

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

WATER RESOURCES BOARD (WRB)
MINISTRY OF IRRIGATION & WATER MANAGEMENT

THE STUDY
ON COMPREHENSIVE GROUNDWATER RESOURCES DEVELOPMENT
FOR HAMBANTOTA AND MONARAGALA DISTRICTS
IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

FINAL REPORT

MAIN REPORT

FEBRUARY 2003

PACIFIC CONSULTANTS INTERNATIONAL

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PREFACE

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct the Study on Comprehensive Groundwater Resources Development for Hambantota and Monaragala Districts and entrusted the study to the Japan International Cooperation Agency (JICA).

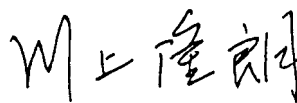
JICA selected and dispatched a study team headed by Dr. Yuichi Hata of Pacific Consultants International to Sri Lanka, four times between March 2001 and February 2003. In addition, JICA set up an advisory committee conducted of Mr. Hisao Ushiki, Senior Advisor, Institute for International Cooperation of JICA, and Dr. Kunio Watamabe, Professor, Geosphere Research Institute Saitama University, between March 2001 and February 2003, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of Sri Lanka and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

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

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

February 2003



Takao Kawakami

President

Japan International Cooperation Agency

**THE STUDY ON COMPREHENSIVE GROUNDWATER RESOURCES DEVELOPMENT FOR
HAMBANTOTA AND MONARAGALA DISTRICTS
IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA**

February 2003

Mr. Takao Kawakami
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

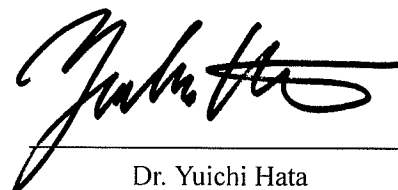
Dear Sir,

We are pleased to submit the final report entitled “The Study on Comprehensive Groundwater Resources Development for Hambantota and Monaragala Districts in The Democratic Socialist Republic of Sri Lanka”. The Study Team has prepared this report in accordance with the contract between Japan International Cooperation Agency and Pacific Consultants International.

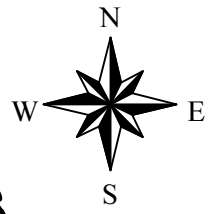
This report presents two hydrogeological maps covering the Hambantota and Monaragala districts have been prepared: namely, the hydrogeological map for the upper fractured aquifer and the hydrogeological map for the lower and deeper fractured aquifer. In addition, groundwater evaluation maps have been provided based on the hydrogeological maps to contribute to the development plan. These maps were first prepared in Sri Lanka, and most important achievement by the Study. The promising area for the groundwater resources development in districts was determined by the groundwater evaluation. Accordingly groundwater resources development plan was formulated.

All members of the Study Team wish to express grateful acknowledgements to the personnel of your Agency, Ministry of Foreign Affairs, and Embassy of Japan in Sri Lanka, and also to officials and individuals of the Government of Sri Lanka for their assistance extended to the Study Team. The Study Team sincerely hopes that the results of the study will contribute to the improvement of water supply and public health conditions in Hambantota and Monaragala districts, and economic activities of the Sri Lanka.

Yours faithfully,



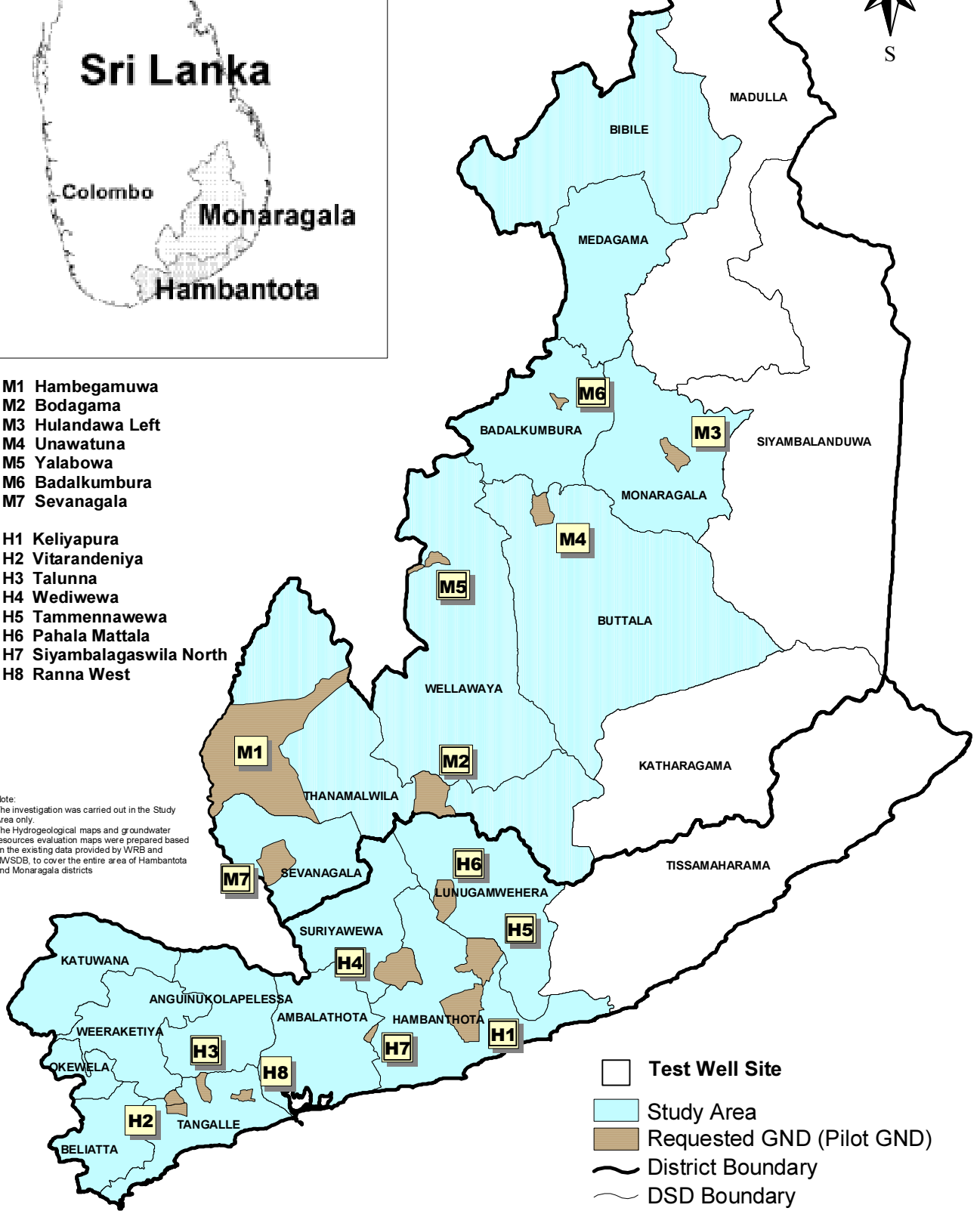
Dr. Yuichi Hata
Team Leader



- M1 Hambegamuwa
- M2 Bodagama
- M3 Hulandawa Left
- M4 Unawatuna
- M5 Yalabowa
- M6 Badalkumbura
- M7 Sevanagala

- H1 Keliyapura
- H2 Vitarandeniya
- H3 Talunna
- H4 Wediwewa
- H5 Tammennawewa
- H6 Pahala Mattala
- H7 Siyambalagaswila North
- H8 Ranna West

Note:
 The investigation was carried out in the Study Area only.
 The Hydrogeological maps and groundwater resources evaluation maps were prepared based on the existing data provided by WRB and NWSD, to cover the entire area of Hambantota and Monaragala districts



- Test Well Site
- Study Area
- Requested GND (Pilot GND)
- District Boundary
- DSD Boundary



LOCATION MAP



Residents are supplied water from a bowser in dry season.



A boy obtains water from dug hole in dried up riverbed.



WRB engineer who measures water quality for the Survey for existing well.



The Study Team Members who conduct Electro-Magnetic Survey (CSAMT method).



WRB engineers who conduct Electrical Resistivity Survey (Schlumberger method) by using donated equipment.



WRB engineers who operate donated drilling rig.



Donated equipments in the yard of WRB workshop.



Groundwater is discharging from the well.



Residents are excited about the success of the well drilling. (Yarabowa)



WRB engineers who conduct pumping test using donated submersible pump.



WRB engineers who conduct well logging using donated equipment.



The completed test well and the signboard which shows the purpose of the well in three languages, Sinhale, Tamil and English, made by WRB.



Mr. Otsuka, Ambassador of Japan, who makes a site visitation to see data download of water level from recorder at completed test well.



Technology Transfer Seminar (20th December, 2002)
About seventy people participated in the Seminar.

EXECUTIVE SUMMARY

1 PROJECT BACKGROUND AND EXISTING CONDITION

The Study covers two districts, Hambantota and Monaragala district. In the two districts, infrastructure improvement including water supply is backward, causing the relatively slow development in the southern areas of the country.

Availability of water sources in the two districts is confined to the certain area. As a result, people have been suffering from a chronic water shortage in the dry season. This is a serious hindrance for the activities of inhabitants in the dry zone. The development of stable water resources is one of the essential factors to improve the present water shortage. The main option for further water resources development is supposed to be the exploration of groundwater resources.

2 HYDROGEOLOGY

The results of hydrogeological study show that the fractured aquifer in the area was categorized into three parts: namely, the upper fractured aquifer, the lower fractured aquifer, and the deeper fractured aquifer. This was the first groundwater study that confirmed the occurrence of a productive aquifer below 100 m. The test well drilling confirmed the occurrence of the productive lower fractured aquifer in three test wells: No.M-2 Bodagama, No.M-3 Badalkumbura, No.M-4 Yalabowa. A productive deeper fractured aquifer was confirmed by the drilling of test well No.H-2 Talunna. Pumping test and water level fluctuation suggest that the deeper fractured aquifer is connected with the upper fracture in the area.

In the Study, 5 of 10 test wells yielded more than 400 litres/min and two other test wells yielded from 85 to 100 litre/min. These are very high potential yield comparing with the data in the past. The locations of test well were selected based on the geological study, especially geophysical survey. Because fractured aquifer in hard rock is unevenly distributed even in the promising area, geophysical survey is essential to select a well location. The relation between geological structure and groundwater helps to decide the geophysical survey line. The hydrogeological map will be revised with these data collected in future.

3 GROUNDWATER EVALUATIONS

Based on the results of the hydrogeological study, two hydrogeological maps covering the Hambantota and Monaragala districts have been prepared: namely, the hydrogeological map for the upper fractured aquifer and the hydrogeological map for the lower and deeper fractured aquifer. These maps will be revised with the further accumulation of hydrogeological data. In addition, groundwater resources evaluation maps have been provided based on the hydrogeological maps to contribute to the development plan. The groundwater resources evaluation map shows promising areas for groundwater development.

These maps were first prepared in Sri Lanka, and most important achievement by the Study since they serve as the basis for future groundwater development and insure the efficient use of investment of two districts.

The promising area is fairly large in Monaragala. The coastal side of the central area in Hambantota is mostly evaluated as “poor” due to water quality.

4 GROUNDWATER RESOURCES DEVELOPMENT PLAN

The promising area for the groundwater resources development in Hambantota and Monaragala district was determined by the groundwater evaluation. The GNDs distributed within the promising areas that were ranked as the “Very Good” and “Good” from the 6 degree of the groundwater evaluation, were extracted to determine the amount and area of the demand to be covered by the plan (See, Table 1)

Table 1 Promising Area for the Groundwater Development Plan by the Aquifer Type

Hambantota District				
Aquifer Type		Number of GNDs	Demand (m³/day)	Area (km²)
Upper Aquifer	Very good	69	11,405	147.29
	good	153	27,487	616.80
Lower/Deeper Aquifer	Very good	3	436	5.75
	good	126	26,323	520.28
Subtotal		351	65,651	1,290.28
Monaragala District				
Aquifer Type		Number of GNDs	Demand (m³/day)	Area (km²)
Upper Aquifer	Very good	84	22,445	1,465.28
	good	115	32,764	1,957.11
Lower/Deeper Aquifer	Very good	42	10,767	302.18
	good	55	22,539	894.40
Subtotal		296	88,514	4,618.97
Total of Hambantota and Monaragala Districts				
		Number of GNDs	Demand (m³/day)	Area (km²)
Grand Total		647	154,165	5,909.25

5 DRILLING PROGRAM FOR GROUNDWATER DEVELOPMENT

Drilling programs for the production wells was examined based on the groundwater development plan as shown in Table 2. A total of 468 wells for the Upper Aquifer and a total of 193 wells for the Lower/Deeper Aquifer are estimated. Since these number of production wells was estimated by the average yield of existing and test wells, estimated number are not entrenched number. However, to cover the demand, it is anticipate a range of 600 to 700 wells will be required to drill the both Upper and Lower/Deeper Aquifers.

Table 2 Required Number of Wells by Aquifer Type

Upper Aquifer	District	Demand (m ³ /day)	Number of Wells
	Hambantota	38,892	193
	Monaragala	55,209	275
	Total	94,101 m³/day	468 wells
Remark: Expected well yield of 201 m ³ /day (an average of 586 existing wells with 12 hours operation/day) was adopted			
Lower/Upper Aquifer	District	Demand (m ³ /day)	Number of Wells
	Hambantota	26,759	86
	Monaragala	33,306	107
	Total	60,065 m³/day	193 wells
Remark: Expected well yield of 312 m ³ /day (an average of 7 test wells with 12 hours operation/day) was adopted			

The drilling programs are recommended that:

- For the Upper Aquifer, two rigs owned by WRB or NWSDB are proposed to assign for the program. Approximately 7.8 years period will be required for drilling a total of 468 wells for the Upper Aquifer. The proposed candidate areas of Bibile- Madulla Brock, Monaragala-Siyambalanduwa Block, Thanamalwila Sub-block and Katuwana-Weeraketiya Sub-block are the major recommended areas to assign the rigs.
- For the Lower/Deeper Aquifer, one drilling rig with necessary equipment capable of drilling to 200 m depth with 8 inches hole diameter is proposed to assign for the program. Approximately 7.5 years period will be required for drilling a total of 193 wells for the Lower/Deeper Aquifer. The proposed candidate areas of Badalkumbura-Wellawaya Brock and Wellawaya-Lunugamwehera Block are the recommended areas to assign the rig.

6 PILOT PLAN

Groundwater development plans for requested 15 pilot GNDs are proposed, as shown in *Table 3*.

Table 3 Demand 2010 and the Development Plan in Pilot GNDs

GN Division Name	Plan NWSDB			Source Potential			Development Plan			
	level 2 (Y.T.) %	level 3 (D.C.) %	Demand 2010 m ³ /day	Test Well m ³ /day	Evaluated Yield ¹⁾ m ³ /day	Water Quality	level 2 (Y.T.) %	level 3 (D.C.) %	Supply Amount m ³ /day	No. of wells
MONARAGALA										
M1 Hambegamuwa	20	80	469	N.A.	72.00	<i>Good</i> ²⁾	100	0	174	3
M2 Bodagama	20	80	389	316.80	N.A.	Alkalinity & F ⁻	45	55	316	1
M3 Hulandawa L	20	80	491	N.A.	72.00	<i>good</i>	100	0	182	3
M4 Unawatuna	10	90	563	N.A.	72.00	<i>good</i>	100	0	148	2
M5 Yalabowa	10	90	313	439.20	N.A.	Alkalinity	10	90	313 plus 1GND	1
M6 Badalkumbura	10	90	178	684.00	N.A.	Fe ³⁺	10	90	178 plus 2GND	1
M7 Sevanagala	20	80	1,315	61.20	N.A.	PH & Pb	100	0	174	3
HAMBANTOTA										
H1 Keliyapura	0	100	11	0.72	N.A.	Inappropriate	0	100	E.S ⁴⁾	N.A
H2 Vitarandeniya	10	90	66	N.A.	36.00	<i>Fair</i> ³⁾	35	65	36	1
H3 Talunna	10	90	206	298.80	N.A.	Hardness & Ca ²⁺	10	90	206 plus	1
H4 Wediwewa	20	80	352	1.08	N.A.	Inappropriate	20	80	E.S	N.A
H5 Tammennawewa	0	100	225	311.04	N.A.	Inappropriate	0	100	225 plus	1
H6 Pahala Mattala	10	90	84	76.32	N.A.	Desirable	20	80	76	1
H7 Siyambalagasvila	0	100	87	0.75	N.A.	Inappropriate	0	100	E.S	N.A
H8 Ranna West	10	90	284	N.A.	72.00	<i>Fair</i>	84	16	71	1

Remarks

1): Estimated yield by the hydrogeological evaluation

2): EC is less than 750 μS/cm

3): EC is between 750 to 3,500μS/cm

4): Expansion of "Existing Scheme" is recommended

Y.T.: Yard Tap

D.C.: Direct Connection

N.A: Not applicable

7 PLANNING PROCEDURE FOR THE IMPLEMENTATION

In this Study, the groundwater development plan for the pilot GNDs was made mainly for domestic use. The extractable amount of groundwater depends on hydrogeological conditions of each area. It is recommended therefore, to use the same procedure carried by this Study for

Executive Summary

the further development planning of other GNDs. The proposed procedure consists of three stages: (1) Hydrogeological Investigation, (2) Master Plan and (3) Feasibility Study and Design.

The Study covered among the proposed procedure as above mentioned are: (1) Hydrogeological Investigation and (2) Master plan. The feasibility study and design is required for the project implementation.

8 DRILLING TECHNIQUE TRANSFERRED

Through the study, drilling method and equipment for the deep well (depth to 200m) were first introduced in Sri Lanka. Furthermore, the necessary techniques for the deep drilling for the various types of geological formations and hole wall conditions were transferred. Considering the capacity of the organization and technical ability of the drillers in WRB, transferred technology and equipments is adequately available for the extending hydrogeological studies to the areas where deep groundwater development is required as well as groundwater development of the Study area.

9 EVALUATION OF GROUNDWATER RESOURCES DEVELOPMENT PLAN

The results of socio-economic evaluation of proposed development plan of 15 pilot GNDs indicate that the development plan will rather contribute to the economic activities and improvement of public health condition. As the overall evaluation, it is concluded that the development plan is the effective measures to, 1) mitigate the labor to obtain water, 2) cover the growing water demand, 3) solve the health problems caused by the water born diseases and 4) cover the seasonal or annual deficit as well as future shortage of water to sustain the welfare of the people and the development of the country.

Considering the expected benefits and concerns above, it is recommended that to start the water supply service with Level 2 and gradually convert to Level 3 in accordance with an increase of people's income level; this option may encourage the financial independence of the water supply service.

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ABBREVIATIONS

ASL, asl	: above sea level
AGL, agl	: above ground level
BGL, bgl	: below ground level
CBO	: Community Based Organization
CEA	: Central Environmental Authority
CSAMT	: Controlled Source Audio-frequency Magneto Telluric Method
DO	: Dissolved Oxygen
DSD	: Divisional Secretary's Division
EC	: Electric Conductivity
EIA	: Environmental Impact Assessment
GDP	: Gross Domestic Product
GND	: Grama Niladhari Division
GPS	: Global Positioning System
GSMB	: Geological Survey and Mines Bureau
GVA	: Gross Value Added
IEE	: Initial Environmental Examination
JICA	: Japan International Cooperation Agency
LAN	: Local Area Network
MIWRM	: Ministry of Irrigation and Water Resources Management (was reorganized as Ministry of Lands, Irrigation and Energy in September 2001)
MIWM	: Ministry of Irrigation and Water Management
MLIE	: Ministry of Lands, Irrigation and Energy (was reorganized to Ministry of Irrigation and Water Management in December 2001)
NORAD	: Norwegian Agency for Development
NWRA	: National Water Resources Authority
NWSDB	: National Water Supply and Drainage Board
P.W.L	: Pumping Water Level
PS	: Pradeshiya Sabha
RWS	: Rural Water Supply
S.W.L	: Static Water Level
T	: Temperature
TDS	: Total Dissolved Solids
TOC	: Top of Casing
USGS	: United States Geological Survey

WRB	: Water Resources Board
WRC	: Water Resources Council
WRT	: Water Resources Tribunal
T	: Transmissivity
k	: Permeability Coefficient
S	: Storativity
Q	: Yield
s	: Drawdown
Q/s	: Specific Capacity

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The Democratic Socialist Republic of Sri Lanka (hereafter referred to as Sri Lanka) is an island nation in the Indian Ocean with an area of 65,610 km². Sri Lanka lies in the typical tropical monsoon zone with high temperature and humidity. Annual rainfall varies with geography, over 5,000 mm in the mountainous areas (wet zone) and 1,000 mm in the northwest and southeast areas (dry zone).

Country's economy is developing and its per capita GDP reached US\$820 in 1999 (ADB, 1999), resulting in the rapid expansion of population and population concentration to the urban areas. Population is expected to increase from 17 million in 1999 to 24 million in 2025. With such a great population increase, there is concern about a severe water shortage in both rural areas, as well as urban areas.

Major water sources in the rural areas are confined to surface water (such as streams and tanks) and shallow wells. As a result, people have been suffering from a chronic water shortage in the dry season. This is a serious hindrance for the activities of inhabitants in the dry zone, causing the relatively slow development in the southern areas of the country. The development of stable water resources is one of the essential factors to improve the present water shortage, and also to fulfill the expected increase of water demand. It will therefore lead to the area's sustainable development.

While there is no effective integral plan for water resource development in Sri Lanka, it is assumed that almost all the river water has been already exploited for the purposes of power production, water supply and irrigation. Therefore, the main option for further water resources development is supposed to be the exploration of groundwater resources.

In this regard, Government of Sri Lanka (GOS) requested the Government of Japan (GOJ) to implement the groundwater development study for two districts, Hambantota and Monaragala, in the southern area located in the dry zone. The study will cover the estimation of the groundwater potential in the area and the preparation of the groundwater development plan.

In response to the request of GOS, GOJ has decided to conduct the "Study on Comprehensive Groundwater Resources Development for Hambantota and Monaragala Districts in the Democratic Socialist Republic of Sri Lanka" ("Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of the technical cooperation programs of GOJ, was assigned to undertake the Study in close cooperation with the authorities of GOS.

In December 2000, JICA dispatched a preparatory Study Team to the Sri Lanka for the preliminary survey as well as discussion of the Scope of Work for the Study. The Scope of Work and the Minutes of Meeting were agreed upon between Ministry of Irrigation & Water Resources Management and Ministry of Finance & Planning, and JICA.

In accordance with the Scope of Work, JICA dispatched the Study Team to Sri Lanka on 6th June 2001. The Study Team submitted Inception Report to GOS, and explained the program, methodology and time schedule of the Study. After a series of discussions on the contents of the Report, the Minutes of Meeting on Inception Report was agreed upon between the Ministry of

Chapter 1 Introduction

Irrigation and Water Resources Management (MIWRM) and Water Resources Board (WRB), and the Study Team on 13 June 2001. The Study has commenced based on this agreement.

1.2 OBJECTIVES OF THE STUDY

The objectives of the Study are:

- (1) To evaluate the groundwater potential in the study area
- (2) To formulate groundwater development plans
- (3) To provide technology transfer to counterpart personnel in the course of the Study.

1.3 STUDY AREA

The Study covers almost all the area of Hambantota and Monaragala Districts, except three Divisional Secretary's Divisions in Monaragala District, namely Madulla, Siyambalanduwa and Kataragama, and one Divisional Secretary's Division in Hambantota District, Tissamaharama. This exclusion is due to security reasons, as agreed upon during the preliminary study for the Study in December 2000, and Minutes of Meeting on Inception Report in June 2001.

The groundwater potential is evaluated on a macro basis for the whole study area specified above. Assessment of extractable yields and preparation of groundwater development plans is carried out for 15 Pilot Grama Niladhari Divisions (GND) selected from 22 GNDs where the candidate sites proposed by WRB. The study area and location of 15 Pilot GNDs are shown in the figure on the first page of the Report.

1.4 IMPLEMENTATION OF THE STUDY

Water Resources Board (WRB) of Ministry of Irrigation and Water Management (MIWM) is the counterpart organization of GOS, and Japan International Cooperation Agency (JICA) is the official agency responsible for the implementation of the technical cooperation program of GOJ.

The study was executed by the Study Team, comprised of members of Pacific Consultants International, officially retained by JICA for the implementation of the Study, and the Sri Lankan counterpart team. The Sri Lankan counterpart team consists mainly of officials of Water Resources Board (WRB) of Ministry of Irrigation and Water Resources Management, and partly of National Water Supply and Drainage Board (NWSDB) and Irrigation Department.

The members involved in the study and the steering committee are listed in *Tables 1.1* and *1.2* respectively.

The Study consists of three phases described below. The Study started in March 2001 and is scheduled to last for 24 months. The progress of the study was assessed in each phase and then the appropriate study contents of the following phase was decided. *Figure 1.1* shows the flow of the Study work.

Table 1.1 List of Members of the Study Team

1) The JICA Study Team is composed of the following 12 members.

Name	Assignments
Dr. Yuichi HATA	Team leader Groundwater resources development
Mr. Yusuke OSHIKA	Deputy team leader Hydrogeology
Mr. Hiroyuki SHIRAIWA	Hydrology / Water Balance
Mr. Toru YORITATE	GIS (Hydrogeology)
Mr. Asahi HATTORI	Geophysical exploration (A)
Mr. Kazuto MATSUKUBO	Geophysical exploration (B)
Mr. Kinichi YAMASHITA	Geophysical exploration (C)
Mr. Toshimitsu OZEKI	Test well drilling
Mr. Masahiro KAWACHI	Water quality / Environment
Mr. Akira TAKACHI	Socioeconomy
Mr. Hiroyoshi YAMADA	Water usage / Study administration
Mr. Kenji MORITA	Organization / Operation / Management

2) The Counterpart Team is composed of the following 14 members.

Name	Assignments
Mr. R.N. Karunaratne (WRB)	Leader of Counterpart Team
Mr. R.S. Wijesekera (WRB)	Policy Matter Leader of Counterpart Team Groundwater resources development
Mr. R.R.G.R. Rajapakse (WRB)	Deputy team leader Hydrogeology
Mr. A.L.M. Cassim (Irrigation Department)	Hydrology / Water Balance
Miss A.A.A.K.K. Seneviratne (WRB)	GIS (Hydrogeology)
Mr. J.M.L. Gonawela (WRB) Mr. S. Wickrema (WRB)	Geophysical exploration
Mr. W.M. Dharmawardena (WRB)	Test well drilling
Mr. J. Weerakoon (WRB) Mr. D.V.K. Wijekoon (WRB)	Water quality / Environment
Mr. G.A. Illangesinghe (NWS&DB)	Socioeconomy
Mr. M.D. Jayaratne (NWS&DB – Moneragala) Mr. U.C. Pathirana (NWS&DB – Hambantota)	Water usage
Mr. R.S. Wijesekera (WRB)	Organization / Operation / Management

Table 1.2 List of Members of the Steering Committee

Name	Organization
Mr. S.B. Bandusena (till Sep. 2001)	Secretary Ministry of Irrigation and Water Resources Management
Mr. Jaliya Medagama (from Sep. 2001 till Dec. 2002)	Secretary Ministry of Lands, Irrigation and Energy
Mr. S. Wickramarachchi (from Dec. 2002)	Secretary Ministry of Irrigation and Water Management
Mr. D.W.R. Weerakoon (till March 2002)	Additional Secretary Ministry of Irrigation and Water Management
Mr. S. Selvarajah (from March 2002)	Additional Secretary Ministry of Irrigation and Water Resources Management
Mr. L.W. Jirasinghe (till September 2001)	Director (Construction) Ministry of Housing, Plantation and Infrastructure
Mr. M.W. Dayananda (from September 2001)	Additional Secretary (Technical) Ministry of Urban Development, Construction and Public Utilities
Mrs. Chandanie Wijayawardhana	Assistant Director Ministry of Finance & Planning
Mr. K.W. Perera	Deputy Director Department of Irrigation
Mr. W.H.M.T. Bandara	Additional Deputy Director (Engineering Geology) Department of Irrigation
Mr. M. Wickremage (till August 2001)	Director General Water Resources Secretariat
Mr. K. S. R. de Silva (From August 2001)	Director General Water Resources Secretariat
Mr. G.K. Simal	Assistant General Manager (Ground Water) National Water Supply & Drainage Board
Mr. P. Lankadikara	Secretary, Agriculture, Land & Wild Life Chief Secretary – Uva Province
Mr. Suwandaratne	Chief Secretary Southern Province
Mr. Ananda Amarathunga	District Secretary Hambantota District
Mr. Danapala Balage	District Secretary Moneragala District
Mr. K. Yoganathan (till Dec. 2001)	Chairman Water Resources Board
Mr. M.W.P. Wijesinghe (from Dec. 2001)	Chairman Water Resources Board

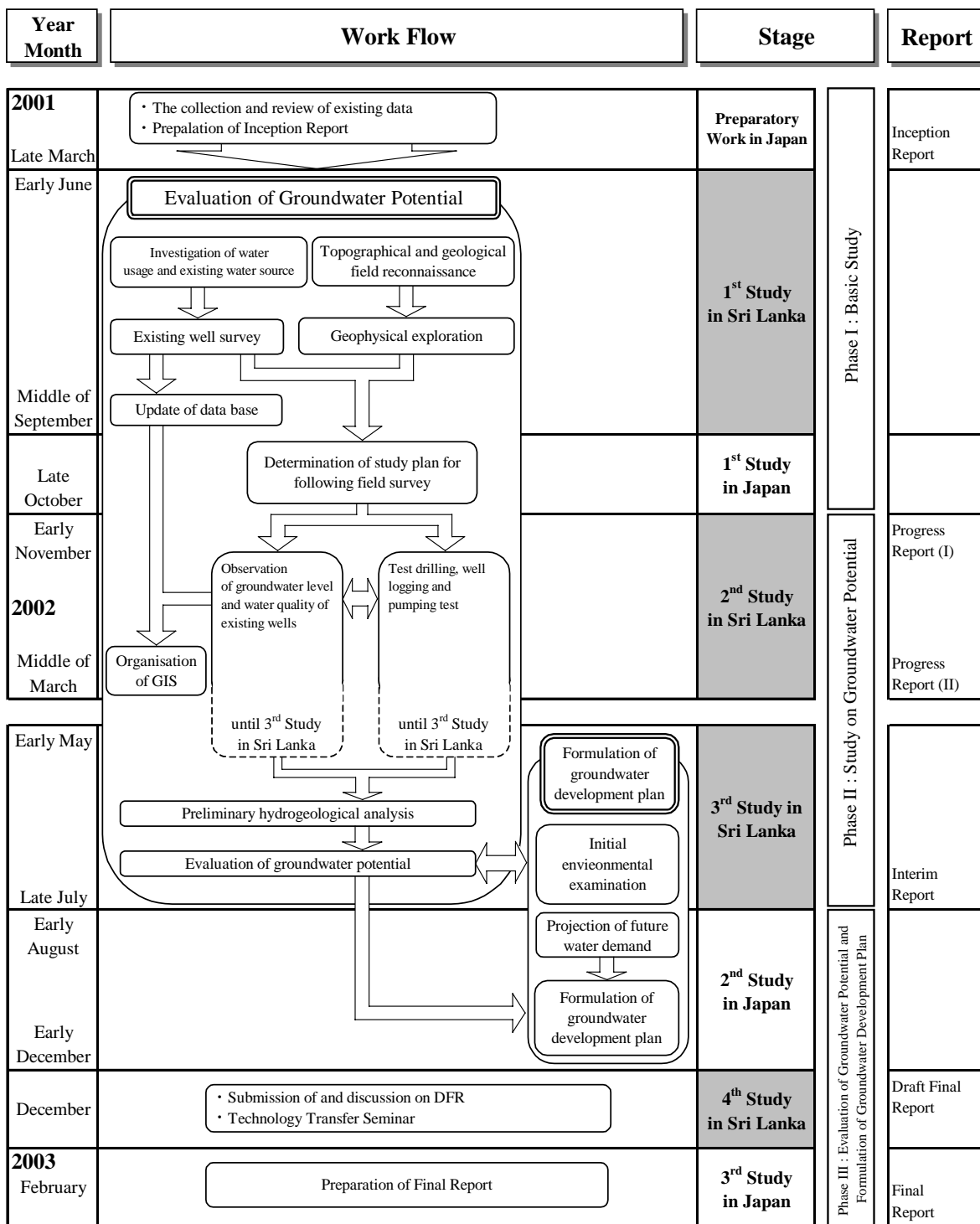


Figure 1.1 Flow Chart of the Study Work

Chapter 1 Introduction

Phase I : Basic Study: After review of the collected data through field study, the existing conditions for the hydrogeological and related subjects is assessed. Based on the results, a practical detail study plan for the next phase was formulated.

Phase II : Evaluation of Groundwater Potential: Based on the study plan formulated in Phase I, groundwater investigation and the hydrogeological analysis is carried out; then, the groundwater potential was evaluated.

Phase III : Formulation of Groundwater Development Plan: The groundwater potential and extractable yield is assessed based on the results of Phase II; then the groundwater development plan was formulated in consideration for future water demands.

1.5 COMPOSITION OF THE REPORT

The Draft Final Report is to be composed of the following components:

(1) Main Report

The main report contains all the Study results including the Master Plan (groundwater resources development plan) of the pilot GND and the study area.

(2) Supporting Report

Each field of the Study is to be reported in detail in 10 supporting chapters as follows:

Supporting 1 Topography and Geology

Supporting 2 Meteorology and Hydrology

Supporting 3 Geophysical Exploration

Supporting 4 Socioeconomic Conditions

Supporting 5 Existing Well Survey

Supporting 6 Test Well

Supporting 7 Hydrogeology

Supporting 8 Database System of the Wells

Supporting 9 Environmental Consideration

Supporting 10 Organization, Management and Operation

(3) Data Book

The Data Book contain the data obtained in Study.

(4) Summary

The summary report will outline the essence of the Study in compact form.