer
STD	Sexually Transmitted Disease
STDs	Sexually Transmitted Diseases
TAC	Technical Advisory Committee
Tb	Treasury bills
TB	Tuberculosis
TBA	Traditional Birth Attendant
TF	Task Force
TFR	Total Fertility Rate
TK	Traditional Knowledge
TM	Traditional Medicine
ToR	Terms of Reference
ToT	Training of Trainers
TP	Traditional Practitioners
TR	Traditional Resources
TULF	Tamil United Liberation Front
U5MR	Under-Five Mortality Rate
UAL	Union Assurance Ltd.
UG	Under Graduate
UGC	University Grant Commission
UN	United Nations
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNP	United National Party
USAID	United States Agency for International Development
VAD	Vitamin A Deficiency
VHV	Village Health Volunteer
VMA	Value for Money Audit
WB	World Bank
WAN	Wider Area Network
WBC	Well Baby Clinic
WFP	World Food Programme
WHO	World Health Organization
WTO	World Trade Organization

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1 INTRODUCTION / EXPLANATION OF MAPS

INTRODUCTION

Maps have long been used in the health sector. Community maps are often used to identify the geographical boundaries, roads and river networks as well as catchment or service areas and location of health and health-related facilities (e.g. market, school, sources of drinking water, toilet). They are required in tracking disease outbreaks or epidemics. They are essential in conducting community diagnosis.

Traditionally, though, maps have been manually. They are seldom drawn to scale. They are hardly reproducible; often, not reproduced and shared to other units of the health sector. On occasions when printed maps are available in health facilities, their usefulness is of limited value. They are usually the topographical maps of the country, province or district. They do not reflect health information.

The advances in information technology have simplified the production of maps suited for many specific requirements of individual researchers, institutions, industries, and sectors. The Geographical Information System (GIS) is one such technology. It has been applied in addressing policy, planning and management problems at various settings.

Objectives of Health Master Plan Study in Employing GIS

The objectives of employing the GIS in the Health Master Plan Study are three. On one hand, GIS was deemed as the appropriate technology **to analyse data and present information that are hypothesized to follow spatial patterns**. It primarily served to support the requirements of the Study Team. Although many maps were produced, not all were included in Supporting Document III. Moreover, only a few maps were incorporated in either the volumes of the Health Master Plan or the other supporting documents.

The other objective of employing the GIS is **to popularise a cutting-edge technology**. When the Health Master Plan Study was initiated, the GIS was already being used in three specialized public health programmes, namely, the Epidemiology Unit, Filariasis Control and Malaria Control (or Vector-Borne Diseases Control). However, its use has not been fully tapped. Essentially the three offices were at various exploratory stages yet. While a few health officials have heard about the technology, only a few were familiar with its potential applications.

In the final analysis, the GIS is one of the **tools towards evidence-based decisions.** The maps were produced for the planning exercise. Nevertheless, the maps in the Supporting Document III can be used to justify support or opposition to policies that are being amended or introduced. They can be used in allocating or re-allocating human, logistical or financial resources. Though they have been used principally for the Health Master Plan Study, the Ministry of Health can use the maps and the technology for myriad reasons even long after the Study has been completed.

Sources of Data

One of the principles in information technology is “Garbage In; Garbage Out”. Towards this end, the secondary data were limited to those generated by reputable institutions. The sources for every layout are printed on the right lower corner.

The Study Team collaborated with the World Health Organization in collecting the geographical positions of health facilities nationwide. Using GPS receivers, the Study Team surveyed the all government health facilities in 12 districts (Table 1). The data from other districts[1] were collected by a team organised and supervised by the WHO. Access to some areas was restricted due to security conditions; as such, the team was unable to collect the positions of health facilities located in these areas.

[1] Clearance to collect GPS data could not be secured for Kilinochchi and Mullaitivu.

INTRODUCTION

Table 1 Districts Surveyed by the MoH-JICA Study Team and WHO

	Districts Covered Surveyed by MoH-JICA Study Team	Districts Covered Surveyed by WHO Team
1	Gampaha	Colombo
2	Kalutara	Jaffna
3	Kandy	Mannar
4	Matale	Vavuniya
5	Nuwara-Eliya	Batticaloa
6	Galle	Ampara
7	Hambantota	Trincomalee
8	Badulla	Puttalam
9	Monaragala	Anuradhapura
10	Ratnapura	Polonnaruwa
11	Kegalle	Matara
12	Kurunegala	

Promoting the Use of GIS

A seminar was organized to orient the senior leadership of the central and provincial MoH on ongoing uses of GIS in Malaria Control and Anti-Filariasis Control Programmes and other potential applications. A hands-on training on GIS was participated by some technical staff that were presumed to be the most likely users of the software. During some of the planning workshops, maps were exhibited for optimum exposure of MoH officials.

After the Health Master Plan Study, the dataset used for GIS analysis and the GIS Software Arc View 3.3 will be turned over to the MoH. Coordination meetings with the Director for Information were organized. Members of the HIS Working Group were briefed on the progress of the data analysis. Finally, preliminary output was presented to the MDPU during one of the weekly meetings with the JICA Study Team.

Because the license for the Arc View is for single user and only a few computer units in the MoH have this software, maps were saved also as graphic file type (Post script file and Microsoft PowerPoint file) and the dataset file (Microsoft Excel). These files will be turned over to the MoH as well so that the interested users of GIS output will not be constrained by lack of GIS software. During the course of the Study, some health officials have already availed of assistance from the Study Team. Some findings of the WHO-sponsored Health Survey are being subjected to GIS technology for analysis.

The dataset used in generating the maps in this Supporting Document may not be comprehensive because they were not intended to be so. Nevertheless, it can readily be expanded with datasets of MoH offices. Once the coding system health institutions has been finalized, the Director/Information can attend to this issue so that GIS maps can be tailor-fitted to different needs of priority users.

Supporting Document III

The Supporting Document III was designed with a group of about ten people viewing the layouts together in a planning meeting. For this reason, the maps were printed using A3 paper.

The maps were intended to serve as examples only on uses of GIS. No examples on model building and simulation analysis because they were deemed not highly relevant for general application. Some recommendations for further study are proposed in the following section. Notwithstanding, the maps do provide essential albeit not sufficient evidence to address common planning issues.

At least two caveats should be considered always when interpreting maps. On one hand, maps are two-dimensional representations of multi-dimensional realities. Often creativity is required in viewing maps but too much of it can lead one to over-reading. On the other hand, the reader of maps should not be surprised if a map in this Supporting Document III is classified under one chapter when s/he believes it can also be used for another chapter. Like pictures, maps do paint a thousand words.

EXPLANATION OF MAPS

2 THE EXTERNAL ENVIRONMENT

Background

Which geographical areas, institutions or individuals are at risk to certain health conditions or events (e.g. disasters) by virtue of certain characteristics in their physical, economic, socio-cultural, and political environments? Which environmental factors seem to facilitate better health outcomes and better performance from the perspective of the public, the experts or both? Do environmental factors interact with behaviours of communities, households or communities? The GIS technology can be applied to address, albeit partially at times, these questions.

In this chapter, GIS was employed to generate information that elucidates specific questions on the external environment.

- Are there districts that may be at higher risk to malnutrition because they have inadequate rainfall or limited access to water bodies and rivers? (Layout 2.1.1)
- Do the networks of railroad and roads contribute to physical accessibility to health facilities? (Layouts 2.1.3 to 2.1.5)
- In which districts could there be natural physical barriers to access because of steep contours (Layout 2.1.6) or people live in islands away from the mainland (Layout 2.1.7)?
- Considering the close relationship between educational attainment of mothers and health of children, is there significant geographical variation among districts in the literacy level particularly of females? Are there other socio-cultural factors (i.e. ethnicity and religion) that interact with literacy? (Layout 2.2)
- Which districts are under the sphere of influence of specific political parties? (Layout 2.3) Would this information be significant the allocation of budget for health or initiation of new projects?
- Which districts have low capacities to generate resources in general and to mobilize resources for health in particular? (Layouts 2.4.1 to 2.4.4)

One of the strong points of using maps is in visually simplifying attempts at comparisons. Towards this end, some maps are displayed side-by-side in one layout (Layout 2.1.1) or in a series of layouts (Layouts 2.1.3 and 2.1.4) before they are laid on top of each other (Layout 2.1.5).

Another usefulness of maps is in exploring associations or correlations among variables (Layout 2.2). To identify patterns without straining the readers' eyes, one technique that can be seen in this layout is the use of same colour codes for categories that are presumed to be associated. For example, many of the Singhalese are Buddhist so they are represented in the pie graphs as dark blue. This was the same rationale in using similar colour codes for Tamil and Hindu as well as for Muslim and Islam.

Notwithstanding their many uses in analysing the health sector, maps are constrained by the fact that each one represents information applicable to a specific point in time. Although several maps can be displayed in one layout to demonstrate changes in time, a line graph is a more efficient tool. For this reason, layouts 2.4.1 and 2.4.4 present both map and graph.

EXPLANATION OF MAPS

Interpretation of Some Lay-Outs/Maps

Lay-out No.	Findings
2.1.5	Road network is well developed in the country, while railroad network is rather limited. Road Grade A and C are equally spread all over the country, however Road Grade B is more concentrated in the South West side of the country. Over all, heavy concentration of road network is in Western Province, Central Province, North-Western Province, and North-Central (Anuradhapura) Province. Overall access to the health facilities should be good due to this well developed road network, however, the quality of minor roads (Grade C)can cause a problem of access which is seen in the roads in Mullative district.
2.2	Ethnicity and Religion are very much related. South-West part of country are mainly Sinhala people and the most of them are Budhist. One fourth of population in Colombo, Kandy, Badulla, Matale, Puttalam consist of Tamils and Muslims. Ampara and Trincomalee have more balanced ethinic/religion composition. The literacy rates are higher in western part of the country and become lower as goes to the Eastern side. Particularly female literacy rates are low in Estate area and this could be related to higher rates of Maternal Mortality and Infant Mortality, and also malnutrition among under 5.
2.3	The pattern of political parties composition is almost unified in every district except the districts in North-East Province. The districts in North-East Province show very distinct patterns from district to district. Therfore, when the political leadership changes from one party to another, then the same reaction can be expected in the Southern provinces, however, it would be very difficult to predict how each district will react to it in North-East Province.
2.4.1	It is obvious that the Western Province has the most capacity to generate funds and has higher provincial GDP due to the economic activities concentrated in Colombo. The other side of exteam cases are Uva and North-Central Provinces. The capacity to generate funds in two provinces are at least 3 times to 20 times less than Western Province and provincial GDP is at least a half to one fourth of the same province.
2.4.2	Poverty population is concentrated in Nuwara-Eliya, Monaragala, and Polonnaruwa mainly due to Estate population and rural populationa. Uva and Sabaragamuwa provinces have high concentration of poor people and this fact seems to have correlation with low health outcome in these provinces. Western province(Colombo and Gampaha districts) has the lowest number of poor population, however, there are population of poor people in urban areas as well, and their health outcome is sometimes worse than rural population.
2.4.4	In the most of provinces, the share of Non-Government sector is the largest except North-East province. In N&E province, the share of Provincial Government and Non-Government Sector are almost equal percentages. In the rest of provinces in the country, the provincial governments are investing less in the health sector, those poor provinces of Uva and North-Central provinces are, however, spending little more money in health sector than other provinces in the South.

Recommendations for Further Study

1) Use the GIS technology in exploring interactions between external environment and health-related behaviours of communities, households or individuals
2) Identify geographical areas that are at higher risk to flooding, other natural disasters, man-made disasters and technological disasters
3) Collect sub-district data

EXPLANATION OF MAPS

3 HEALTH SYSTEM ACTIVITIES

Background

How does one measure the effect of health system activities on diseases they intend to control? Can one convincingly measure such effect? Can a qualitative analysis suffice? Can the GIS technology be used to identify possible correlations? Simpler yet, can it identify geographical areas, institutions and households where individuals who fall ill or succumb to certain health conditions reside? Indeed, the GIS technology can at least help address the simpler question.

The Health Master Plan Study Team analysed the spatial distribution of most of diseases targeted by specialized public health programmes. The maps for immunizable diseases incorporated information on cases and deaths vis-à-vis coverage. To facilitate comparison, one layout was used for the maps of water- and food-borne-diseases (cholera, food poisoning and shigellosis), for the maps of other notifiable diseases caused by viruses (viral encephalitis, viral hepatitis and typhoid fever), for the maps of vector-borne diseases (malaria, dengue haemorrhagic fever and filariasis), and for Japanese encephalitis and dengue haemorrhagic fever. To study spatial distribution of curative and rehabilitative activities, available utilization indicators were used such as outpatient attendance, rates of hospital deaths, average duration of hospital stay, bed turnover rate and occupancy rate.

Some graphs (age distribution, seasonal/monthly distribution and time-series incidence) were incorporated into some layouts. This technique was employed so that geographical analysis of diseases could be done into context by readers of these maps. Some of the intended audience may be familiar with the graphs already. However, for those who are not and for those who know already but would benefit from any reminder, presenting the graphs with the maps fosters a broader and deeper examination of the priority health conditions.

One challenge in developing the maps is in the selection of techniques to present information. Monochromatic colours for the base maps were essentially helpful in automatically categorizing districts. While bar graphs were selected to represent a sizable number, rate or ratio, symbols such as dots or triangles allowed one to manage small numbers (e.g. one or two deaths).

Interpretation of Some Lay-Outs/Maps

Lay-out No.	Findings
3.1.1	Incidence of Measles has been well controlled until 1999. The reason of this re-surge of Measles incidence needs to be investigated. In general those districts have higher immunization coverage has lower cases of Measles except Matara, Kandy and Batticaloa. Colombo has relatively lower immunization coverage and higher cases. Anuradhapura, Kurunegala, and Ratnapura should work on increasing coverage of Measles vaccination.
3.1.3	In the last 30 years, TB incidence are hovering between 30 to 40 per 100,000 population. The most significant fact is that those urban cities; Colombo, Kandy and Gampaha have higher cases and death rates, and the immunization coverage are relatively low. This fact shows that there are some problems existing in the TB control program at some urban districts. The investigation on the problem/issues in the implementation of the TB control needs to be done as soon as possible in the urban areas.
3.1.9	Cholera cases are high in those areas have problems in the availability of water in general. Food poisoning is higher in urban areas than rural areas. Shigellosis shows the same patter as food poisoning. Nuwala- Eliya has lower cases in both food poisoning and Shigellosis. The neighboring districts such as Kandy, Badulla, Ratnapula, and Kegalle have, on the other hand, higher cases of both food poisoning and Shigellosis.
3.1.12	Death caused by Malaia distributed almost equally among districts in Sri Lanka, however, the number of cases varies from 0 to 12, 336 cases. Monaragala has the

EXPLANATION OF MAPS

Lay-out No.	Findings
	highest Malaria cases in the whole country. Obviously different pattern is shown between Malaria cases and DHF. Cases. DHF is completely high in urban areas due to the characteristics of DHF borne mosquitoes. Death by DHF is so much concentrated in Colombo. Filariasis is also higher in urban areas, especially Colombo, Gampaha, Kalutar, and Matara, If the control of filarial can be concentrated on these districts, it would be possible to control Filariasis in the next few years.

Recommendations for Further Study

1) Analyze spatial distribution of priority health conditions at sub-district level
2) Pilot-test the use of GIS in tracking outbreaks or epidemics
3) Develop model/s for using GIS in assessing efficiency of hospital operations and other units

EXPLANATION OF MAPS

4 HUMAN RESOURCES FOR HEALTH

Background

Could the GIS be utilized to provide evidences on issues related to human resources? Some of the questions facing policy-makers, planners and managers include the following:

- What is the adequate cadre per category of health personnel? If not, what is the gap between the demand and supply?
- Are the cadres distributed equitably among provinces, and districts, divisions as well as among different levels of health facilities?
- What factors influence the deployment of human resources? Are geographical conditions one of those? Could they explain vacancies?
- Which geographical areas and institutions are in dire need of key health personnel?
- Could the deployment of human resources be rationalized and could its implementation be easily monitored?
- In which geographical areas could public-private partnership be initiated or encouraged?

The GIS is a potential technology to generate information that can answer directly or indirectly most of the aforementioned questions. Remember, it is not a broad-spectrum antibiotic; one capsule treats all.

In this chapter, base maps and maps with graphs are presented as examples. Layout 4.1.1 uses population density as the base and bar graphs of staff-population ratio as the overlay. The staff are classified into three: medical officers and MOH; dental surgeons, registered assistant MO, nurses and hospital midwives; nursing sisters, public health inspectors and midwives. This layout can be used in visually identifying and presenting the areas that are in need and those that have in abundance of certain personnel categories.

Layout 4.1.2 is a set of four maps. Its purpose is to determine any pattern between the distribution of three selected key personnel, namely, medical officers, nurses and midwives, and the distribution of infant mortality rates. This type of layout may be plotted before a more rigorous quantitative analysis (e.g. regression) is performed.

Certain types of human resources naturally go together. They are pairs; to achieve optimality in their performances, they should be deployed in the same facilities or at least in facilities such that coordination between them is not hampered. Layout 4.1.4 displays the distribution of the following pairs/groups: ECG technicians and cardiologists; EEG technicians and neurologists; and radiographers, radiologists, radiotherapists, and oncologists. If the cardiologist does not have easy access to an ECG technician, then he either has to depend on himself (not necessarily an efficient use of his time) or on other personnel who may not have the same training and expertise as the ECG technician. This type of layout is useful in diagnosing irrational deployment.

Interpretation of Some Lay-Outs/Maps

Lay-out No.	Findings
4.1.1	The distribution of medical officers and hospital personnel such as nurses, dental surgeons, RMOs and hospital mid-wives are equally distributed among districts, except RMOs in Baticalloa district. The distribution of field staff, however, shows the opposite trend from the hospital health personnel. Anurachapura, Polonnaruwa, Monaragala, and Hambantota have higher population ratio of mid-wives where have lower population ratio of hospital personnel. Colombo has the opposite trend. Kandy, Kurunegalal, and Galle have higher ratios in both clinical personnel and as well as field personnel. The lower IMR in the rural areas might be explained partly by this high population ratio of field workers such as mid-wives in these areas.
4.1.2	Distribution of Medical Officers and Nurses show the same pattern, while distribution of midwives has different pattern. Midwives are more distributed in rural areas than urban areas except northern part of districts. IMR is

EXPLANATION OF MAPS

Recommendations for Further Study

1) Validate the areas identified as “inaccessible” by incorporating information on population at the smallest unit possible, plantation areas and national parks as well as travelling time and transport networks.
2) Compare the results of optimisation analysis with catchment areas or areas that officially fall under the responsibilities of the MOH Offices.
3) Complete data collection and GIS analysis.

EXPLANATION OF MAPS

Lay-out No.	Findings
	higher in these urban areas Colombo, Kancy, and Galle where have more tertiary health facilities, also in some surrounding districts. Also IMR is high in two districts in North-Central Province, Killinochchi, Mullatitive districts. Infants in Killinochchi and Mullative are dying without getting any proper medical care, since there are no tertiary or even secondary health facilities existing in these two districts.
4.1.4	The number of these specialists are very limited in the numbers except radiographers, and naturally their distribution is concentrated in these urban areas; Colombo, Kandy and Galle where have tertiary hospitals and specialized hospitals. Some Neurologists seem to be deployed without many facilities to work with and there is not a single Neurologists in the northern part of the country. Radiographers are scattered around in all over the country, but again radiologists are limited in their numbers, therefore only limited place have radiologists. In terms of Radiotherapists, the numbers are much more limited and are distributed into only 3 districts out of 25 districts.

Recommendations for Further Study

1) Develop model/s to determine the adequate cadre per category for setting up of standards
2) Determine demand-supply gaps at the provincial, district and institutional levels for formulation of plans aimed at minimizing the gaps
3) Study feasibility of using GIS maps in monitoring the distribution of human resources for health and the factors that influence equitable distribution
4) Identify geographical areas and institutions for public-private partnership in the production, allocation and utilisation of human resources for health

EXPLANATION OF MAPS

5 HEALTH OUTCOMES

Background

Health outcomes traditionally include morbidity, mortality, nutritional, fertility/demographic, and disability indicators. In this chapter, examples of the first three groups of indicators were used in generating the GIS maps (Layouts 5.1 to 5.7.2).

The maps in this chapter display the flexibility of as well as the ease in producing and interpreting GIS maps. Layout 5.2.1 uses time-series data for three census years that are spread apart so they can reflect significant changes in population density. By using the same scale and monochromatic colour for each category, the reader can easily identify the districts that become more densely populated. Because the scales are different for each year, then different monochromatic colours were used for Layout 5.4.1.

Layouts 5.4.3 and 5.5.2 are maps that assist decision-makers in identifying priority areas. They show the specific locations of the divisional secretary areas with mortality rates higher than the national average. They list the names of all these areas; there are more than forty for each layout. They include bar graphs of the priority areas. In one layout, all these information are presented neatly.

This chapter also includes maps that are aimed at displaying correlations between health outcomes and other variables. Layout 5.4.4 tries to identify any similarities in the pattern of infant mortality rate and those of either poverty or per calorie consumption for poor household. Layout 5.4.5 overlays the pie graph of one variable (source of drinking water) against the base maps for infant mortality rate, neonatal mortality rate and maternal mortality rate.

Interpretation of Some Lay-Outs/Maps

Lay-out No.	Findings
5.2.1	Trends of population density for 60 years from 1946 to 2001 is significant. The population density is going up from western side of districts to eastern side of districts, also from southern part of districts to the northern part. Gampaha district showed the most significant change in the population density during this period. The pattern of population density is well correlated with the road network(2.1.5) as well, since the road will lead the economic activities, distribution of goods and information, etc., so that people tend to concentrate along the roads.
5.4.3	Within these districts have higher IMR (4.1.2), there are divisions which have almost 5 times higher IMR than other divisions. There are some divisions show higher IMR, though other divisions in the same district have low IMR. for example, Tamankaduwa division in Polonnaruwa district, Kegalle division in Kegalle district have at least 3 times higher IMR than other divisions in the same district. In these divisions in high IMR, the reasons to be high in IMR need to be investigated and some interventions should be taken immediately at divisional level.
5.4.6	Distribution of IMR and NNMR show almost the same pattern, except Gampaha, Kalutara, Ampara, and Batticaloa have lower IMR and relatively high in NNMR. MMR, on the other hand, show a different patter from IMR and NNMR. MMR is high in North-East Province, Central Province and Southern Province. The eastern side of country has high MMR than western side. Monaragala district has, however, lower rates in IMR, NNMR and MMR. By looking at the geographical data of mortality rates and type of toilets, there seems no relationship between two.

EXPLANATION OF MAPS

Recommendations for Further Study

1) Generate maps for disability indicators and fertility rates
2) Generate regional/global maps to compare the health outcomes of Sri Lanka with those of the rest of the region/world

EXPLANATION OF MAPS

6 MEDICAL INSTITUTIONS AND BEDS

Background

Chapter 3 demonstrates, among other things, the application of GIS to analyse curative and rehabilitative activities. This chapter exhibits simple maps that can help identify some nuances regarding the distribution of government medical institutions and beds. Its maps were developed using data from the Annual Health Bulletin 2000.

This chapter has two layouts. Both show the distribution of institutions on the left side and that of beds on the right side. The technique of putting two maps side-by-side was employed for readers to visualize easily two sides of the same coin. One misses a significant portion of reality when he studies one side only.

Layout 6.2.1 reflect the total number of institutions and the rates of the total number of beds per thousand population within a district. On the other hand, layout 6.2.2 represents the number of institutions and beds disaggregated according to the levels of facilities. It should be noted that none of the maps use population-bed ratio.

Interpretation of Some Lay-Outs/Maps

Lay-out No.	Findings
6.2.1	There is an obvious concentration of medical institutions in the eastern part of the country and Colombo is the highest concentration since many tertiary hospitals are concentrated in the area. Kandy, Gampaha, Kalutara, Galle, Matara has the second concentration. However, in terms of number of beds per 1000 population shows that the most of districts fall into between 2 to 2.9 beds per 1000 population. Only exceptions are the northern like Vavunia, Kilinochchi, and Jaffna. This geographical information shows that the number of beds are equally distributed across the nation, though some districts are high number of beds in primary level health facilities and some have high in higher level health facilities. Therefore, the function of beds has discrepancies across the districts.
6.2.2	Though the distribution of institutions (6.2.1) cannot show the type of service provided in district, the number of government medical institutions and beds show how the services vary from district to district. Colombo, Kandy, and Galle have higher beds ratio in the tertiary hospitals followed by Gampaha and Kurunegalla. Karutala and Matara have higher concentration in the secondary medical institutions and their beds per population. Therefore, the same bed per population ratio does not mean the same services are provided in different districts.

Recommendations for Further Study

1) Plot population-bed ratio by district

EXPLANATION OF MAPS

7 SERVICE AREAS OF HOSPITALS

Background

Should the government build additional health facility? Should some existing ones be upgraded, merged, downgraded, or closed? Is the distribution of hospitals within the country, region, province, or district economically optimal? Does it promote equity in people's access to services? What is the strategic system of referring patients from the community to and between facilities? How could the public and private hospitals work together particularly during emergencies brought about by natural, man-made or technological disasters? These are some of the pressing planning issues related to strengthening the health facilities in Sri Lanka. They are the types of questions that may benefit from the GIS.

To provide the essential information in discussing policy, planning and management questions related to the distribution of hospitals and hospital services, the MoH and JICA Study Team organized a survey to determine the geographical positions of government health facilities in 12 districts. The WHO Country Office collected information about the other 13 districts. The purpose of this chapter is to present the findings of this survey through the presentation of GIS-generated maps.

There are two types of maps. The service radius (catchment area) maps (Lay-outs 7.1.2 to 7.1.25) is actually composed of six maps, one each for the following: teaching/base/general hospitals; district hospitals; rural hospitals and peripheral units; central dispensaries and maternity homes; all hospitals; and the Sri Lanka map highlighting the district. They show radii appropriate for the level. For example, teaching & base hospitals are intended to have wider service coverage than central dispensaries and maternity homes. As such, the former have radii of 2 to 10 kilometres whereas the latter have a maximum radius of 5 kilometres only.

The other type of maps is called the service polygon (Lay-outs 7.2.2 to 7.2.25). They represent one possible way of dividing the district into service areas. They need refinement, however, to account for the reality in Sri Lanka. As they are right now, the maps are plotted by level initially then all together. By themselves, the individual maps could have straightforward interpretation. However, caution should be taken when specific services are the units of analysis because some higher-level facilities actually do provide primary services. In other words, the overlapping of functions and services would have to be considered in assessing the optimal distribution of facilities. The map that plots all the hospitals is useful when the issue at hand considers higher-level facilities to indeed have their immediate neighbourhood as the service area.

The Supporting Document III includes service radius and service polygon maps for all the districts except Colombo.

Interpretation of Some Lay-Outs/Maps

Lay-out No.	Findings
7.1.2	There is no spot which has more than 5 km to access health institutions in Gampaha district. The most of places can access a health institution within 2 km. Also road network is well developed in the district, so that it won't be a problem for a patient to access any institutions in the district. Tertiary and Secondary hospitals are also well distributed, so that the physical referral system can be easily organized. Gampaha might need to look into the utilization of existing health institutions, so that any rationalization of health institutions will save the expenditure for facility maintenance and can be shift the budget for the improvement of the quality of health service in the district as a whole.
7.1.9	Hambantota does not have a tertiary hospital nor secondary level hospitals. The primary level hospitals are so much concentrated in the western part of the district and there is no hospital facility exists in the eastern tip of district. Also the central part of the distinct does not have the same concentration of hospitals as the western part has. Out of 6 district hospitals, there is only one district hospital locates in the central and eastern part of the district. This disparity shows that the people in

EXPLANATION OF MAPS

Lay-out No.	Findings
	Hambantota have not only unequal access to the hospital facilities but also there is unequal access to the higher level of services.
7.1.13	In Vavuniya district, government hospitals are only concentrated in the southern part of the district, since the northern part is un-cleared area. This district has only one Base Hospital, One District Hospital and one Rural Hospital to support the total population and it is obvious that the number of hospital is not sufficient to cover the total population. Bed per 1000(6.2.1) is also lowest in the country. The quantity and quality of health service needs to be improved significantly in Vavuniya district to catch up with the rest of districts in the country.

Recommendations for Further Study

1) Develop models for using GIS in analysing the distribution of government health facilities in a district and in a province; then, apply the model/s in addressing an important policy or planning issue
2) Within a given province, determine an optimal system for referring patients from the community to and between government facilities
3) In high-risk areas, develop options for public-private networking during different types of emergencies
4) Complete the data collection

EXPLANATION OF MAPS

8 SERVICE AREAS OF DDHS OFFICES

Background

Are the DDHS or MOH Offices accessible? To put it in another way, how accessible are the MOH Offices to their target populations? Are there communities or population centres that have limited access to MOH Offices? Consequently, are these communities underserved? On the other hand, are there communities that are over-served? Is the physical distribution of MOH Offices equitable? The MOH Offices play significant role in the delivery of health services primarily because they are the focal points for public health programmes. At the community level, they are the faces of the entire health sector.

The maps in this chapter are examples of the use of GIS in addressing the issue of access (or service coverage or equity in distribution of facilities) between MOH Offices and their services areas. They are intended to identify possible geographical areas that may be considered inaccessible physically. The term “possible” is emphasised because the maps reflect only a 2-dimensional analysis of distance with the MOH Offices as the reference points.

Recognizing that access can have other dimensions such as economic and cultural, the spatial analyses were limited to physical access. One technique employed was to plot the service radii (catchment area) for 5, 7 and 10 kilometres (Lay-outs 8.1.1 to 8.1.9). Initially, this was done for each district. Province-wide analysis was deemed necessary to validate some inaccessible areas that may fall within the service radii of MOH Offices of adjacent districts.

Another technique to study physical accessibility of MOH Offices was to plot the optimal service areas using the Thiessen Polygon Method. The results of the analysis could then be compared either with the service areas that fall under the official responsibilities of MOH Offices or with the residences of those who actually benefit from services provided by these offices. The maps (Lay-outs 8.2.1 to 8.2.9) show only the results of the optimisation analysis.

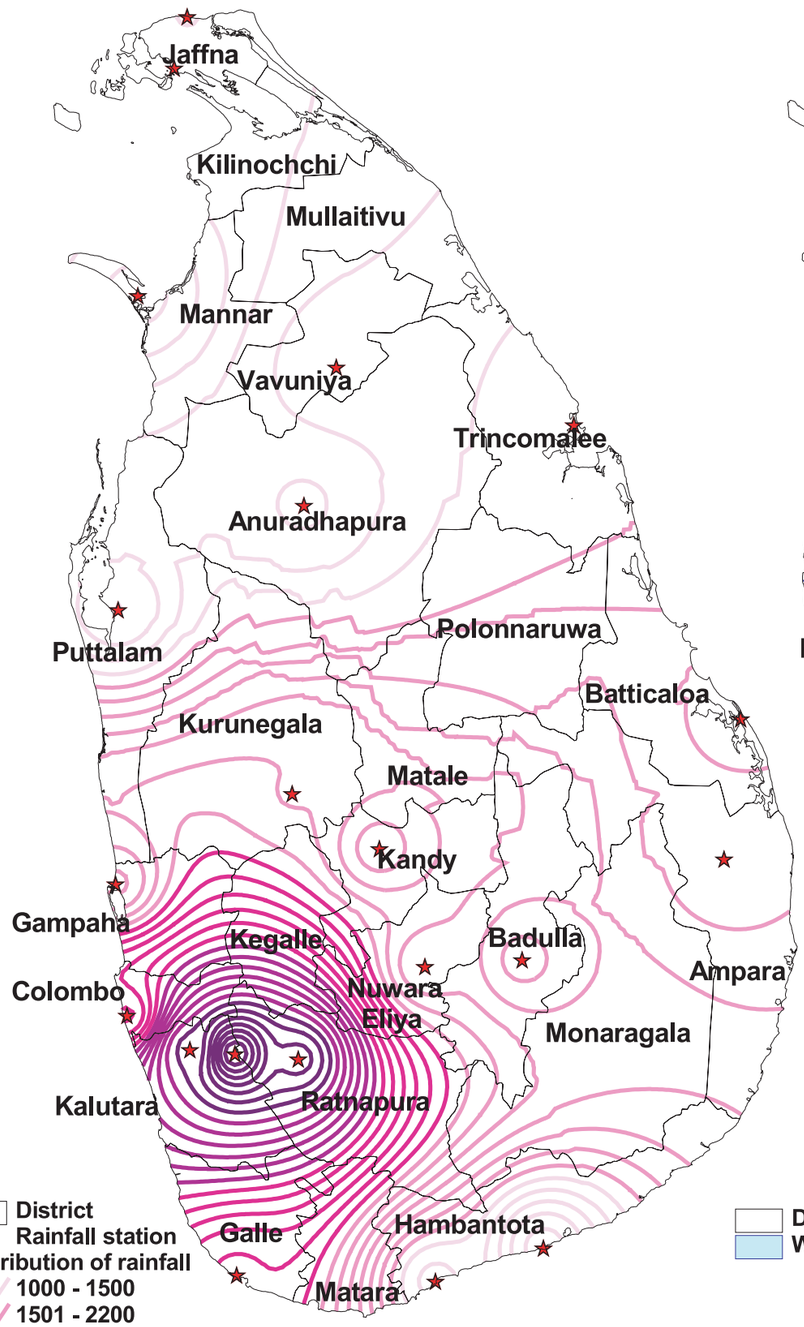
Interpretation of Some Lay-Outs/Maps

Lay-out No.	Findings
8.1.2	The areas that seem to have limited access to MOH Offices are the northern and eastern areas of Matale District and peripheral areas of Kandy and Nuwara-Eliya Districts. These inaccessible areas were reduced when all the districts within the Central Province were analysed together. Nonetheless, within the province, the northern and eastern border of Matale remains to fall outside the radii (catchment area) of any MOH Office. Pockets of underserved areas within the province require further investigation.
8.1.3	The Southern Province is a study in contrast. Galle District appears to have an abundance of MOH Offices so much so that it has no inaccessible area and the service radii of some MOH Offices even go beyond the district boundaries. On the contrary, Hambantota District has a third of its land area on the eastern side that is outside the service radii of any of its MOH Offices. There are pockets of inaccessible areas in between some MOH Offices in the central part of the district. Matara District cannot be analysed as the data available are insufficient.
8.2.3	How should catchment areas be determined? In Sri Lanka, it is mainly based on the population and secondarily on other factors such as accessibility. The Southern Province could be one of the possible sites to explore the issue of physical accessibility using GIS. Further study, though, would be required to answer the question on appropriate criteria for determining catchment area and, eventually, to address the issue whether the people in Hambantota have better physical access than their counterparts in Galle.

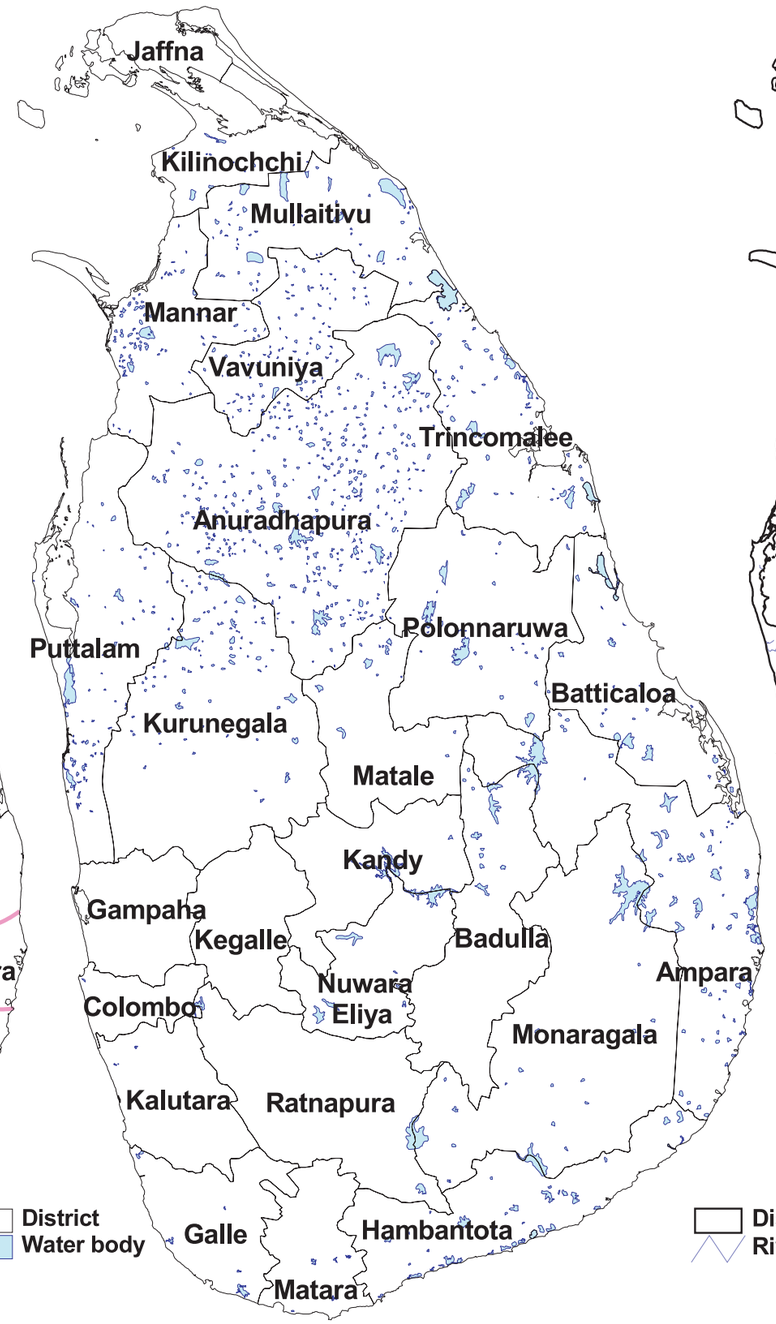
2 THE EXTERNAL ENVIRONMENT

RAINFALL, WATER BODIES & RIVERS

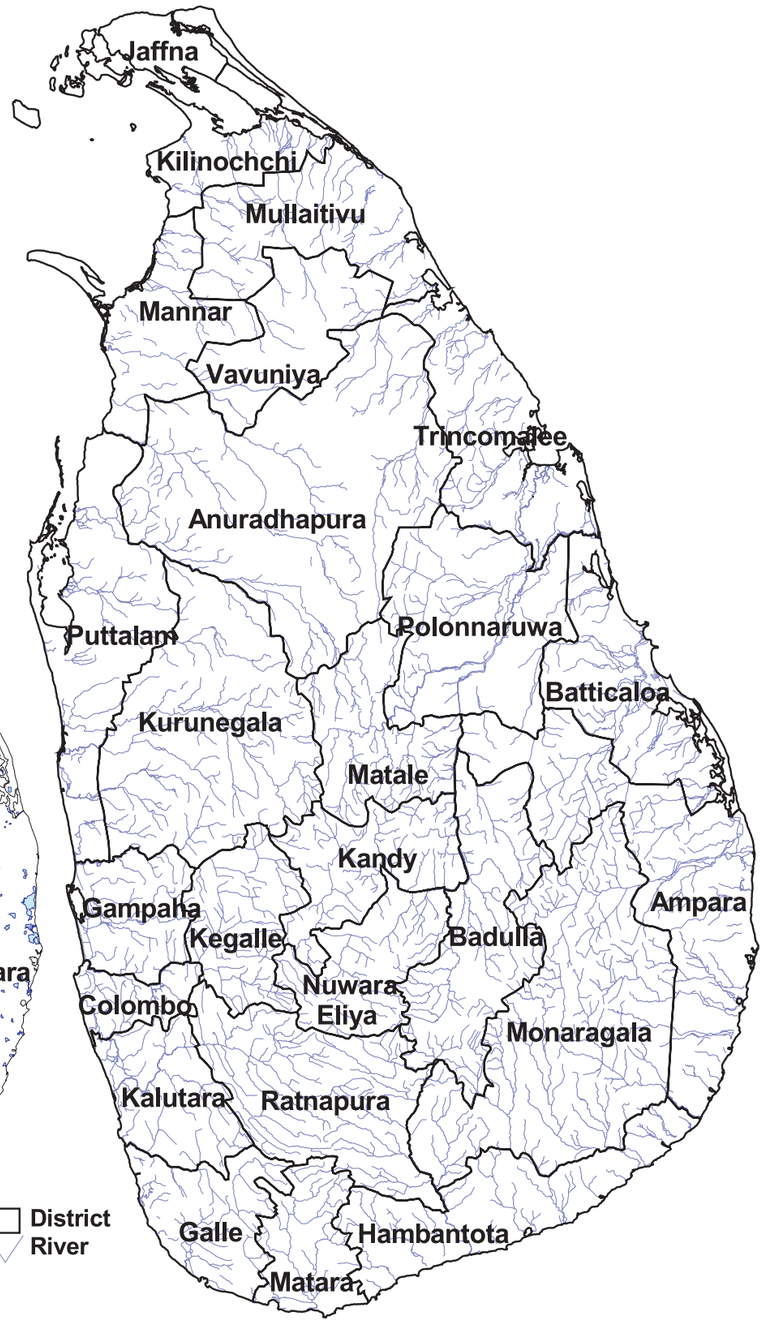
RAINFALL



WATER BODIES



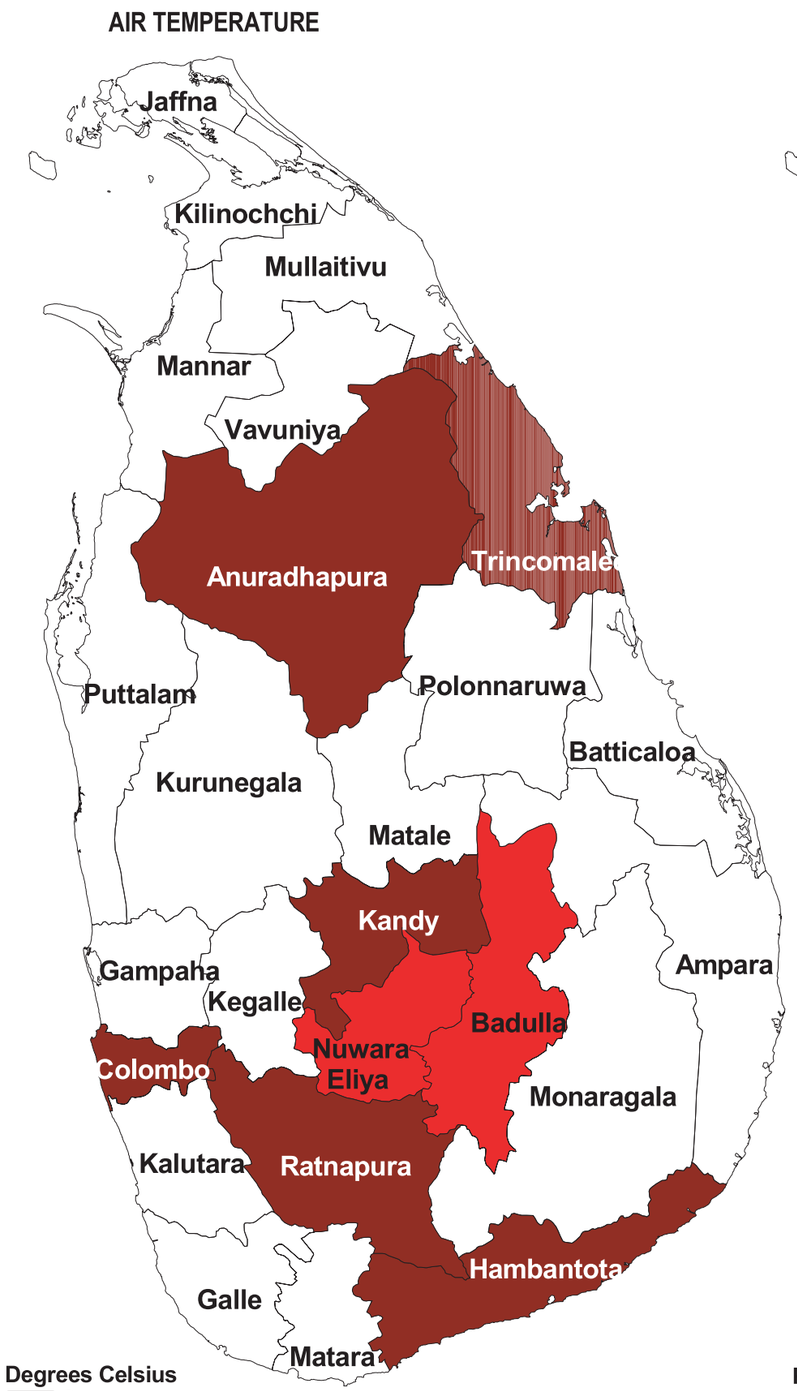
RIVERS

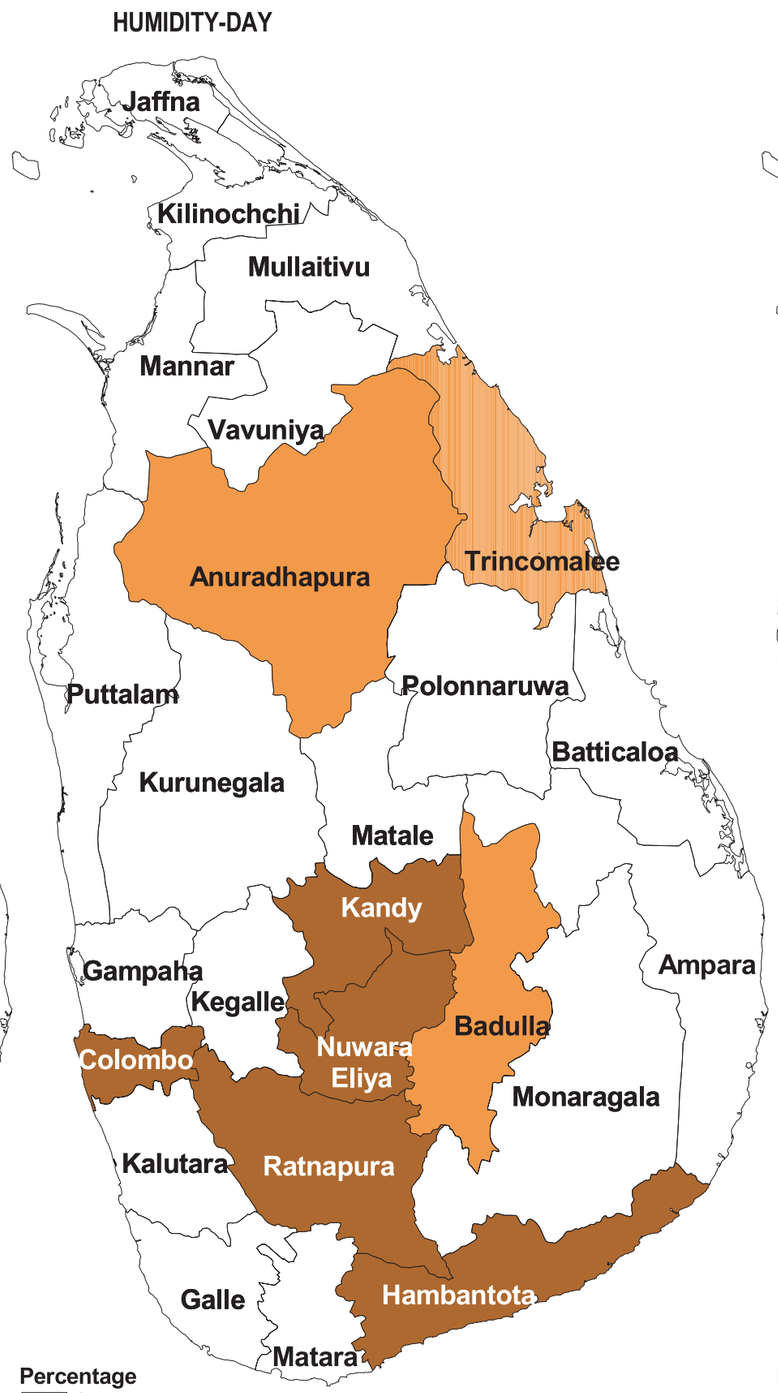


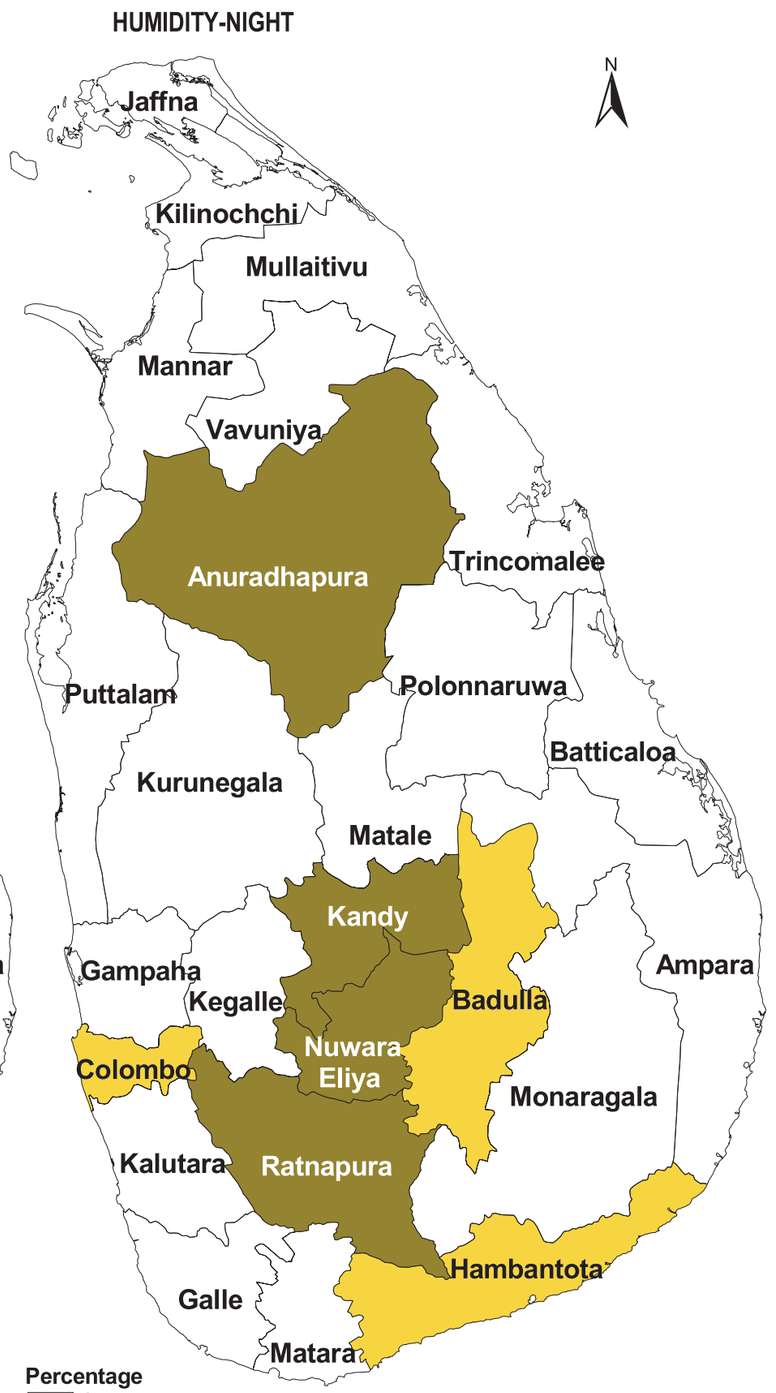
50 0 50 Kilometers

Source: Department of Survey General

MEAN ANNUAL AIR TEMPERATURE AND RELATIVE HUMIDITY, 2000







Source: Annual Health Bulletin 2000