

JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT,
MINISTRY OF PLANNING AND INVESTMENT
SOCIALIST REPUBLIC OF VIETNAM

THE STUDY

ON

GROUNDWATER DEVELOPMENT IN

THE RURAL PROVINCES OF

THE CENTRAL HIGHLANDS

FINAL REPORT

VOLUME II

MAIN REPORT

Dac Lac Province



AUGUST 2002

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Composition of the Final Report

- Volume I : SUMMARY
- Volume II : MAIN REPORT
- Volume III : SUPPORTING REPORT
- Volume IV : DATA BOOK
- Volume V : SUMMARY in Japanese

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Kon Tum Province : Study Area

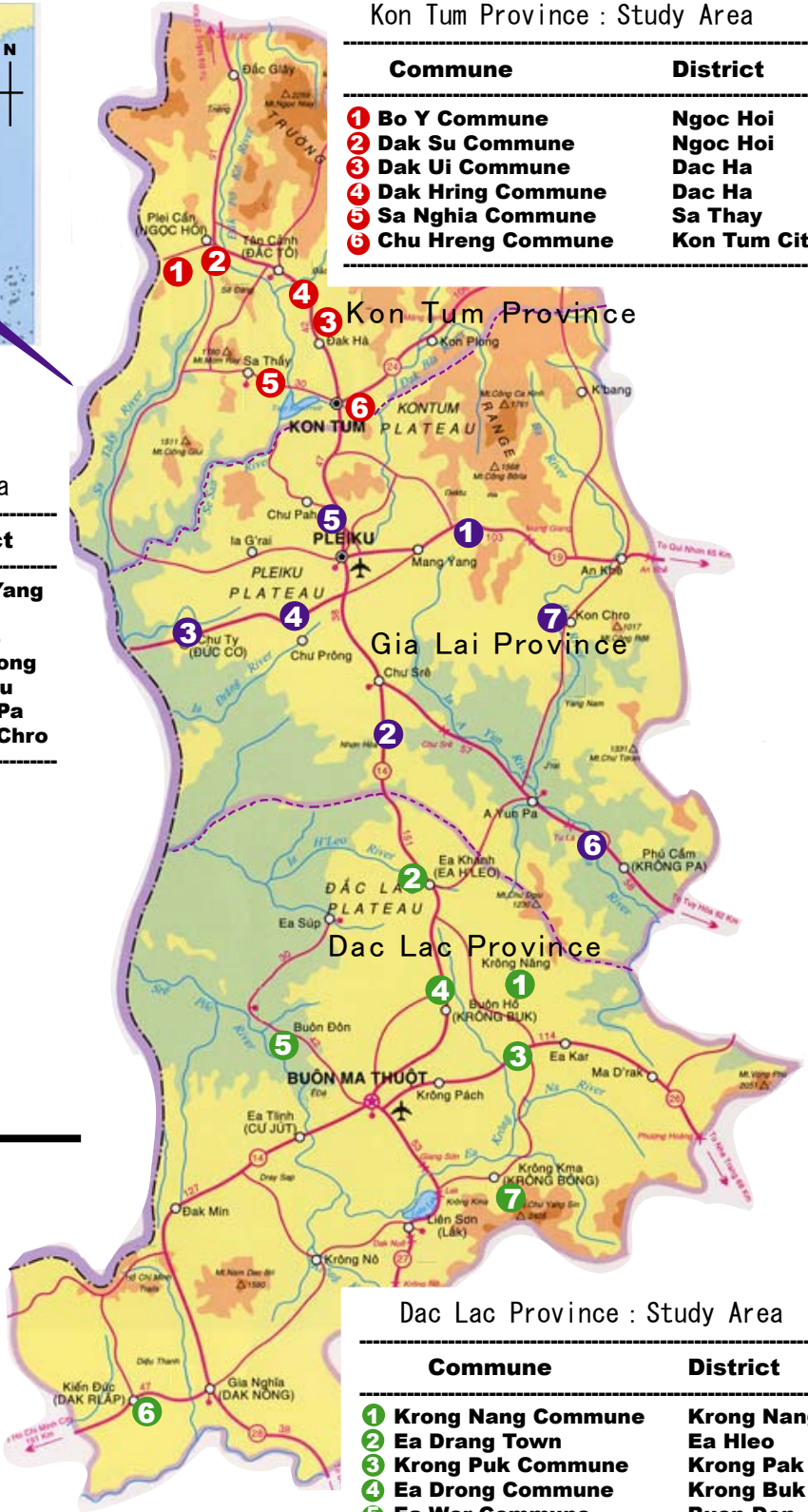
Commune	District
1 Bo Y Commune	Ngoc Hoi
2 Dak Su Commune	Ngoc Hoi
3 Dak Ui Commune	Dac Ha
4 Dak Hring Commune	Dac Ha
5 Sa Nghia Commune	Sa Thay
6 Chu Hreng Commune	Kon Tum City

Gia Lai Province : Study Area

Commune	District
1 Kong Tang Commune	Mang Yang
2 Nhon Hoa Commune	Chu Se
3 Chu Ty Town	Duc Co
4 Thang Hung Town	Chu Prong
5 Nghia Hoa Commune	Chu Pau
6 Ia Rsiom Commune	Krong Pa
7 Kong Yang Commune	Krong Chro



100km



Dac Lac Province : Study Area

Commune	District
1 Krong Nang Commune	Krong Nang
2 Ea Drang Town	Ea Hleo
3 Krong Puk Commune	Krong Pak
4 Ea Drong Commune	Krong Buk
5 Ea Wer Commune	Buon Don
6 Kien Duc Commune	Dac Rlap
7 Krong Kmar Town	Krong Bong

Location Map

MAIN REPORT DAC LAC

TABLE OF CONTENTS

PART I	ANALYSIS OF PRESENT CONDITION
Chapter 1	INTRODUCTION
Chapter 2	NATURAL ENVIRONMENT
Chapter 3	SOCIO-ECONOMIC CONDITION
Chapter 4	RURAL WATER SUPPLY
Chapter 5	INSTITUTIONAL FRAMEWORK
Chapter 6	LEGISLATION, REGULATIONS AND FINANCIAL ISSUES
PART II	GROUNDWATER STUDY
Chapter 1	HYDROGEOLOGICAL INVESTIGATION
Chapter 2	GEOPHYSICAL PROSPECTING
Chapter 3	EXPLORATORY WELL DRILLING
Chapter 4	EVALUATION OF GROUNDWATER RESOURCES
Chapter 5	WATER QUALITY
PART III	MASTER PLAN STUDY
Chapter 1	WATER SUPPLY MASTER PLAN
Chapter 2	SELECTION OF PRIORITY PROJECTS
PART IV	FEASIBILITY STUDY
Chapter 1	FEASIBILITY STUDY FOR THE FIVE PRIORITY SYSTEMS
Chapter 2	ORGANIZATIONAL SETTINGS
Chapter 3	ENVIRONMENTAL IMPACT ASSESSMENT (EIA)
Chapter 4	FEASIBILITY EVALUATION
Chapter 5	RECOMMENDATIONS FOR IMPLEMENTATION SCHEDULE AND METHOD
Chapter 6	PROJECT EVALUATION
PART V	RECOMMENDATIONS
Chapter 1	APPROACH TO INFORMATION, EDUCATION AND COMMUNICATION (IEC)
Chapter 2	OTHER RECOMMENDATIONS

APPENDIXES

APPENDIX 1

WATER SUPPLY SYSTEMS IN THE 9 COMMUNES
(TABLES OF FACILITIES IN EACH SYSTEM)

APPENDIX 2

COST ESTIMATION IN PRIORITY COMMUNES

APPENDIX 3

O&M COSTS FOR EACH TARGET COMMUNES

List of Abbreviations

ADB	Asian Development Bank
As	Arsenic
ATP	Ability to Pay
AusAID	Australian Grant Aid
BARD	bank for Agriculture and Rural Development
B/D	Basic Design
CERWASS	Centre for Rural Water Supply and Sanitation
CHC	Community Health Centre
CIDA	Canadian International Development Assistance
CPC	Commune People's Committee
DANIDA	Danish International Development Assistance
DARD	Department of Agricultural Development
DF/R	Draft Final Report
DFID	UK, Department for International Development
DGMV	Department of Geology and Minerals of Vietnam
DHC or DHS	District Health (Services) Centre
DOF	Department of Finance
DOH	Department of Health
DOSTE	Department of Science, Technology and Environment
DPC	District People's Committee
DPI	Department of Planning and Investment
EIA	Environmental Impact Assessment
EM	Ethnic Minority
F	Fluorine
F/R	Final Report
F/S	Feasibility Study
FU	Farmer's Union
GAD	Gender and Development
GDP	Gross Domestic Product
GSO	General Statistical Office
HDPE	Hard PVC pipes
HRD	Human Resources Development
HC	House Connection
IEC	Information, Education and Communication

IC/R	Inception Report
IT/R	Interim Report
IEE	Initial Environmental Examination
JICA	Japan International Cooperation Agency
KI	Key Informant
kWh	kilo Watt(s) hours
lcd	litre per capita per day
LEP	Law on Environmental Protection
MARD	ministry of Agriculture and Rural Development
MCM	Million Cubic Meter
M/M	Minute of Meeting
MOC	Ministry of Construction
MOET	Ministry of Education and Training
MOF	Ministry of Finance
MOLISA	Ministry of Labour, Invalids and Social Affairs
M/P	Master Plan
NGO	Non-Governmental Organizations
NIPHEP	National Institute of Public health and Environmental Protection
NRWSS	National Rural Water Supply and Sanitation
VIWASE	Vietnam consultant for Water supply Sanitation and Environment
ODA	Official Development Assistance
O&M or O & M	Operation and Maintenance
PC	Portland Cement
PCERWASS	
PCM	Project Cycle Management
PDM	Project design Matrix
PDOSTE	Provincial Department of Science, Technology and Environment
PDPSC	Provincial Disease Prevention and Sanitation Centre
PHSC	Provincial Health Services Centre
PPC	Provincial People's Committee
P/R	Progress Report
PSCWS	Provincial Steering Committee for Water Supply and Sanitation
PE	Poly-Ethylene Pipe
pH or PH	Potential of Hydrogen
PT	Public Taps
PVC	Poly-Vinyl Chlorine Pipe

PWL	Pumping Water Level
QTT2	Quantification Theory Type II
RRA	Rapid Rural Appraisal
RWSS	Rural Water Supply and Sanitation
SPC	State Planning Committee
SRV	Socialist Republic of Vietnam
S/W	Scope of Work
SWL	Static Water Level
TEM	Transient Electromagnetic Method
TDEM	Time Domain Electromagnetic Method
THS	Town Health Services Centre
TPC	Town People's Committee
TV	Television media
UARD	Unit of Agriculture and Rural Development
UFW	
UNDP	United Nation Development Planning
UNICEF	United Children's Fund
USD	US Dollar
VHW	Village Health Worker
VIP	Ventilation type Improved Pit
VND	Vietnam Dong
VNYU or YU	(Vietnam) Youth Union
WB	World Bank
WAT SAN	Water Supply and Sanitation
WHO	World Health Organization
WID	Women in Development
WTP	Willingness to Pay
WU or VWU	(Vietnamese) Women's Union

Unit

bar	Pressure
h	Hour
pH	Potential of Hydrogen
q_{\max}	Maximum hourly demand
Q_{\max}	Maximum daily demand
Q_{av}	Average day demand
mg/l	milligram per litre
l	Litre
m	Medium
vh	Very high
l/c/d	Litre per capita per day
l/s	Litre per second
m^3	Cubic meter
km^2	Square kilometre
μ	1×10^{-6}
ϕ	Diameter
$^{\circ}\text{C}$	Centi-degree
%	Percent
γ	Gamma (electrical logging)
k	Permeability coefficient
S	Storage capacity

PART I ANALYSIS OF PRESENT CONDITION

Chapter 1 Introduction..... DI1-1

1.1	Background.....	DI1-1
1.2	Objectives of the Study.....	DI1-3
1.3	Study Area.....	DI1-3
1.4	Organization of the Study.....	DI1-3

Chapter 2 Natural Environment..... DI2-1

2.1	Geomorphology	DI2-1
2.2	Meteorology	DI2-2
2.2.1	The solar radiation	DI2-2
2.2.2	Air temperature.....	DI2-2
2.2.3	Rainfall	DI2-2
2.2.4	Humidity	DI2-3
2.2.5	Evaporation.....	DI2-3
2.3	Hydrology	DI2-3
2.3.1	Mekong River system.....	DI2-3
2.3.2	Dong Nai River system.....	DI2-3
2.4	Soil and Vegetation	DI2-4
2.5	Geology	DI2-4
2.6	Hydrogeology	DI2-6

Chapter 3 Socio-economic Condition..... DI3-1

3.1	National and Regional Economy	DI3-1
3.1.1	Social Condition and National Economy	DI3-1
3.1.2	Social Condition and Regional Economy.....	DI3-2
3.2	Results of Rapid Rural Appraisal	DI3-3
3.2.1	Population and Projection of Population	DI3-3
3.2.2	Household Size	DI3-4
3.2.3	Ethnic Groups.....	DI3-4
3.2.4	Migration and Settlement	DI3-4
3.2.5	Capricious Migraqtion.....	DI3-5
3.2.6	Water Resource	DI3-5
3.2.7	Water Quality and Quantity	DI3-8
3.2.8	Poverty	DI3-9
3.2.9	Gender.....	DI3-10
3.2.10	Mass Organization.....	DI3-11

3.2.11	Rural Infrastructure.....	DI3-11
3.3	Results of Household Survey.....	DI3-13
3.3.1	Interviewee	DI3-13
3.3.2	Household Size	DI3-13
3.3.3	Household Structure	DI3-14
3.3.4	Ethnic Group.....	DI3-14
3.3.5	Migration	DI3-14
3.3.6	Occupation.....	DI3-14
3.3.7	Responsibility in family	DI3-14
3.3.8	Education	DI3-15
3.3.9	Water Related Issues	DI3-16
3.3.10	Living Condition.....	DI3-19
3.3.11	Agriculture.....	DI3-21

Chapter 4 Rural Water Supply..... DI4-1

4.1	National Rural Water Supply and Sanitation Strategy	DI4-1
4.2	On-going Projects and Existing Water Supply System.....	DI4-2
4.2.1	Activities of the Donors in the Whole Country	DI4-2
4.2.2	Activities of the Donors in the Study area.....	DI4-3
4.3	Survey for Existing water supply systems.....	DI4-3
4.3.1	Back ground Data of the Piped Schemes	DI4-3
4.3.2	Main Findings and Lessons Learned	DI4-4

Chapter 5 Institutional Framework..... DI5-1

5.1	Political and administrative system.....	DI5-1
5.2	Central level institutions.....	DI5-2
5.2.1	Ministry of Agriculture and Rural Development.....	DI5-2
5.2.2	Center for Rural Water Supply and Environmental Sanitation....	DI5-3
5.2.3	Ministry of Planning and Investment	DI5-4
5.2.4	Ministry of Finance.....	DI5-4
5.2.5	Ministry of Construction.....	DI5-5
5.2.6	Ministry of Health.....	DI5-5
5.2.7	Ministry of Science, Technology and Environment	DI5-6
5.2.8	Ministry of Education and Training.....	DI5-6
5.2.9	National Steering Committee for Rural Water Supply and Environmental Sanitation	DI5-6
5.2.10	Mass Organizations.....	DI5-7
5.2.11	Provincial Institutions.....	DI5-7
5.2.12	District Level Institutions.....	DI5-11
5.2.13	Commune/Town Level Institutions	DI5-12
5.3	Private Sector	DI5-14

Chapter 6 Legislation, Regulations and Financial Issues..... DI6-1

6.1	Law on Water Resources	DI6-1
6.2	Decree promulgating the regulation on the exercise of democracy in communes	DI6-1
6.3	Regulations on management of investment and construction	DI6-2
6.4	Financing	DI6-2
6.4.1	Sources and Volume of Sector Financing.....	DI6-2
6.4.2	Revenues from piped water supply schemes	DI6-4
6.4.3	External support.....	DI6-4

List of Tables

Table 2.1	Location of the Target Communes	DI2-2
Table 2.2	Geological Sequences in the Central Highlands	DI2-5
Table 2.3	Geology in the Target Communes	DI2-6
Table 2.4	Hydrogeology in the area	DI2-6
Table 2.5	Well Production Classification	DI2-6
Table 3.1	Monthly Income per Capita by Income Source and Region in 1999	DI3-2
Table 3.2	Monthly Income per Capita by Income Source in the Central Highlands.....	DI3-3
Table 3.3	Monthly Income per Capita by Income Source in Central Highlands ...	DI3-3
Table 3.4	Projection of Population.....	DI3-3
Table 3.5	Water Source in Target Area.....	DI3-5
Table 3.6	Classification and Definition of Poverty by MOLISA.....	DI3-9
Table 3.7	Poverty situation in the Target Area	DI3-10
Table 3.8	Household with Electrification.....	DI3-11
Table 3.9	Population of Children and Adults.....	DI3-13
Table 3.10	Responsibility on Family Issue by Sex	DI3-13
Table 3.11	Ownership of dug well	DI3-17
Table 3.12	Requests for Improvement to the Present Water Supply.....	DI3-18
Table 3.13	House Holder Expectations on Organizational responsibility for water supply O&M.....	DI3-18
Table 3.14	Willingness to Pay and Ability to Pay.....	DI3-19
Table 3.15	Average Expenditure by Expenses Items.....	DI3-19
Table 3.16	Power Source for Domestic Use	DI3-20
Table 3.17	Definitions of House Type.....	DI3-20
Table 3.18	Cultivated Area in Interviewed Households.....	DI3-21
Table 4.1	Donor Involvement in Water Sector.....	DI4-2
Table 4.2	Audited Water Supply Systems.....	DI4-4
Table 6.1	Investment in rural water supply in US\$ million	DI6-3

List of Figures

Figure 3.1	Educational System in Vietnam.....	DI3-16
Figure 5.1	Organization Chart of MARD.....	DI5-16
Figure 5.2	Organization Chart of CERWASS.....	DI5-17
Figure 5.3	Organization Chart of PCERWASS.....	DI5-18

Chapter 1 Introduction

1.1 Background

The Government of the Socialist Republic of Vietnam (the Government of Vietnam) has been promoting the water supply and sanitation system in the rural area to improve the living standard and the gap between rural area and urban area since 1982. The target planned in the year 1996 for water supply is 80% coverage for the rural area by the year 2000, and potable water service to the 13,000 primary schools in the whole country. The target was re-scheduled to the year 2005 by the National Program for Rural Water Supply and Environmental Sanitation (NPRWSS). However, the present coverage of the potable water is only 9.25% in the rural area. In this connection, “the Study on Groundwater Development in the Rural Provinces of Northern Part in the Socialist Republic of Vietnam” was conducted under the target year 2005 by JICA.

The National Rural Water Supply and Sanitation Strategy (NRWSS), which was approved by the Prime Minister in August 2000 (No.104/2000/QD-TTg), re-scheduled again its target by the help of The Danish International Development cooperation Agency (DANIDA) as follows:

Re-scheduled Target by NRWSS

Short term target year : 2005	To provide clean water service to <u>all public offices</u> in the rural area.
Interim term target year : 2010	To provide clean water service to 85% of population in the rural area, and 70% of coverage with <u>60 l/capita/day</u> for sanitation and hygiene improvement.
Long term target year : 2020	To provide 100% coverage to population in the rural area with <u>60 l/capita/day or more</u> for sanitation and hygiene improvement.

In the difficult situation to achieve this target, and in order to catch up the delay for the target year, the Government of Vietnam requested to the Japan Government for the Study on Groundwater Development in the Rural Provinces in the Central Highlands.

The study on Groundwater Development in the Rural Provinces of the Central Highlands was formulated by the Preliminary Mission of Japan International Cooperation Agency (JICA) in September 2000. Prior to the study, JICA had conducted a study on Groundwater Development in the Northern Provinces, and the

study was completed in March 2000. The following basic design study (B/D) was started in May 2001. As this study contributed to the development planning for groundwater in Vietnam, the Government of Vietnam requested the Japan Government to carry out another study in the Central Provinces.

The rural areas in the rural provinces of the Central Highlands, Kon Tum, Gia Lai, and Dac Lac provinces, have faced the low living standard especially the water shortages. The populations of the areas, comprising more than a dozen of ethnic people, have been increasing due to the migration of the majority Kinh people from the northern provinces since the 1970s. The migrants started to cultivate commercial and profitable agricultural products, e.g. coffee, pepper, and rubber on the lands where the ethnic minorities had lived earlier, which has led to the scarcity of water especially in the dry season. In the Central Highlands, surface water is usually polluted by pesticides and fertilizers due to intensive production on the newly developed agricultural lands, and water in shallow dug wells is generally contaminated by animal and human waste. It has been reported that serious water shortages happened from time to time, and water-borne diseases, e.g. typhoid, cholera, and dysentery are still common in the rural areas of the Central Highlands.

The Study aims to help the poverty-stricken people in the rural provinces of the Central Highlands by identifying new groundwater resources to supply safe and clean water (SCW) as a basic human need and to improve rural living standards.

The JICA Preparatory Study Team headed by Mr. Kanamaru made site reconnaissance in September 2000 to discuss the Scope of Work with MARD, the Ministry of Planning and Investment (MPI), the Center for Rural Water Supply and Sanitation (CERWASS), and the other authorities concerned. The main counterpart agency of the Government of Vietnam is CERWASS, responsible for the implementation of rural water supply, sanitation and environment in Vietnam, and both parties exchanged their views how to operate the Study and finally determined the Scope of Work.

Based on the S/W, JICA made a contract with the joint venture of Nippon Koei Co. Ltd. and Nikko Tankai Co., Ltd. in December 2000 for the implementation of the study. The study team, which consists of the expert of the joint venture, was dispatched to Vietnam in January 2001 and conducted the first, the second and the third field work in Vietnam till May 2002. This draft final report presents the results of study carried out through domestic work from May to June 2002 with referring the former stages of the reports.

1.2 Objectives of the Study

The objectives of the F/S study are as follows:

- 1) to evaluate groundwater resources in the study area,
- 2) to formulate a master plan for rural water supply and sanitation in the whole study area,
- 3) to conduct a feasibility study for priority projects selected by the master plan,
- 4) to carry out technology transfer to the counterpart personnel in the course of the Study.

1.3 Study Area

The study area covers 7 target communes/towns (3 communes and 4 towns) in Dac Lac province in the Central Highlands, taking into account the proposals submitted by the Provincial CERWASS (PCERWASS) as shown in the location map on the front page).

1.4 Organization of the Study

MARD is responsible for the coordination of rural water supply and sanitation (RWSS) programs and projects, and CERWASS is the main counterpart responsible for the implementation of RWSS. JICA is the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan. The list of the members of the Study Team and the staff of CERWASS are shown below:

Study Team

Mr. Tadao Suzumura	Team Leader/Groundwater Development Plan
Dr. Masao Higuchi	Hydrogeologist-A
Mr. Ichiro Noguchi	Hydrogeologist-B
Mr. Toshihisa Ishibashi	Geophysicist-A
Mr. Saburo Tachikawa	Geophysicist-B
Mr. Hatsuo Kumano	Drilling Expert-A
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Mr. Michael Fenger-Cordes	Water Supply Plan Expert
Mr. Kiyoto Yamazaki	Facility Design Expert/Cost Estimator

Mr. Hannu Vikman	Institution/O&M Plan Expert, and Financial Analyst
Mr. Yasunori Kudo	Social Survey and Economic Analyst
Mr. Yukiyasu Sumi	Sanitary and Environmental Expert
Mr. Takuya Yoshizawa	WEB Design Expert/Supervision of Pilot Model Projects

CERWASS

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Mr. Ha Van MANG	Chief of Investment and Planning Division
Ms. Nguyen Thanh BINH	Vice Chief of Investment and Planning Division
Ms. Ha Thanh HANG	Vice Chief of Investment and Planning Division
Mr. Pham Anh DUNG	Expert of Environmental Division
Mr. Nguyen Thanh LUAN	Vice-Chief of Technology Transfer Center
Mr. Phan Dinh PHU	Chief of Administration Division
Ms. Nguyen Hanh DUNG	Expert of Environmental Division
Mr. Doan Xuan TIEN	Expert of Technology Transfer Center
Mr. Nguyen Son TUNG	Technical Department
Mr. Le Quang HUNG	Expert of Technical & Capital Construction Division

Chapter 2 Natural Environment

2.1 Geomorphology

Vietnam is divided into the following 4 geomorphological regions:

- Northern Highlands
- Red River Delta
- Annamese Highland and the Coastal plains
- Mekong River Delta

The study area is located in the central part of Annamese Highlands. The main cities in and around the Central Highland and Coastal plains are Danang, Qui Nhon, Nya Trang and Da Lat from the north to the south. The area is located in the center of the Highlands with a few hundreds kilometers away from these cities. The provincial capital of Kon Tum, Gia Lai and Dac Lac is Kon Tum, Pleiku and Buon Ma Thout, respectively. The paved highways linking provincial capital and main cities in the Highlands and Coastal plains are national road No. 14 (Ho Chi Minh City - Danang via Buon Ma Thout and Kon Tum), No. 26 (Buon Ma Thout - Nya Trang), and No. 19 (Pleiku - Qui Nhon), respectively.

The Central Highlands (Tay Nguyen Highlands) covers most of the territory of Kon Tum, Gia Lai, Dac Lac and Lam Dong provinces with a total area of 57,373 km². The Central Highlands are surrounded by the mountainous area of the Quang Nam province to the north, Binh Thuan, Dong Nai, Binh Phuoc provinces in the south and south-west, coastal provinces of Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan to the east, and low flat land of Laos and Cambodia to the west. The Central Highlands are characterized by various topographic features as described below.

The Ea Soup Peneplain is 140-300 m high in the western part of the Dac Lac province. The Cheo Reo-Phu Tuc depression stretches along the Ba River and the Krong Pak-Lak Depression is along the Srepok River with several swamps and lakes.

The target communes/towns are located in the topographic zones as shown in Table 2.1.

Table 2.1 Location of the Target Communes

Geomorphological zone	Target commune/town
Buon Ma Thuot Highland	D1, D2, D3, D4, D5
Dak Nong Highland	D6
Krong Pak-Lak Depression	D7

2.2 Meteorology

The climate in the study area is characterized with the tropical monsoon and is influenced by the topographic features of the highlands.

2.2.1 The solar radiation

The solar radiation in the highlands is as high as 235-240 kcal/cm²/year. The variation in radiation through the year is small with the difference between the maximum and minimum being 4-5 kcal/cm².

2.2.2 Air temperature

The average temperature is 24°C in the lowlands with less than 500 m elevation, 21 - 23°C in the highlands from 500 to 800 m, 19 - 21°C in the highlands from 800 to 1100 m, and 19°C in the high mountains higher than 1550 m elevation. The highest temperature is 28 - 30°C in April and the lowest temperature is 15°C in January. The annual temperature differences between the wet and dry seasons are only 4 - 5°C and the daily difference is comparatively large at 9 - 11°C in average.

2.2.3 Rainfall

In the northern part of the Central Highlands, the annual rainfall ranges from 1,800 - 2,000 mm, 1,400 - 1,800 mm in the lowland in the Dac Lac province. In the southern part of the Highlands, the annual rainfall is 2,000 - 2,400 mm in Di Linh, and 2,876 mm in Bao Loc.

There are clearly distinguishable wet and dry seasons. The wet season lasts from May to October and the rainfall received in wet season is equivalent to 75 % of the total rainfall. The dry season lasts from November to April. The three months from December to February are the driest months with a rainfall of 10 - 40 mm/month.

2.2.4 Humidity

The average humidity is 80 - 85 % with the highest level of 88 - 92 % in June to October and the lowest of 70 - 72 % in February to March.

2.2.5 Evaporation

The average annual evaporation varies in each locality between 600 - 1,500 mm. The highest is 1,600 mm/year in Buon Ma Thuot. The highest evaporation is normally in March, reaching 230 mm/month in Buon Ma Thuot. The lowest evaporation is normally 30 - 40 mm/month from August to October.

2.3 Hydrology

There are two major river systems. Each river system is explained in the following sub-sections.

2.3.1 Mekong River system

The Mekong River has two major tributaries in the area, Se San River and Srepok River. The Se San River originates from the mountainous area in the northern, northeastern and western parts of the KonTum province.

The Srepok River originates from the Buon Ma Thuot Highlands and the southwestern part of the Plei Ku Highlands. The catchment area is 11,830 km² and the annual runoff is estimated as 7.79×10^9 m³.

The total catchment of the Mekong River system is about 30,000 km² and is equivalent to 54% of the total area of the Central Highlands. The annual runoff is estimated as 19.65×10^9 m³.

2.3.2 Dong Nai River system

Dong Nai River originates from the mountainous area in Lam Dong province and the southwestern part of Dac Lac province. The catchment area is 9,670 km² and is equivalent to 18% of the Central Highlands. The annual runoff is estimated as 8.6×10^9 m³.

2.4 Soil and Vegetation

The soil in the study area is classified into eight types: 1) alluvial soil, 2) gray soil, 3) black soil, 4) ferrallitic or laterite soil, 5) red-yellow moistured soil, 6) moistured soil in the mountains, 7) eroded skeletal soil, 8) swampy & peaty soil.

The ferrallitic soil, which is purple-brown, red-brown and yellow-brown, originates from weathered basalt. The soil is widely distributed in the study area (about 66% of the total area) and has a very important role for agricultural products in the Highlands. The high permeability of this soil shows that it has a high potential for groundwater recharge.

2.5 Geology

Geological processes that took place in the Paleozoic and Mesozoic Eras and subsequent geomorphological processes have affected to the shapes and components of the Central Highlands. The most events took place in the Cenozoic. The Late Mesozoic-Paleogene epoch is a period of intense pressure on the Indochina plates. It occurred the collision of the South China and Indochina plates. Following, the Indochina plate is characterized by a decrease of crustal pressure in the Neogene- Quaternary epoch. As a result, the South China Sea was formed. This might be affected the extensive metamorphism in the southeastern region of the Indochina plate in the Late Neogene. The sedimentary rocks were pierced in many places by volcanic activities. The basalt lava covered large plateau in the Central Highlands.

Two types of basalt lavas are known, 1) tholeiitic basalt of upper Neogene-Pleistocene age, and 2) olivine basalts of Pleistocene-Holocene. Tholeiitic basalt of Neogene-Pleistocene age occupies the main areas of the Highlands. It is silica-rich with containing low- calcium pyroxenes and without olivine. Olivine basalt of Pleistocene-Holocene age covers parts of the Neogene-Pleistocene basalt. It was violently erupted in many places where the older basalt is not found.

These basalts covered all the bedrocks earlier than Late Neogene, except the peaks or relief of the bedrocks. It might be covered very wider area than the present covering area. The top basalt lava has been partly eroded, while the underlying rocks became exposed.

Table 2.2 Geological Sequences in the Central Highlands

Era	Period	Lithology	Intrusive rocks
Cenozoic	Quaternary (Q)	- Alluvium in plains/valleys (Q) - Basalt (β)	
	Lower Quaternary	Basalts (β N ₂ -Q ₁) in large areas of the plateau except northern Kon Tum province	
	Upper Neogene		
	Middle/Lower Neogene (N)	Sandstone, claystone & siltstone	
	Paleogene		- Granodiorite, granite & granosyenite of late Mesozoic to Early Cenozoic age - Dionite, granosyenite & granite in Dac Lac province
	Late Paleogene – Early Mesozoic		- Biotite & granite in Gia Kai province - Granite, granophyre & granodiorite in Gia Lai province and the northern Dac Lac and southwestern Kon Tum provinces. - Dionite, granodiorite
Mesozoic	Cretaceous (K)	Sandstone, conglomerate & siltstone	
	Upper Jurassic		
	Middle/Lower Jurassic (J)	Marine deposits of sandstone, siltstone, shale, limestone & conglomerate (J _{1,2}) in Dac Lac province	
	Triassic (T)	Volcano-sedimentary sequence of sandstone, siltstone, shale, limestone & conglomerate with rhyolit & dacite (T ₂) in Da river basin of Gia Lai province and western Central Highlands	
Paleozoic	Upper Permian	Basalts in Da river basin	
	Middle/Lower Permian (P)	- Siliceous shale with limestone & andesite in western Dac Lac province - Basalt, schist & siltstone in Da river basin of Gia Lai province	
	Carboniferous (C)		
	Devonian (D)		
	Silurian (S)		
	Upper/Middle Ordovician		
	Lower Ordovician (O)	Schist, shale, quartzite & limestone in western Kon Tum province	
	Upper/Middle Cambrian		
	Lower Cambrian	Schist, quartzite & dolomite (PR ₃) in northern Gia Lai and southern Kon Tum provinces	
Proterozoic	Upper Proterozoic		Granodiorite, granite & migmatite in eastern Kon Tum province and small parts of eastern Gia Lai and Dac Lac provinces
	Middle/Lower Proterozoic	Gneiss, amphibolite & quartzite (PR _{1,2}) in Gia Lai and Kon Tum provinces	
Archeozoic (AR)		Granulite & crystalline schist in upper Da river basin of Gia Lai province	Enderbite, chamokite, granite & migmatite in upper Da river basin of Gia Lai province

*Source: General Department of Geology & Mines (partly revised).

The target communes/towns belong to the following geological zones as shown in table 2.3.

Table 2.3 Geology in the Target Communes

Target commune		Geology	Geomorphology
Dac Lac province			
D1	Krong Nang	Basalt (βN_2-Q_1)	Buon Ma Thuot Highland
D2	Ea Drang	Basalt ($\beta Q_{2,4}$)	Buon Ma Thuot Highland
D3	Krong Buk	Basalt (βN_2-Q_1)	Buon Ma Thuot Highland
D4	Ea Drong	Basalt (βN_2-Q_1)	Buon Ma Thuot Highland
D5	Ea Wer	Basalt (β), Jurassic sandstone (J)	Buon Ma Thuot Highland
D6	Kien Duc	Basalt (βN_2-Q_1)	Dak Nong Highland
D7	Krong Kmar	Sand (Q), Jurassic sandstone (J)	Krong Pak-Lak Depression

2.6 Hydrogeology

The Central Highlands except for the Lam Dong province can be divided into 8 zones as follows in consideration of the hydrogeological characteristics in the Central Highlands as described in Table 2.4:

Table 2.4 Hydrogeology in the area

Hydrogeology		Thickness (m)	Yield (l/sec)	Specific yield (l/sec/m)
Alluvial sediments (Q_4)	Sand, silt and gravel	3-5		0.05-0.33
Pleistocene sediments ($Q_{1,3}$)	Sand, silt and gravel	10-15	0.2-0.4	
Neogene sediments (N)	Sandstone, conglomerate, siltstone	10-500		0.06-0.54
Middle Pleistocene basalt (βQ_2)	Olivine basalt	10-150	0.16-14.68	0.01-3.06
Upper Neogene – lower Pleistocene (βN_2-Q_1)	Tholeitic basalt	80-150	0.16-10.47	0.01-3.59
Cretaceous sedimentary rocks (K)	Sandstone, conglomerate, siltstone			0.02-0.2
Jurassic sedimentary rocks ($J_{1,2}$)	Limestone, sandstone, conglomerate, siltstone			0.05-0.33
Cambrian – Archeozoic metamorphic rocks and granites (PR- γ)	Gneisses and granites			0.01-0.03

Table 2.5 Well Production Classification

Class	Yield (l/s)	Specific Yield (l/s/m)
Rich and very rich	1,0 – 5,0 and higher	0,5 – 1,0 and higher
Medium	0,5 – 1,0	0,2 – 0,5
Poor	0,1 – 0,5	0,05 – 0,2
Very poor (aquitarde)	< 0,1	< 0,05

The hydrogeological characteristics and features of target communes/towns are described in detail in Supporting Report-A.

Chapter 3 Socio-economic Condition

3.1 National and Regional Economy

3.1.1 Social Condition and National Economy

The population of Vietnam was estimated at 76.3 million in 1999 (statistics in 1999), and 118 million in 2025 (World Development Report: 1996). The total area of Vietnam is 332,000 km². The land is administratively divided into 57 provinces and 4 central control cities (Hanoi, Ho Chi Minh, Hyphong and Danang) in November 1996. The people of 20 % are living in urban area and the rest people are in rural area. More than 60 ethnic peoples are identified. They are Kinh (majority: 87 %), and the minorities of Thai, Muong, Taie, Nue, Meo and so on. The Zao, Ede and Bana minority peoples are living in the north. The Gia Lai people is in the Highland. The Cham and Khmel peoples are in the south.

Since 1986, Vietnam has experienced a transition from a centrally planned economy to a market economy called as “Doi-Noi”. Over the last ten years, the economy has achieved a high growth rate at 9 % per year. Industry output growth has averaged 13.5 %. In spite of this significant growth, Vietnam remains still one of poor countries in the world, whose GNP per capita is estimated as US\$ 250 (World Development Report 1996).

Vietnam is a poor, densely populated country that has had to recover from the ravages of war, the loss of financial support from the old Soviet Bloc, and the rigidity of a centrally planned economy. Substantial progress has been achieved over the past 10 years in moving forward from an extremely low starting point, though the regional downturn is now limiting that progress. GDP growth of 8.5 % in 1997 fell to 4 % in 1998. These numbers masked some major difficulties that are emerging in economic performance.

Since 1997, the economic situation in Vietnam was rather complicated due to the influence of the financial crisis in the Asian region and losses to agricultural production caused by floods in the central coast area. The GDP still increased at an average rate of 6.1 % for the period 1996-1999.

According to the Results of the household Living Standards and Economic Condition Survey in 1999, income increased for both the poor and the rich, but the results also indicated the gap between the poor and the rich is widening.

3.1.2 Social Condition and Regional Economy

Table 3.1 shows monthly income per capita by income source in seven regions.

North East South region contains Ho Chi Minh City and surrounding provinces and has achieved outstandingly in most sectors. Central Highlands has the second highest per capita income among the 7 regions. Agriculture sector in Central Highlands contributes the highest regional sector income in the country, and supports about 55 % of total income of the region. Central highlands are famous for industrial export crops, such as coffee and rubber. However, since the year 2000, the international price of coffee has dropped dramatically, and has effected coffee farmers in the region.

Table 3.1 Monthly Income per Capita by Income Source and Region in 1999

Unit: 1,000 VND

Region	Total	Salary & wage	Agriculture Forestry & Fishery	Industry & construction	Service activities	Others
North West and North East	210.00	34. 70	117.00	12.00	24.20	22.10
Red River Delta	280.30	75. 70	93. 30	23.00	42.30	46.00
North Central Coast	212.40	40. 40	88. 10	21.20	29.50	33.20
South Central Coast	252.80	70. 50	83. 90	13.70	54.10	30.60
Central Highlands	344.70	54.50	189.20	15.90	59.60	25.50
North East South	527.80	191. 60	111.40	54.40	117.70	52.70
Mekong River Delta	342.10	69. 40	164.90	17.10	57.50	33.20

Source: Results of the Households' Living Standards and Economic Condition Survey in 1999

Table 3.2 Monthly Income per Capita by Income Source in the Central Highlands

Year	Total	Salary & wage	Agriculture, Forestry & Fishery	Industry & construction	Service activities	Others
1995	241.14	35.40	136.39	9.86	39.31	20.18
1996	265.60	39.20	146.50	13.00	45.60	21.30
1999	344.70	54.50	189.20	15.90	59.60	25.50

Source: Results of the households' Living Standards and Economic Condition Survey in 1999

Table 3.3 presents income per capita by income source in each province. Dac Lac is the richest of the three provinces. The main income source is agriculture, especially coffee production.

Table 3.3 Monthly Income per Capita by Income Source in Central Highlands

	Total (1000VND)	Salary & wage	Agriculture, Forestry & Fishery	Industry & construction	Service activities	Others
Unit: %						
Dac Lac						
1996	309.52	10.84	59.69	3.68	17.03	8.76
1999	386.90	12.27	57.31	2.86	17.36	10.20

Source: Results of the households' Living Standards and Economic Condition Survey in 1999

Coffee is planted in about 250,000 ha in the province. Agriculture accounts for a high proportion of income, but the proportion has slightly decreased from 59.69% in 1996 to 57.31% in 1999, while salary and wages has increased.

3.2 Results of Rapid Rural Appraisal

3.2.1 Population and Projection of Population

Population and growth rate data were collected as much as possible. However, as the growth rate in some communes is not available, the neighboring data was assumed for population projection for the year 2005, 2010, 2015 and 2020. Table 3.4 shows the data for population and population growth rate.

Table 3.4 Projection of Population

Commune	Total Villages	Number Household	Growth Rate(%)		Population 2000
Dac Lac province					
D1: Krong Nan	9	1998	1.80	1.80	10795
D2: Ea Hleo	13	2631	2.20	2.20	14853
D3-1: Krong Puk	7	1192	2.60	2.60	6619
D3-2: Krong Puk	5	640	2.60	2.60	3453
D3-3: Krong Puk	8	766	2.60	2.60	3494
D4-1: Ea Drong	6	1245	1.20	1.20	6901
D4-2: Ea Drong	4	431	1.20	1.20	1805
D5-1: Ea Wer	9	963	10.00	2.10	4992
D5-2: Ea Wer	1	64	10.00	2.10	313
D5-3: Ea Wer	1	46	10.00	2.10	197
D6: Kien Duc	8	2062	2.10	2.10	8626
D7: Krong Kmar	8	1169	3.40	2.00	5735

Population growth through migration was assumed only until the year 2005 due to unknown factors of political decisions for migration and limited land area.

3.2.2 Household Size

The RRA results show that the average household size in the target towns/communes varies from 4.2 persons per household to 5.6 persons. The average household size is larger in villages/wards with a high proportion of ethnic minority (EM) groups.

3.2.3 Ethnic Groups

Official figures show that there are in total 54 ethnic groups in Vietnam. The majority of the population in the country belongs to the Kinh group. In the target area, 20 ethnic groups were identified (Data Book Appendix-3, Figure 1.1 – 1.20). Ethnic minorities (EM) such as E De, Gia Rai, Ba Na, Xe Dang, Xo Dra, Ca Dong, Mnong, Gie, Mang, Brau and Romam originate from the central highland area. According to the study results, E De is distributed in Dac Lac province. According to RRA results, proportions of Kinh households in the target area are estimated as 70% in Dac Lac province.

It is observed that the locations of most original EM communities are far from main road in communes/towns and close to mountainous area. They had practiced slash-and-burn cultivation, shifting cultivation, and relied on forest products, but most of them have stopped shifting cultivation, apart from a few minority groups. Some recently settled Kinh people live in remote area because they could not find land around the center of town/commune.

In general, each ethnic group, especially original EMs, tends to keep its own community, which often shaped village/ward.

3.2.4 Migration and Settlement

There are two kinds of migration pattern. One is government sponsored resettlement program (New Economic Zone). The Government has supported New Economic Zone program, in order to move people from high population density areas to sparsely populated areas. In this program, the Government prepares social and economic infrastructure and some institutional supporting systems for these settlers, so that migrants can start their lives smoothly.

Another is free migration where people move into unused area and start cultivation. Even though they are free migrants, they have a right to receive social services, such as education and health service just the same as legal dwellers. After several years, the town or commune where they live judges their behavior and, if there are no serious problems and troubles with them, they can be registered as a legal dweller. The considerable difference between legal dweller and illegal dweller is whether they have land use certification. It is necessary to borrow money from official banks. In case of free migration, seasonal migration was sometimes observed whereby those from another province come to the central highlands to reclaim forest area and cultivate cash crops every season. After selling the harvested crops they return to their main place of residence.

3.2.5 Capricious Migration

Migration of Kinh and the other ethnic minorities peoples are sometime capriciously migrating without government control. The population growth ratio is included such capricious influences. The growth ratio of 2-3% in the Central Highlands is therefore, higher value than the average growth ratio of approximately 2% in the whole country.

3.2.6 Water Resource

Water resource map in all target communes were drawn with the help of key informants (Data Book Chapter 1). The water resources are classified into dug well, shallow borehole with a hand pump (UNICEF), deep well, river, stream, spring and rain water (rainy season only). The same household often has several sources for different domestic purposes. They need to keep plural water sources which can be accessed through a year, even in the driest year.

Table 3.5 Water Source in Target Area

Province	Commune	Dug well	Spring	Borehole	River	Stream	Vendor
Dac Lac	Krong Nang	O	O				
	Ea Drang	O	O	O			O
	Krong Puk	O					
	Ea Drong	O	O				
	Ea Wer	O			O		
	Kien Duc	O		O			O
	Krong Kmar	O				O	

Dug well includes UNICEF shallow borehole, Borehole: private use only

(1) Dug wells

Dug wells are the most popular water source in the target area. Most Kinh people and some EMs, who follow the Kinh practice, use dug well. The depth of a dug well varies from 5-6 m to 30 m and more. People use bucket with rope, bucket with pulley, hand pump or electric pump to lift water from well. Dug well water is used for drinking, cooking, bathing, washing and/or plant watering.

Most households using a dug well have their own dug well except EMs. If a household does not have a well or sufficient water in their well, water is collected from neighbors without payment. This is from mutual help custom. However, when a well is equipped with an electric pump, the owner charges a electricity fee to users who regularly use the pump.



Left: EM woman washing cloths and girls collecting water at Kong Yang commune in Gia Lai province. Right: EM woman pouring water into a gourd at Kong Yang commune in Gia Lai province.

The Government has issued instructions to boil water for drinking purpose through local institutions such as health services and schools. At school level, when a school has a dug well and enough water, schools prepare drinking water tanks for children. If a school does not have a well or sufficient water in their well, teachers instruct children to bring boiled water from home.

(2) Springs, Streams and Rivers

Springs, streams and rivers have been used for a long time as water sources, mainly by EM in the area. Before rapid migration started in the central highlands, a large number of springs were located in mountainous area as well as rivers and streams. Mass migration caused deforestation for reclamation of agricultural and residential lands and pollution of these water resources by agricultural chemicals and human waste. Consequently, many springs have

disappeared as water source or the quantity of water has decreased, and quality of these water sources has become worse.

Generally, water collection is done mainly by women including girls among ethnic minorities. Gourd bottles and plastic PET bottles are used for water collection. These bottles are carried by women in a bamboo basket on their back. Collected water is used for drinking and/or cooking. When women collect water from a spring, stream or river, they usually wash cloths and take baths as well, while men take baths during vacancy of women or at another water source. Most of these water collection points are kept a certain distance from the residential area, and cannot be seen from outside easily.



Left: Spring at Chu Hreng commune in Kon Tum province. Right: Spring at Krong Nang town in Dak Lak province

These water collection points have another important role. They provide a public space for communication, where women can exchange various kinds of information on their economic activities and lives.

(3) Deep boreholes

Deep boreholes are not popular in the residential area, but are observed at official facilities in some communes/towns. Water from those deep boreholes are for office use only and are not utilized within private households. In Ea Drang town and Kien Duc town in Dac Lac province, a few private deep boreholes are used. In Kien Duc town, two deep boreholes are used for to obtain water for selling.

(4) Piped water

Piped water system is seen at D5, D6 and D7 in the target area. However, they are not properly operating at present by the reason of failure of water charge collection and very low house connection rate, etc.

At Krong Kmar town (D7) in Dac Lac province, UNICEF constructed a gravity type piped water supply system in 1998. The system supplied water from

Krong Kmar head works to a public tank with a tap located in each village. After one-year of operation the system was destroyed by flood. People use dug wells now.

In Ea Wer commune (D5) of Dac Lac province, the province dug a deep borehole to serve water to six concrete tanks with a tap for two villages at the center of the commune.

Bamboo piped system was observed at Dak Ui commune in Kon Tum province. A spring is located at the middle of a mountain which is at a higher elevation than the villages. In the 1970's people started construction of a gravity type water supply piped system using bamboo from the forest. Recently they put PVC pipe inside the bamboo pipe for reinforcement of the facility. Users purchase materials and maintain the facility by themselves.



Left: Public piped water supply system is made of bamboo and woods at Dak Ui commune in Kon Tum province. A board and a stone are used for washing cloths. PVC pipe is recently used for reinforcement. Right: Water intake at spring

3.2.7 Water Quality and Quantity

Change of water quality and quantity were also clarified in cooperation with key informant. Results are shown in Supporting-A with rainfall pattern. It cannot be compared with other communes, because these figures were subjectively made by informants. The results, however, indicate changes of water quality and quantity through the year. It is necessary to combine these data with scientific examination conducted by the team, then the water condition in each communes/towns can be forecasted in detail.

The rainy season in the target area starts in March or April and ends in October to January. One or two months after the start of the rainy season, the quantity of water in all sources begins to increase, while quality begins to decrease. Meanwhile, there

are areas, like Kong Tang town and Nonh Hoa commune in Gia Lai province, where it takes 5 months for the rain water to effect the water level of sources.

3.2.8 Poverty

Several definitions measuring poverty are available in Vietnam. The study team used the definition of Ministry of Labor, Invalids and Social Affairs (MOLISA), which is prevalent in rural administrative offices of target area. MOLISA uses rice as a measurement of income, and it can be converted to a money equivalent. Table 3.6 shows the poverty definition published by MOLISA in May 1997. The definition would be valid for 1998, but local administrations in the target area still use this definition.

Table 3.6 Classification and Definition of Poverty by MOLISA

Classification	Definition
- Very poor	Income less than 13kg rice capita/month, equivalent to VND 45,000
- Poor in rural mountainous and islands	Income less than 15kg rice capita/month, equivalent to VND 55,000
- Poor in rural, delta and midland areas	Income less than 20kg rice capita/month, equivalent to VND 70,000
- Poor in urban areas	Income less than 25kg rice capita/month, equivalent to VND 90,000

Source: Ministry of Labor, Invalids and Social Affairs

Poverty situation from the results of key informant interview is shown in Table 3.7. Of the three provinces it can be seen that Gia Rai province and Kon Tum province have rather high proportions of poverty. Towns commonly have less than 15% poverty rate, which is low compared to communes.

The poverty rate of these villages is remarkably high, 85% and 90%, even through their villages are sited on a main road. First priority of their needs is easier access to health service, second priority is clean water supply, followed by draught animals and electricity supply. According to key informants in these communes, the main reason of poverty is low agricultural production, especially cash crop production. Cash crops such as coffee, pepper and rubber, which are cultivated in other areas, cannot be grown in this area because of poor soil fertility. They grow cashew, maize, beans and sesame.

Meanwhile, in Ea Drang town, Kien Duc town and Krong Kamr town in Dac Lac province, the ratios of poor households are much lower than in other

communes/towns. One characteristic common to these towns and communes is, the high proportion (over 90%) of Kinh households.

Among communes/towns, it tends that villages that are located in remote area have a high concentration of poor households. The situation of social and economic infrastructure is very poor.

Table 3.7 Poverty situation in the Target Area

Town/ Commune	No. of Household (household)	Population	Poverty ¹⁾ (household)	Poverty (%)
Dac Lac province				
Krong Nang T.	1,998	10,795	300	15%
Ea Drang T.	2,631	14,853	228	9%
Krong Buk C.	2,598	13,566	370	14%
Ea Drong C.	1,676	8,706	316	19%
Ea Wer C.	1,073	5,502	207	19%
Kien Duc T.	2,062	8,626	107	5%
Krong Kmar T.	1,169	5,735	97 ²⁾	8%
Province total	13,207	67,783	1,625	12%
Area total	24,191	118,617	4,430	18%

Source: RRA results

1) Poverty includes very poor and poor households by MOLISA definition

2) There is no very poor households

According to the key informants, characteristics of poverty are;

- Households of illegal migrants
- Households with invalids by disease or accident
- Households with numerous children
- Households with insufficient land and capital to invest
- Households without modern cultivation technology

3.2.9 Gender

Among Kinh people (majority), male and female share the housework such as water lifting, cooking, cleaning, washing cloths and taking care of children. Among EM, some EM groups share the housework, but some do not. It is difficult to say that certain ethnic groups do one way or the other because even in the same ethnic group, various customs and traditions apply.

According to the results of household survey, responsibilities for finance, education and health in the family are shared between women and men, and there is no difference among different ethnic groups. Even though these responsibilities are

shared among family members, final decision is prevalently made by men. When a family must make a decision on some important issues, the husband discusses it with his wife, and sometimes other family members or friends, then the husband makes the final decision after the discussion.

3.2.10 Mass Organization

In all target communes/towns, several community organizations are established, such as Farmer's Union, Women's Union, Youth Union, Elder's Union and Red Cross. Most of these organizations were established to spread government propaganda, but now they also have important roles of economical and social activity. All organizations take care of not only legal dwellers, but also illegal immigrant in their activities as the Government does. The main problem in all organizations is the shortage of budget for activities.

3.2.11 Rural Infrastructure

(1) Education

All communes/towns have primary schools. There is one primary school at the center of commune/town to teach from grades 1 to 5 as compulsory education. There are also many primary schools with one or two classrooms in remote areas which can teach from grade 1 to grade 2 or 4. Classes are carried out in two shifts, morning class and afternoon class, because of the shortage of classrooms. Towns usually have lower secondary and/or upper secondary school as well.

The drop out rate is quite low (less than 5%) according to teachers in all interviewed primary schools, while the household survey suggested it is higher. Teachers insisted that some students drop out in spite of their great effort. When a student almost drops out, or after the student dropped out, teachers visit the students and her/him parents to encourage them to stay or return to school.

(2) Health

The health service is located in all communes/towns, called Commune/Town Health Service (CHS and THS). More than two staff, at least physicians are stationed in each health service. Most health services are equipped with beds, treatment tools and medicines. CHS/THS is in charge of simple treatment for sickness and injury, delivery of babies, basic data collection and campaigns for

improvement of health condition. Patients in serious cases are transferred to an upper level health service or hospital, such as District Health Service (DHS) and Provincial Hospital. Village health worker (VHW) system started in 2000. DHS appoints health workers and pays an allowance (about 40,000 VND/month). VHW have to inform the CHS/THS about disease cases and cooperate in campaigns organized by CHS/THS.

(3) Road and bridge

All communes/towns have or will soon have a main asphalt road passing through the center of the commune/town, but roads and bridges inside commune/town are in poor condition. Access to remote villages is difficult to even in the dry season.

(4) Electricity

Electricity distribution in each commune/town is shown in Table 3.8. Electricity is installed in all target communes/towns, but not to all villages and households. Villages in remote area and poor households cannot install electricity, because of economical difficulty. Users must contribute for installation of village power line as well as house connection. It costs between 1 million and 3 million VND depending on the distance from the main line, while a house connection costs 0.6-0.8 million VND per 100 m from the village line.

Electricity tariffs vary between 400 VND/kwh and 800 VND/kwh depending on commune/town. Tariff is categorized as private use, commercial use and official use, and agricultural use sometimes. The tariffs for official use and agricultural use are set about 100 VND/kwh higher than it of private use, and tariff of commercial use is set at almost twice that of private use.

CPC, TPC or DPC (in case of towns) have electricity management units for management, operation and maintenance. They usually have 3 or 4 staff for metering making bills, collection of charges and payment to the electric company. Before they pay the electric company, their salary and O&M cost are deducted.

Table 3.8 Household with Electrification

Dac Lac Province	Households (%)
Krong Nang T.	78%
Ea Drang T.	91%
Krong Buk C.	49%
Ea Drong C.	23%
Ea Wer C.	48%
Kien Duc T.	67%
Krong Kmar T.	99%

Source: RRA results

3.3 Results of Household Survey

3.3.1 Interviewee

To obtain accurate data from each household, an interviewer could speak to any family member. The interviewee means the person who mainly answered the questionnaire. Twenty percent (180) of the main interviewees were female in total. Thirty percent of the interviewees were female in Dac Lac province.

3.3.2 Household Size

The average household size in all provinces was 5.24 persons per household. There is little difference in average household sizes among provinces. Average household sizes in Dac Lac province are 5.18 persons per household.

Proportion of children (under 15 years) and adult by province and ethnic group is shown in Table 3.9 The number of children is not higher for EM than it is for Kinh, but the number of adults in EM is higher than it is for Kinh in whole area.

Table 3.9 Population of Children and Adults

Province		Children	Average per household	Unit: persons	
				Adult	Average per household
Target area	All	1,174	1.96	1,967	3.28
	Kinh	657	1.77	1,186	3.19
	EMs	517	2.27	781	3.43
Dac Lac	All	423	2.01	665	3.17
	Kinh	262	1.83	414	2.90
	EMs	161	2.40	251	3.75

Source: Household survey results

3.3.3 Household Structure

The population of the 20-24 years age group is sharply lower than the age group under 20 years. This may be considered to be due to the wars from 1946 to 1975. Regarding the number of children, it is high for the age group 15-19 years, but has tended to decline in the past five years. Overall the sex ratio is 51 percent female and 49 percent male, and there is no significant difference between provinces.

3.3.4 Ethnic Group

Total proportion of Kinh in households interviewed was 59 percent. Kinh is a major ethnic group in the country. The proportion of Kinh households in Dac Lac is 62 percent. There is a high ratio of E De in Dac Lac province.

3.3.5 Migration

Results of the household interview survey shows that 64 percent of households interviewed were the migrants. Of these, 71 percent had settled in last two decades and 92 percent were Kinh. In Dac Lac province, 64 percent of households settled from out of the province, of which 76 percent of households came after 1980. In Dac Lac province, the proportion of migrants after 1990 is lower than in the 1980's.

3.3.6 Occupation

Agriculture is a major income source in the central highlands. The occupation distribution also reflects this. The majority of workers are involved in agriculture. Beside agriculture, there are some small business, such as retail trading, restaurant, milling factory and workshops are observed in the area, but compared to Dac Lac and Gia Lai province only a small number of people are involved in non-farming jobs in Kon Tum province. The percentage of females working in retail trade or as teachers is higher than males.

3.3.7 Responsibility in family

Table 3.10 shows the sex ratio for responsibility for family issues. Issues selected were family finance, education of children and health of family members. Female's responsibility for education and health is relatively high in Dac Lac province. Besides, there is no difference between female and male in responsibilities for the family. As mentioned earlier, the final decision is generally made by the male rather than female, even though responsibilities are shared between female and male.

Table 3.10 Responsibility on Family Issue by Sex

Unit: persons (%)

	Finance	Education	Health
Dac Lac province			
Female	213(48 %)	193(58 %)	190(60 %)
Male	227(52 %)	139(42 %)	128(40 %)

Source: Household survey results

3.3.8 Education

The percentage of population that is uneducated decreases as the age group becomes younger. Difference between female and male has been improved as well. Education system in Vietnam is shown in Figure 3.1. Compulsory education period is 5 years from grade 1 to grade 5 in primary school.

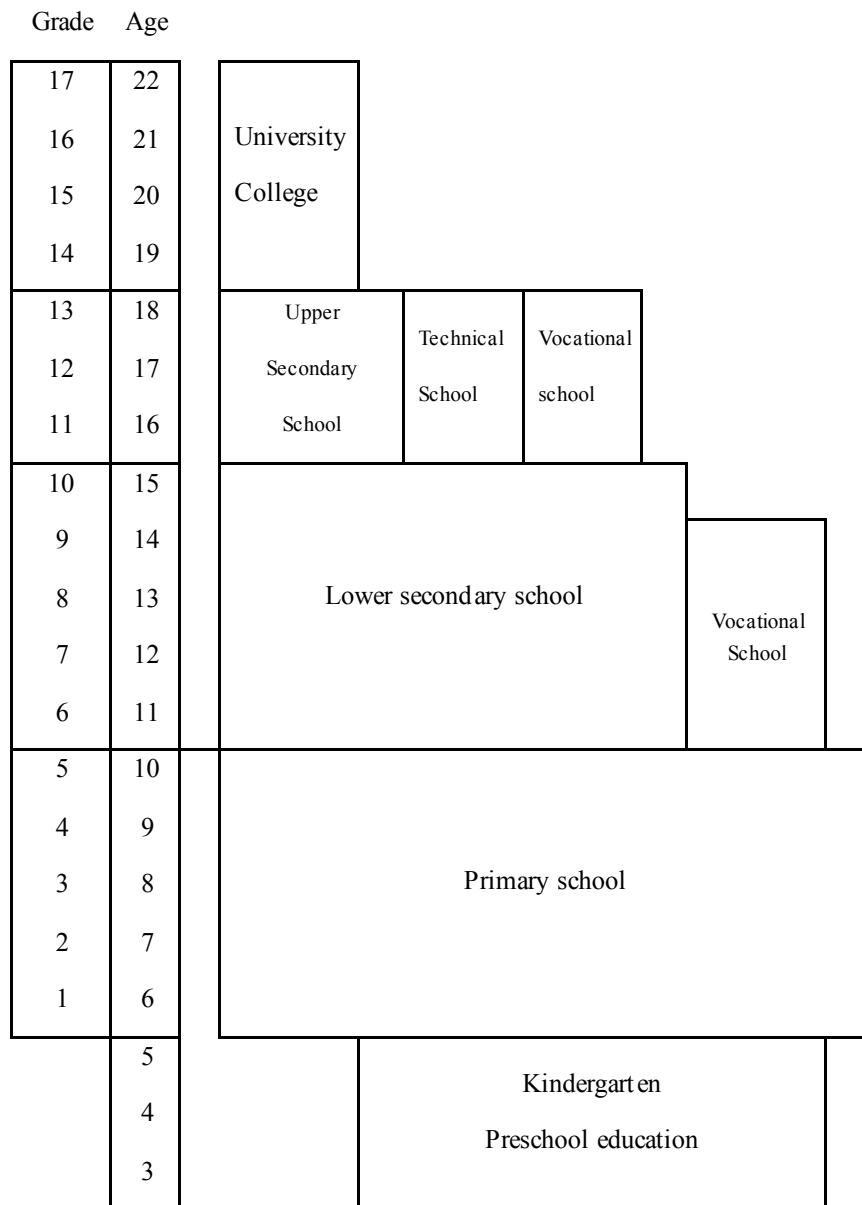


Figure 3.1 Educational System in Vietnam

Highest education level increase as age group becomes younger. However, many people dropped out in both primary and secondary education at present. A difference between female and male can be seen even for primary level education. Females tend to stop studying at an early stage of education.

3.3.9 Water Related Issues

(1) Water source

Dug well, borehole, spring and river are used for water sources. Dug well is common in interviewed households of all communes/towns except three

communes, Ea Wer commune in Dac Lac province. Ea Wer commune has a public water supply facility with deep borehole, and one village located by Srepok river relies on river water.

(2) Ownership of water source

Spring, stream and river are public water sources. Only wells can be owned privately. Table 3.11 shows the proportion of dug wells as water source and ownership status. There is quite a low percentage people that own a dug well in Kon Tum province. This is related to income because construction of the dug well costs money and owners must incur O&M cost every year for the well.

The only private borehole was identified in Ea Wer commune in Dac Lac province.

Table 3.11 Ownership of dug well

	Proportion of dug well user	Of which, own well
Dac Lac	82 %	90 %

Source: Household survey results

(3) Quality

Fifty percent of households in Ea Wer commune in Dac Lac province are not satisfied with water quality in dry season.

A few households answered “dissatisfied” with water quality through the year in Krong Nang town and Krong Kmar town in Dac Lac province.

(4) Quantity

In Dac Lac province, the quantity is little change throughout the year.

(5) Request for present water condition

Table 3.12 shows points of dissatisfaction with the present water supply. Interviewees answered “Distance” do not have their own water source.

Fifty-five percent of interviewed households answered “Equipment” as a dissatisfied point. Of these 54% use a bucket for lifting water. Households that use a bucket generally seek to upgrade to a motor pump. Some people that presently use a motor pump also responded “Equipment”. It is not clear whether they want a higher quality or quantity pump. Households that answered “Quantity” account for 48% of total interviewed households. It is observed in all kinds of water source users.

Table 3.12 Requests for Improvement to the Present Water Supply

	Distance	Equipment	Quantity	Quality
Dac Lac	17%	44%	33%	60%
Total	25%	55%	48%	60%

Source: Household survey results

Sixty percent of those interviewed answered “Quality” to be improved.

(6) Operation and maintenance

At present, people, who own a dug well maintain (i.e. dredging mud in the bottom of a well) the well by themselves. When a dug well needs to be deepened, however, an owner asks a specialist. Most households responded that they want CPC or DPC to manage the water supply system as well as the electricity supply system (Table 3.13). It is considered that this is because most have never experienced using a borehole before. Even though people have used water from the borehole, they have never operated the borehole because CPC or DPC has carried out all O&M and paid for them.

Table 3.13 House Holder Expectations on Organizational responsibility for water supply O&M

		Activity				
		Construction of Facility	O&M Of Facility	Money collection	Management auditing	Tariff setting
Dac Lac	CPC	88 %	89 %	96 %	93 %	92 %
	DPC	10 %	8 %	3 %	3 %	4 %
	PCERWASS	0 %	1 %	0 %	0 %	0 %
	Village	0 %	0 %	0 %	0 %	0 %
	User	1 %	1 %	0 %	3 %	3 %

Source: Household survey results

(7) Ability and Willingness to Pay

Willingness to Pay (WTP) for individual piped system is similar to or exceeds that for public water supply system in all communes/towns. WTP in Dac Lac province are 84%. Average WTP for individual piped system are quite high in all provinces, 85% in Dac Lac province.

According to National Rural Potable Water Supply and Sanitation Strategy to 2020, an average household spends less than 1 percent of its annual income on water supply and sanitation, and the strategy assumes that an average rural household could pay between 3 percent and 5 percent of its total annual income for potable water and sanitation in the future.

Table 3.14 is a rough estimation of WTP (payment) and Ability to Pay (ATP) calculated from present income. At present, people are ready to pay more than 1% of their income for piped water supply in all communes/towns. Table 3.14 also describes ATP calculated by percentage in accordance with NRWSS. If income stays at present levels the, amount stated in Table 3.14 can be spent by users for both water supply and sanitation. The difference between the present WTP and ATP should be reduced through the Information, Education and Communication activity of the project.

Table 3.14 Willingness to Pay and Ability to Pay

Town/ Commune	Average annual income per capita	Unit VND			
		Willingness To Pay for piped system (VND, %)	3% of income	5% of income	
Dac Lac province					
Krong Nang T.	4,075,111	60,500	1.5%	122,253	203,756
Ea Drang T.	3,015,873	53,600	1.8%	90,476	150,794
Krong Buk C.	2,855,897	51,300	1.8%	85,677	142,795
Ea Drong C.	3,026,693	55,700	1.8%	90,801	151,335
Ea Wer C.	1,295,899	32,300	2.5%	38,877	64,795
Kien Duc T.	4,668,492	209,500	4.5%	140,055	233,425
Krong Kmar T.	3,287,566	62,900	1.9%	98,627	164,378

Source: Household survey results

(8) Future water needs

For domestic use including drinking, 80 percent of households respond that they need from 20 to 120 liters per day per person. Households that answered from 40 to 60 liters per day-person are 32 percent of total households. Meanwhile, for gardening and livestock, 54 percent of households need less than 120 liters per day, while 22 percent answered that it is unnecessary.

3.3.10 Living Condition

(1) Income and Expenditure

Table 3.15 Average Expenditure by Expenses Items

	Food	Cloths	House	Water	Electricity	Fuel	Education	Medical service	Agriculture	Other	Total
Dac Lac	5,249,148	574,082	132,864	55,560	559,692	298,740	1,180,000	477,273	1,845,856	154,796	10,528,011

Source: Household survey results

Table 3.16 shows expenditure by expenses items in interviewed households. Average expenditure of interviewed households is 10,373,000 VND/year in Dac Lac. Expenses for water is only 0.5% in Dac Lac. Expenses for electricity in Dac Lac province is the highest of the three provinces because of the high proportion of households who have electric products such as TV, video and electric fans.

(2) Electricity

Eighty-eight percent of total interviewed households use electricity (including batteries). Most users access the power line, while a few households in Dac Lac province use batteries. More details about access to the electricity in whole area are described in the result of RRA.

Table 3.16 Power Source for Domestic Use

	Power line	Battery	Generator	None
Dac Lac	87%	3%	0%	10%
Total	86%	2%	0%	12%

Source: Household survey results

Wood and charcoal are still the dominant source of heat for cooking, even in electrified area. Communes/towns in Dac Lac province relatively use gas for cooking compared to the other two provinces. About 80 percent of household that use gas for cooking are not farm households.

(3) Type of Housing

In the household survey, definitions of house type are shown in Table 3.17 and were obtained from the 1999 Population and Housing Census.

Table 3.17 Definitions of House Type

Classification	Definition
- Permanent type	Brick wall, ceramic roof and cement floor
- Semi-permanent type	Wood wall, ceramic roof and cement floor or ground
- Temporary type	Any type other than above

Permanent and semi-permanent houses are common in the high-income group, while temporary types are common for the low-income group. Because people must buy housing materials in case of permanent and semi-permanent type houses, these results are directly linked to income level. It is not clear whether the difference between rates of permanent type and semi-permanent type house is related to income.

(4) Commodity Ownership

Private transportation methods are important in terms of accessing information and interacting with people in other areas. More than half of the households interviewed have a motorcycle in Dac Lac province. Households that do not have either a bicycle or motorcycle account for 26% in Dac Lac province.

Having electric products is related not only to income level, but also to the situation of power supply in the residential area concerned.

Watching TV program or video is a common source of enjoyment in the lives of householders. Televisions account for the highest rate of ownership among electric products. TVs also have an important role as an information source in terms of activities of campaign and promotion. The number of households having a TV set in Dac Lac province is two times higher than Kon Tum province.

Telephone is not yet prevalent in the interviewed households. This is also condition of infrastructure is related to expansion of user.

3.3.11 Agriculture

Agriculture is the main income source in the central highlands. Following Table 3.18 shows cultivated area and number of farmers in the interviewed households. As can be seen, households have about 1.1 - 1.4 ha in Dac Lac province. Main cash crops are coffee, pepper and cashew.

Table 3.18 Cultivated Area in Interviewed Households

Total farmland (Ha)	Farm households (Households)	Average farmland per household (Ha/household)	Number of farmers (Persons)	Average farmland per farmer (Ha/ farmer)
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Source: Household survey result

Chapter 4 Rural Water Supply

4.1 National Rural Water Supply and Sanitation Strategy

The Vietnamese rural water supply and sanitation policy and strategy is defined by the National Rural Water Supply and Sanitation Strategy (NRWSS). The basic underlying principle of NRWSS, “sustainability” means the following:

- to ensure adequate and timely financial resources, not only for construction of the facilities but also for management, operation and replacement of the facilities at the end of their service life (financial sustainability),
- to have clear ownership so that owners are interested in protection of facilities and in continuous utilization (utilization sustainability), and
- to have a management system (even a very simple one), appropriate technology, staff capable of operation and maintenance of facilities, the network of repair services, and easily found spare parts (operational sustainability).

In order to achieve sustainable development, five implementation guidelines need to be followed:

- Users will select the technology to be applied, the site of full piped water supply scheme, and level of service and operational arrangements.
- Users shall pay all construction costs and management and operation costs. The government will only support the poor, the social policy target households and certain types of technologies that need promotion.
- Information, education and communication (IEC) programs providing guidance to people for the understanding of technologies, techniques, operation and maintenance, financial mechanism, credit etc. to help them make correct decisions will start before the planning or construction of RWSS facilities.
- Effective operation and management arrangements of RWSS facilities that are intended to serve more than one household (for example full piped water supply schemes) shall be clearly put in place prior to construction of facilities.
- Advanced and appropriate technologies (technologies that are easy to operate; for which spare parts, equipment or materials are readily available; have

been tested and shown to be sustainable; are not too expensive and are acceptable to users; are environmentally acceptable) shall be promoted. Technologies, which are harmful to health and environment shall be rejected.

4.2 On-going Projects and Existing Water Supply System

4.2.1 Activities of the Donors in the Whole Country

UNICEF has been the principal donor in RWSS since 1982. They have supported and strengthened the institution and organizations through co-operation with CERWASS.

The World Bank (WB), Asian Development Bank (ADB), UNDP, UK Department for International Development (DFID) and Australia have also been indicated as providing funding support for NRWSS Programme in accordance with the NRWSS. Danish International Development Assistance (DANIDA) is providing the most support for this field at present. The following Table 4.1 shows the activity of donors involved in the water sector.

Many countries such as Australia, Denmark, Finland, France, Japan and the Netherlands have supported urban water supply and sanitation as the principal donors.

Table 4.1 Donor Involvement in Water Sector

Support Area and Fields	Main Donors							
	DANIDA	ADB	WB	AusAid	Netherlands	UNDP	CIDA	Japan
NWRC	○	○		○	○			
Secretariat		○						
Capacity Building for LWR strategy	○		○		○			
Capacity Building for technical level	○							
Information Management				○				
Dam Safety						○		
Central Region Investment		○	○		○			○
Dong Nai river modeling and institutions		○			○			
Mekong Delta area			○	○			○	
River Basin Manage (Srepok and Ca river)	○							
Red river		○						
Human Resource Dvlp	○			○	○			○

Source: SPSD Water Sector – Vietnam Chapter 3.4 (partly modified by new information)

CIDA studied for the water supply scheme in Mekong delta area in 1998

4.2.2 Activities of the Donors in the Study area

(1) DANIDA

DANIDA has been supporting the water supply and sewerage expansion project of Buon Ma Thout city, Dac Lac province since 1997. The project will continue until March 2002. The project aims to establish guidelines for water supply as well as the rural water supply started recently by DANIDA in the 3 districts of Dac Lac province, and to implement of water strategy in the 4 provinces.

(2) United Nation Children Fund (UNICEF)

UNICEF has been contributing to help poor people by introducing shallow hand pump wells and sanitary latrines since 1990. However, most hand pump wells do not function due to the shortage of spare parts and lack of administration. Taking account of this situation of hand pump wells, especially for public use, UNICEF has adjusted its program to support individual households by dug well construction and sanitation.

4.3 Survey for Existing water supply systems

There are a number of small and middle scale systems. Six existing water supply systems were audited: one in Kon Tum, two in Gia Lai, and three in Dac Lac province.

The main purpose of these audits was to collect experience and lessons learned, in order to avoid replication of past mistakes and to make use of procedures and practices that have proved successful.

The audit was based on interviews with the management of the responsible O&M organization, review of some key documentation if made available, and interviews with two customers of each piped scheme.

4.3.1 Background Data of the Piped Schemes

The schemes were selected on the basis of their size (larger schemes preferred), service based on house connections, a variety of technologies (emphasizing pumping schemes), and age (preferring longer O&M experience).

Table 4.2 Audited Water Supply Systems

Scheme	Population served	Number of connections	Type of technology	Year of construction
Ea Phe	2000	300	Dug well, pumping, no treatment	1996
Cu M'Gar Town	3000	189	Dug well, pumping, no treatment	1998
Buon Trap	2000	250	Dug well, pumping, no treatment	1996
Chu Ty Town	1200	240	Borehole, pumping, no treatment	1992
Chu Prong Town	2500	> 300	Borehole, pumping, no treatment	1998
Dak To Town	n.a.	n.a.	Stream, gravity, iron removal, chlorination	1998

n.a.= not available

The number of connections is quite low compared with the population served. This is partly explained by sub-connections, i.e., additional customers connected to connections that have a contract with the service provider.

4.3.2 Main Findings and Lessons Learned

It seems very common that there is no storage capacity in the system except for that of the customers of the schemes. Consequently there is virtually no pressure in the network for most of the time, because pumping is limited to a few hours a day. This results in a high probability of infiltration into the pipes and subsequent risk of contamination. The sanitary condition of many of the household tanks adds to the contamination problem. Direct pumping into the distribution system might be troublesome, due to evident water hammer effect, which may be the most common reason for leakage in small schemes.

One of the audited schemes was a gravity system supplying water from a spring. This scheme seems to have problems quite typical of spring-fed gravity schemes in Vietnam. The gravity schemes in Vietnam tend to extract water from a stream flowing from the spring rather than from the spring itself. The source, in such cases, is surface water rather than groundwater. The audited system had been designed to consist of iron removal and dis-infection at the source not so easily accessible. This undermines the simplicity of a gravity system. Spring protection and extraction of groundwater through properly designed spring box structures does not appear to be technology known or appreciated by designers.

There is a lack of quality control and quality management in design, construction supervision, and selection and purchase of equipment and materials. Complaints about “old” pipes that frequently burst are very common, even though the pipes are severally less than ten years old and in most cases, less than five years old.

The audited utilities reported that they meter all connections. With the exception of one operator, the accuracy of metering has not been addressed, however. The meters are usually owned and often purchased by customers. There is a risk that a high percentage of meters are of low quality. Only one operator was reported to calibrate meters (by a very labor-intensive method). The operators did not recognize the risk of meter manipulation by the customers.

Another issue vaguely addressed by the utilities and their owners is the control of illegal connections. The representatives of PC tend to deny even the possibility of illegal connections.

For many reasons, rural water supply – as other sectors in Vietnam – is investment oriented. Decisions on investment, financing, selection of technologies etc. are determined in a top-down manner. The users and also operators of utilities are at the end of a chain and have little to say before and during the implementation. This approach does not provide a good basis for learning from experience. When the responsibilities for investment and its maintenance have been separated, there is a risk of inadequate inputs for maintenance. Often, O&M is organized around the time of completion of the construction and handing over of the schemes. The operators have not been able to participate in the construction, which would be very useful for their work.

In one case the O&M had been contracted out to the private sector. There are many risks. First of all, this kind of arrangement calls for transparency, which could not be assessed in the audit. Secondly, there should be a systematic regulation mechanism and relatively high regulating competence to ensure that the services are provided as required and that the condition and value of the fixed assets are properly maintained. The audited example seems to have critical system weaknesses. The most serious risk is associated with the possibility of short-sighted increasing of profit (during the five-year O&M contract) by minimizing expenditure on maintenance and repairs, when the PC would contribute to major repairs (costing at least VND 3,000,000). The fact that the private operator has to forward a fixed share of billing to the PC sets a very strong incentive for efficient collection.

The availability of spare parts has not been much of a problem (the schemes being so new). The most frequently needed parts are pipes and fittings that are quite readily available at least in bigger centers in the area.

The service level provided by most audited schemes leaves room for improvement. The water quality is mainly affected by high iron content. Even where iron removal is in place, it is not fully operational, obviously due to lack of expertise and the remote location of the plant from the office of the operators. The limited hours of operation indicates a low service. The reliability of service is affected by the lack of stand-by pumps. It was reported that in some cases pump repair or overhaul had resulted in several weeks' interruption in water supply.

Capacity problems seem to be common. In some cases, there is an implication of seasonal variation in water availability, often caused by an imbalance between the demand and the supply capacity. In one case, the utility asks the customers to conserve water in the dry season, but there are no demand management methods.

Customers seem to be quite tolerant. Even when they complain about service level problems they seem to accept the explanations and excuses of the operators. On the other hand, there is indication that some customers and potential customers have lost their confidence in the service. In extreme cases this may become a risk for utilities in term of non-payment and investment in individual water supply.

In most cases, accounting is undertaken by the accountant of the respective PC. The financial data of the operators is not very comprehensive and sometimes seemingly inaccurate. The billing procedures seem to be quite good. Utilities have customer registers and ledgers for monthly meter readings. The bills are usually prepared by the accountants while the operating unit staff is responsible for collection.

Officially the collection rates were reported to be very high and the collection periods very short: ranging from the incredible “ a few days” up to two months, even without a need to enforce payment with disconnection. In most places disconnection is permitted but rarely implemented.

Operators reported that they balance their expenditure on the basis of revenue. The foremost cost item (except in a gravity scheme) is electricity. It is crucial for the utilities to be able to pay for power. Even salaries in some cases are said to be paid from the balance left after settling the power bill. Minor repairs are typically financed from revenues but the utilities are not able, with their present tariffs and collection rates, to accumulate reserves for major repairs, overhauls, rehabilitation and extension or upgrading of the systems.

Chapter 5 Institutional Framework

5.1 Political and administrative system

The political and administrative system of Vietnam resembles a kind of a matrix organization. The integral “columns” of this matrix comprise the Communist Party, the Government (GoV) and mass organizations, while the “lines” of the matrix consist of the Central (State), Provincial, District and Commune levels.

The Communist Party has a central role in defining and determining the overall policy direction of the economic and social development strategy of the country. The highest policy-making body is the Party Congress, which meets every five years. The most recent Party Congress was held in April 2001. Between congresses, the Central Committee of the Party formulates policies.

The legislative body is the National Assembly (NA) and the executive body is the central Government Administration. The latter implements the Constitution, directs central ministries and PPC, drafts laws and decrees, and manages the duties of the State.

The mass organizations form a separate branch of the executive as they report directly to the NA through its Standing Committee. They have separate budgets and staff, and they execute their own programs. They have been under the Fatherland Front. The Fatherland Front is a constitutional body established to represent the mass organizations’ part of the political system.

The institutional structure in Vietnam is characterized by democratic centralism and double subordination. The democratic centralism places a strong role on the Central Government to direct the pattern of development, including decisions on major investments, while relying on local participation to ensure that development responds to local needs. Double subordination means that local administrative bodies are accountable to the respective PC as well as to the higher level line organizational bodies.

As a consequence of the double subordination, the functions of the central-level ministries are usually undertaken by respective provincial departments (and district divisions). Especially at the district level, the number of divisions may be lower than the number of ministries, due to divisions undertaking a combination of functions. The lower level bodies are often said to be accountable to their respective PC under the guidance of the respective higher level line organization.

5.2 Central level institutions

5.2.1 Ministry of Agriculture and Rural Development

The Ministry of Agriculture and Rural Development (MARD) is, by far, the most important institution in the development of rural water supply. It is responsible for rural development, including the development of rural infrastructure. Secondly, MARD has the responsibility for overall water resources management, including surface and groundwater resources. Specifically, MARD has been mandated to assume the prime responsibility for the implementation of NRWSS. The organization chart of MARD is presented in Figure 5.1.

In rural water supply and sanitation, the central level responsibilities, as defined in NRWSS, include:

- ❑ setting policies, mechanism and plans for RWSS development and supervising and managing the implementation of these policies and mechanisms,
- ❑ overall co-ordination of implementation of National Strategy, in particular close co-ordination between different ministries, sectors, social organizations and donors,
- ❑ establishing credit funds, assistance funds to ensure adequate government budgets for the implementation of the strategy,
- ❑ carrying out IEC and HRD activities to meet the demand of RWSS, and
- ❑ monitoring and evaluation of strategy implementation, updating strategy for every new five-year plan to make it appropriate to reality and new circumstances.

According to NRWSS, MARD is the lead ministry to co-ordinate with other ministries in RWSS implementation and is responsible for: coordinating implementation of RWSS programs and projects,

- ❑ overall co-ordination of IEC,
- ❑ HRD and training,
- ❑ pilot implementation and technological guidance,
- ❑ coordinating funds for grants and loans,

- ❑ coordinating the use of donors' funds for implementation of national programs according to priorities,
- ❑ supervising the implementation and updating of NRWSS, and
- ❑ setting plans and steering implementation of plans for natural disaster mitigation.

5.2.2 Center for Rural Water Supply and Environmental Sanitation

The Center for Rural Water Supply and Environmental Sanitation (CERWASS) was established in 1982 to implement activities in connection with the International Drinking Water Supply and Sanitation Decade. Initially it was established within the Ministry of Labour, Invalids and Social Affairs (MOLISA) and its main function was the execution of the UNICEF assisted Water and Sanitation Program (WATSAN).

- ❑ As a consequence of the water sector reform in 1995, CERWASS was transferred from MOLISA to MARD and was given the responsibility as the main agent for the development of rural water supply. CERWASS has continued to be the counterpart agency for UNICEF in water supply (not sanitation) but it has also implemented a number of other projects with national and international financing.

NRWSS does not explicitly ascribe any responsibilities and functions to CERWASS. In fact, the NRWSS does not mention CERWASS. It is understood, however, that CERWASS has established itself within MARD and actually carries out most of the duties related to rural water supply that fall under the responsibility of the ministry.

CERWASS has five sections as shown in the organization chart in Figure 5.2. Planning and Investment Section is in charge of project planning and the preparation of cost estimates for selected projects submitted by respective PCERWASS throughout the country. Projects must be approved by MARD. The planning and Investment Section is in charge of the UNICEF program and coordination with other international organizations.

Technology and Capital Investment Section's main responsibility is the approval of the water supply and hydrogeology technology schemes that are submitted by PCERWASS. It cooperates with the Department for Water Resources Management

and Irrigation Schemes of MARD and engages to a limited degree in supervision of construction.

The Environment, Communication and Sanitation Section provides the main link with the provinces and includes, according to its mandate, IEC and its activities.

The building, Material and Equipment Administration Section deals, apart from regular financial and personnel administration, with the administration of the workshop compound, office buildings, equipment and materials inventories for the entire country. It also manages the donations in kind from UNICEF.

The Center for Material Delivery and Technology Transfer maintains a small unit in Ha Dong in the vicinity of Hanoi for the material and water quality testing, testing of new technologies and conducts training courses in new technology.

The number of staff in CERWASS is about 40. Much of the expertise in CERWASS and, particularly in PCERWASS, is technically oriented but more recently, due to its involvement in the approval procedure of NRWSS, CERWASS has also good understanding of the concepts and requirements of the demand responsive approach and factors that are needed to ensure sustainability.

5.2.3 Ministry of Planning and Investment

The Ministry of Planning and Investment (MPI) has a very wide mandate, which covers the establishment of strategies and master plans for the socio-economic development of the country, the orientation and structure of domestic and foreign investment. MPI is very important in balancing the finance, budget and coordinating foreign aid and investment.

5.2.4 Ministry of Finance

The mandate of the Ministry of Finance (MOF) covers the coordination of the ministries in the drafting of the annual State budget, the management of the State budget, the State assets, and the management of loan and debt payment and the control of the ministries, State-owned enterprises and other institutions under the State management.

According to NRWSS, MPI and MOF will have the responsibility of administering the allocation of funds, general co-ordination of funding and coordination of donor inputs, including the annual government budget for RWSS and for donor assisted projects.

5.2.5 Ministry of Construction

The importance of the Ministry of Construction (MOC) to rural water supply focuses on four of its main duties and functions:

- ❑ overall responsibility for construction and supervision of installations in urban areas and densely populated rural areas,
- ❑ responsibility for urban water supply and sanitation and ownership of a network of related design and construction companies,
- ❑ functions with respect to the issuance of permit for construction and manufacture of building materials, and
- ❑ involvement in the preparation of annual, mid term and long term plans for urban development.

The line of responsibility between MOC and MARD has been marked at Class V towns, which are included in MOC's mandate. As a rule of thumb, Class V towns usually have a population of at least 15,000.

According to NRWSS, MOC will retain its state management function on capital construction, supervision and engineering adjustment of WSS facilities.

5.2.6 Ministry of Health

The Ministry of Health (MOH) has been assigned to undertake regulatory functions, such as provisions for hygienic standards to be maintained in institutions in charge of domestic water supply, the disposal of industrial and domestic waste and hygiene in public places. MOH is also responsible for prevention of communicable diseases through the maintenance of a primary health care system, including water supply and sanitation. The key institutions at the central level are the Department for Hygiene and Epidemiology and the Institute for Occupational and Environmental Health.

MOH is the executing body of the UNICEF assisted household sanitation improvement activities of the WATSAN program.

According to NRWSS, MOH will have the key role in: IEC activities and raising awareness about hygiene and health, setting standards for water quality and hygienic latrine, and setting regulations on reuse of human excreta as fertilizer. MOH will also monitor water quality and sanitation facilities and monitor the implementation of quality standards for potable water supply and sanitation. MOH

will have the responsibility to continue building up and to make full use of its extensive network at grass root level to implement rural sanitary assurance.

5.2.7 Ministry of Science, Technology and Environment

The functions of the Ministry of Science, Technology and Environment (MOSTE) that are related to rural water supply include:

- ❑ environmental assessment of major before they are submitted to the Cabinet,
- ❑ professional guidance for the management of environmental protection, including environmental aspects of drinking water supply,
- ❑ coordination of the development of Vietnamese standards, drafting of national measurement standard system and organization of a nation-wide network for measurement verification, and
- ❑ guidance in respect of quality control and, organization of the registration of the quality of goods to assure compliance with Vietnamese standards and approval of laboratories.

According to NRWSS, MOSTE will be responsible for research and development of advanced technologies solving difficult problems in RWSS, transfer of RWSS technology and environmental protection against pollution of water resources.

5.2.8 Ministry of Education and Training

The Ministry of Education and Training (MOET) is involved in rural water supply in two separate ways. Its training institutions are responsible for the education and training of technical staff for the sector, and its Department of Physical and Health Education is responsible for health education in schools in line with the general mandate of the ministry.

According to NRWSS, MOET will have the responsibility to carry out research on integration of education of health, potable water supply and environmental sanitation into school education.

5.2.9 National Steering Committee for Rural Water Supply and Environmental Sanitation

The National Steering Committee for Rural Water Supply and Environmental Sanitation (NSCRWSS), established in 1994, is chaired by the Minister of

Construction and reports directly to the Prime Minister. The key ministries, such as MOC, MPI, MOF, MOSTE, MARD, MOH etc. are represented at vice ministerial level. The only mass organization represented in NSCRWSS is Vietnam Youth Union. The role of NSCRWSS is somewhat unclear and it has not functioned very actively.

5.2.10 Mass Organizations

The Vietnamese mass organizations are an integral part of the government system. For rural water supply Vietnamese Women's Union (VWU) and Vietnam Youth Union (VNYU) are the most important.

VWU is a nation-wide organization, which represents Vietnamese women and has a very densely knit organizational network that extends to all levels of the Vietnamese society. The IEC and awareness campaigns with their use of new and innovative approaches, which VWU has developed in cooperation with UNICEF, has been of particular importance. Also the experience that VWU has developed with the management of rural savings and credit groups is now extensive and has potential strength for the development of rural water supply. The main weakness of VWU is probably its dependence on UNICEF's financial resources, technical guidance and IEC material. VNYU is a political mass organization with the purpose of organizing young people in social and revolutionary activities. VNYU is partly financed from State budget allocations. Particularly VWU will participate according to their functions in implementation of NRWSS, especially in IEC activities, in mobilization of community's active involvement in construction, operation and management of RWSS facilities, and in credit operation. Mass organizations will help users to form user groups or cooperatives.

5.2.11 Provincial Institutions

(1) Provincial People's Committee

Provincial People's Committees (PPC) are in a position to promulgate decisions and directives under the general central level framework. Provincial departments are administratively responsible to the PPC and, simultaneously, in technical matters to their parent ministries at the national level.

PPC is the agency with highest mandate and responsibility to implement NRWSS in each province. PPC will establish appropriate organizations and structures at local level, prepare program and plan for rural water supply, steer

and coordinate different departments within the province and direct districts to implement relevant programs and ensure adequate provincial funding for this purpose. Another important responsibility of the provincial level is to coordinate with different ministries and sectors at national level and donors to attract funds and technical assistance for strong development of water supply and sanitation.

(2) Department of Agriculture and Rural Development

The Department of Agriculture and Rural Development (DARD) exercises at the provincial level functions similar to those of MARD at the State level. From rural water supply's point of view the most important functions of DARD, are related to water resources management, development of irrigation (a number of community managed irrigation schemes have paved the way for a concept of community managed rural water supply schemes), policy setting on water tariffs and subsidies and, above all, planning, prioritization, management and implementation of rural water supply projects. DARD's involvement in sanitation is very limited.

The implementation of NRWSS will be managed by individual provinces, who will have considerable flexibility to adjust the implementation to suit the specific local conditions. It is anticipated that in most provinces new Provincial Steering Committees will be responsible for the overall co-ordination of activities, whereas DARD will be the lead organization with the main responsibility for implementation and day-to-day coordination.

(3) Provincial Center for Rural Water Supply and Environmental Sanitation

The Provincial Center for Rural Water Supply and Sanitation (PCERWASS) is the lead sector agency at the provincial level. It reports directly to the Director of DARD and to CERWASS. PCERWASS is mandated to undertake the following functions:

- ❑ coordination of all operations in the rural water supply sector,
- ❑ preparation of medium term and annual plans both at the provincial and district levels and separate projects,
- ❑ implementation of plans approved by the central and provincial authorities,

- ❑ supervision of the quality of construction of rural water supply installations,
- ❑ organization, directing and monitoring of both domestic and foreign funds, including UNICEF funds, and

The operational activities of PCERWASS are mainly concentrated on the implementation of the UNICEF WATSAN program. This involves construction of dug wells, drilling of tube wells, installation of pumps and pipes for smaller rural schemes and building of water tanks and arranging training courses in O&M.

Staffing of PCERWASS offices varies in the range of 5 to 24 people, who are organized in technical units under the Director. A typical organization chart of PCERWASS is presented in Figure 5.3.

Due to the extremely low recurrent budget allocations, PCERWASS is financially very vulnerable and dependent on income generating activities. This is a generic problem in Vietnam, not specific to rural water supply or any particular sector. With the great fluctuations in available funding, which primarily relies on UNICEF, planning even over the mid-term becomes a serious problem. In order to avoid redundancy among its staff, PCERWASS frequently undertakes contract work also for the private sector and individuals.

It is evident that the poor financial status of PCERWASS has serious impacts on its ability to be the engine of the development of rural water supply. In addition to the obvious capacity shortcomings the dependence of PCERWASS on earnings is likely to result in biased direction of its operations. For example, PCERWASS needs drilling jobs in order to survive; low-cost technologies, such as spring-fed gravity water supply, does not involve meaningful survival opportunities.

(4) Department of Planning and Investment

The Department of Planning (DPI) coordinates the inputs of the line ministries' sub-departments in accordance with the Government's long, medium and short (annual) term plans. DPI advises PPC on budgets for each sector, and exerts an indirect control over expenditures.

(5) Department of Finance

The Department of Finance (DOF) is closely connected to DPI. Its main tasks include support and guidance to PPC in the preparation of the annual budgets

and assistance in drafting medium and long-term financial plans. It also participates in drafting of annual socio-economic plans and plans for capital investments.

DOF participates in the evaluation of all projects where foreign funds are involved.

(6) Department of Construction

The Department of Construction (DOC) undertakes the function of MOC at the provincial level. DOC affects rural water supply mainly in two ways: land use planning in district and communes is supervised by DOC, and DOC is usually heavily involved in the provision of consulting services and contracting through a number of companies that it owns.

In some cases, for instance in Dac Lac, a provincial water company that mainly operates in the provincial capital, is also in charge of water supply services in smaller rural towns. For example Dac Lac, the provincial water company has developed the water supply system serving about 18,000 people in a town of Phuoc An. The role of the company is very strong and the district has no say on the tariffs.

(7) Department of Health

The Department of Health (DOH) takes care of preventive and curative health services through the operation of the primary health care system at the local level. Its role in the water and sanitation sector is to provide health education, to promote proper water supply and sanitation practices, and to implement sanitation programs in rural areas.

DOH is the umbrella organization covering all health activities at the provincial and local levels. Its main functions are related to:

- ❑ provision of standards and guidance to the public on all issues related to safe water and environmental sanitation,
- ❑ giving standards and guidance to professional organizations engaged in building and operating water supply systems, and
- ❑ monitoring and evaluation of health issues related to public use of water supply facilities and sanitation.

(8) Provincial Disease Prevention and Sanitation Center

The Provincial Disease Prevention and Sanitation Center (PDPSC) is an arm of DOH that focuses on regulatory function related to the monitoring and enforcement of standards. It also delivers public services to the private sector and carries out IEC programs. PDPSC has relatively large staff and basic laboratory facilities.

(9) Department of Science and Technology

The main function of Department of Science and Technology (DOSTE) in rural water supply and sanitation are related to protection of water resources and, in particular, to control of industrial pollution and misuse of pesticides in agricultural production.

(10) Provincial Steering Committee for Water Supply and Sanitation

The Provincial Steering Committee for Water Supply and Sanitation (PSCWS) is an institution created in 1997. These committees are headed by PPC chairman with a representative of DOSTE as a standing member and other members from relevant departments. In most cases this committee is a formality rather than a fully operational body.

(11) Mass organizations

The mass organizations, VWU and VNYU being the most relevant, have their provincial level unit in the same manner as the government administration.

5.2.12 District Level Institutions

(1) District People's Committee

The District People's Committee (DPC) exercises powers similar to those of PPC within its administrative area. There is, however, a substantial restriction at the district level: unlike provinces and communes, districts are not budgetary entities.

The line organizations are much weaker and also fewer at the district level. DPC's involvement in day-to-day activities is, therefore, more active than that of typical PPCs. The district level line or sector organizations are called (translated into English as) units, offices or divisions. In this report they are consistently called units.

According to NRWSS, districts will be the main level of implementation with the following functions:

- ❑ detailed planning and organizing implementation of WSS within the districts,
- ❑ giving advice to users about different technological options, mechanisms and procedures for financial support or other kinds of support through district WSS advisory service centers,
- ❑ managing systems of grants and loans through banks at the district, and
- ❑ giving guidance to user groups to manage construction and operation of piped schemes.

Based on the findings during interviews and discussions in the target communes and respective districts and provinces, it is obvious that there is a huge gap between the present situation in districts and the approach proposed in NRWSS. District level involvement in rural water supply is virtually non-existent.

(2) Unit of Agriculture and Rural Development

The Unit of Agriculture and Rural Development (UARD) has a comprehensive mandate covering the entire range of activities in the agricultural sector, such as planning, programming, managing and implementing activities. In the water sector its functions cover water resources management and rural water supply. In practice, however, UARD has very little to do with rural water supply.

(3) District Health Center

The District Health Center (DHC) is in charge of the monitoring of water quality and sanitation situation in the district.

5.2.13 Commune/Town Level Institutions

(1) Classification of towns

The Vietnamese government defines small towns (thi tran) as urban administrative units and communes (xa) as rural administrative units. Small towns and communes operate in the jurisdiction of a district (huyen) with its own elected council and committee.

According to Decision No. 132 HDBT May 5, 1990, the criteria for a small town include:

- ❑ population from 4,000 to 30,000 persons (2,000 in mountainous areas),
- ❑ density averaging 60 persons/hectare (30 in mountainous areas),

- ❑ over 60% of a town's population involved in non-agricultural activities, and
- ❑ significant public facilities and services.

Besides these small towns are areas of increasingly dense settlement called townlets (thi tu). Townlets are unincorporated settlements that may cross several commune boundaries. They often have a population of more than 2,000 inhabitants and may be bigger than the district towns. Townlets have no central administrative unit and may be administered by one or more CPCs.

(2) Commune/Town People's Committee

An executive Commune People's Committee (CPC) and Town People's Committee (TPC) as well as an elected People's Council are responsible for commune and town affairs. In most cases, the TPC and the District People's Committee (DPC) are located in the same community. Some districts have a second small town with only a TPC.

Most of the functions managed by a number of line organizations (departments and units) at the provincial and district levels are concentrated under the umbrella of the CPC or TPC.

In rural water supply, the role of the CPC and TPC has traditionally been quite weak, because in only few places water supply has been organized and piped water supply provided. As long as point sources have been developed, they have mainly been private initiatives of the users. Where piped water supply has been developed, CPC and TPC have assumed a key role in the management of the system. TPC/CPC is usually the owner of the system and organizes the O&M through a special unit established for that purpose. According to NRWSS, communes are the lowest grass root administrative level which is closest to people. This level will work in close co-ordination with individual users, user groups, mass organizations, in particular the Women's Union and banks to carry out most of government support function for RWSS. The commune level will act as coordinator and advisor to users, and organizer of implementation of commune's RWSS plan.

Communes consist of several villages, further divided into hamlets. The Head of the Village is a link between CPC/TPC and the local community, and is the lowest representative of the State management system.

(3) Commune Health Center

The main functions of the Commune Health Center are:

- ❑ conducting of awareness campaigns together with CPC/TPC members and village/hamlet heads,
- ❑ promotion of the use of clean latrines and safe water,
- ❑ collection of water samples and sending them to DHC for testing, and
- ❑ monthly reporting.

(4) Mass organizations

VWU is considered to be the most active mass organization at the community level; Apart from the WATSAN program, the Women's Union may promote the social and economic position of women by, e.g., credit schemes and mother and child care programs.

VNYU is active in some communities. For example, the local Youth Union had participated in the construction of a piped water scheme by providing unskilled labor against compensation. VNYU members are often involved also in information activities.

5.3 Private Sector

The private sector's role in rural water supply is divided into two very different lines. Non-piped water supply is virtually private as a whole, from initiative and financing to construction and operation. Piped water supply is quite opposite. The development of water supply is part of the government's investment program, involving all bureaucratic steps and providing business opportunities mainly to the business arms of authorities at various levels, especially at the provincial level.

Consulting assignments and construction contracts are predominantly signed between government bodies and state-owned companies. Small private companies and individuals provide important services such as stocking and distribution of sanitation hardware, as well as providing pipes and pumps for water supply. Craftsmen and small contractors are engaged in borehole drilling, digging wells, and installation of simple water and sanitation facilities. Small consultancy companies providing design services for urban developments including water supply are emerging. The development of a larger scale more formalised private

sector is still limited by the overall political environment, which favors State-owned companies. Small private organizations are emerging that provide training and educational services of relevance to the sector. These include computer training companies, language training companies and companies that provide training for their workforce within construction, engineering design and related fields.

NRWSS suggests a radical change in the financing of rural water supply schemes. The proposed approach would largely rely on the use of the existing financing institutions, particularly Vietnam Bank for Agriculture and Rural Development (BARD) and its extensive network and its arm for the poor, namely the Bank for the Poor.

BARD is not a private company, but its proposed role as the channel for the sector financing is largely comparable to the role of the private banking sector.

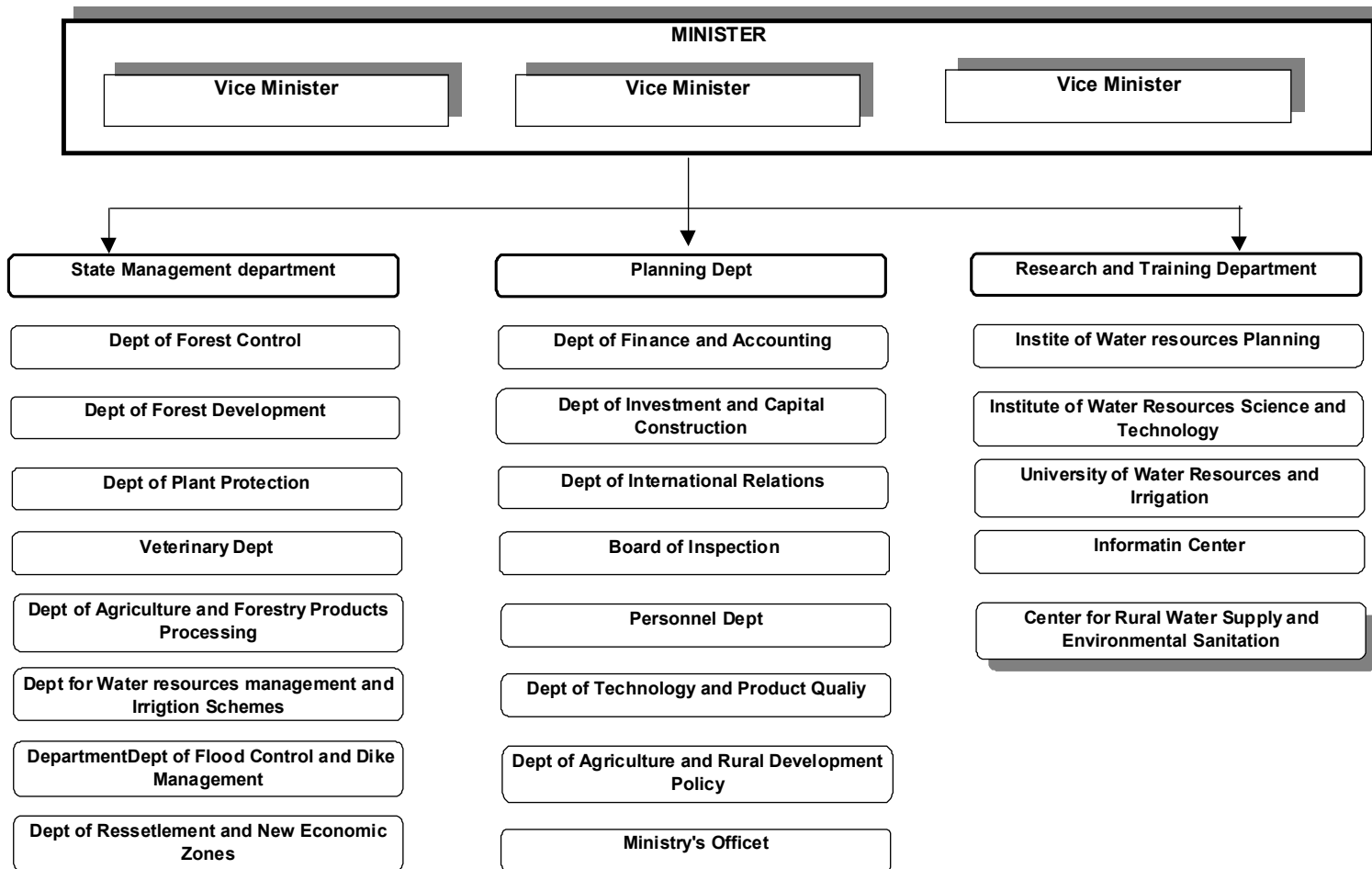


Figure 5.1 Organization Chart of MARD

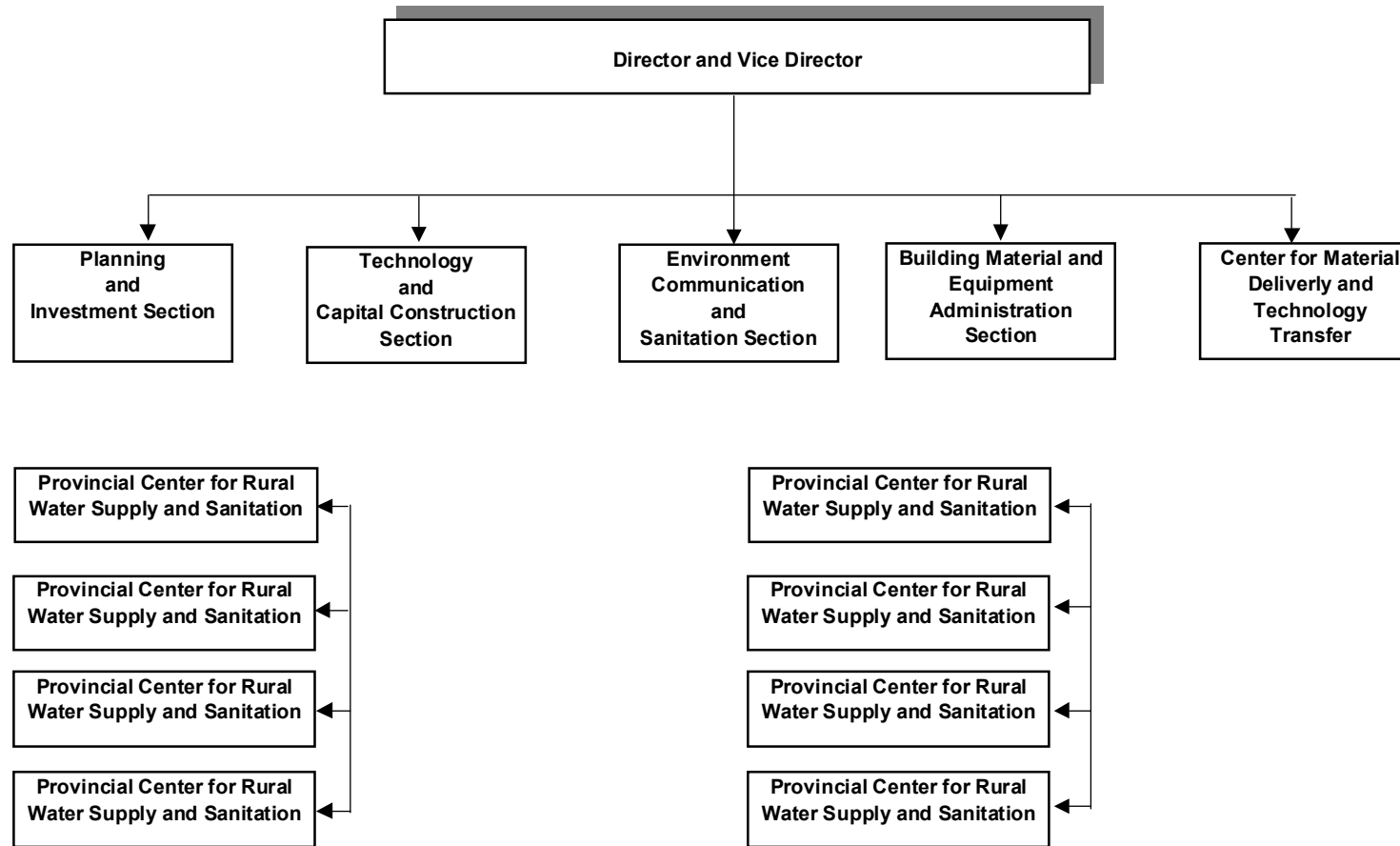


Figure 5.2 Organization Chart of CERWASS

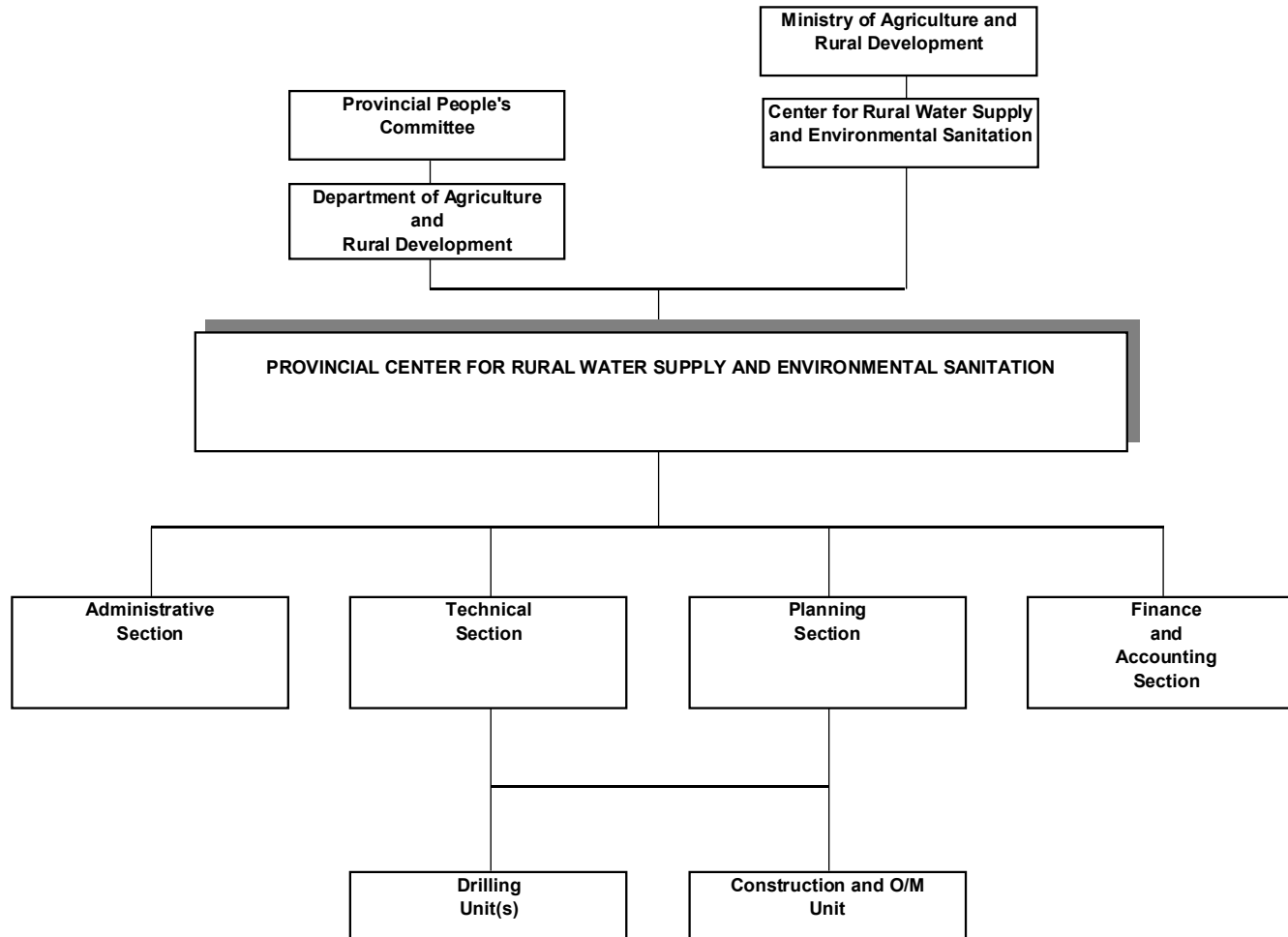


Figure 5.3 Organization Chart of PCERWASS

Chapter 6 Legislation, Regulations and Financial Issues

6.1 Law on Water Resources

The Law on Water Resources (LWR) was passed in May 1998, after several years of preparation and redrafting. This law is a typical framework law; it defines the organization and general principles of water resources management but as such needs further supportive legislation, decrees and regulations to become meaningfully enforceable. Water resources management is strongly integrated into the overall administrative structure of Vietnam.

Article 25 also stipulates that “organizations and individuals that are supplied with water for living and clean water shall have to contribute manpower and finance to the exploitation and treatment of water” as prescribed by competent agencies and organizations.

According to the LWR, stipulates that the competent State agency, which has issued the permit shall have to settle complaints arising from the carrying out of that permit. In case the person in question disagrees with the decision on settling the complaint, he has the right to send the complaint to the competent State agency or start a legal action at the Court.

6.2 Decree promulgating the regulation on the exercise of democracy in communes

The decree promulgating the regulation on the exercise of democracy in communes was issued in May 1998. In general, this decree “aims to bring into full play the commune people’s mastery and creativeness, mobilize the peasants’ and people’s great and intellectual strengths for economic development, social and political stabilization, to enhance the rural solidarity, improve the people’s lives and knowledge, build clean and strong Party organizations, administration and mass organizations in commune, to prevent and overcome the problems of degradation, red tape and corruption, thus contributing to the cause of striving for a prosperous people, a strong country and an equitable and civilized society along the socialist orientation”. The decree emphasizes the binding nature of the majority’s decisions. “The people shall have the duty to strictly observe the decisions approved by the majority. If they deem the majority’s decisions inconsistent with laws or regulations

of the local administrations, the CPCs shall propose them to the DPCs for consideration and decision.

6.3 Regulations on management of investment and construction

The regulations on management of investment and construction are based on Decrees 52-1999-ND-CP and 12-2000-ND-CP of the Government, issued in July 1999 and May 2000, respectively. Depending on the nature and scale of investment, domestic investment projects are classified into three groups A, B and C for the purpose of delegation of management. Rural water supply projects are likely, in most cases, to be classified in group C, which includes, inter alia, water supply and drainage projects with a capital value less than twenty billion Vietnamese dong.

The decree contains stipulation on public participation in the planning process. “When researching the construction of projects for master planning of socio-economic development, planning for specialized development and planning for urban and rural construction, comments must be widely sought from relevant industries, branches and localities. Upon research for project formation, urban and rural construction planning must be publicly announced and a poll must be conducted among the inhabitants and the people’s council of the zone which is subject to planning. Projects for construction planning (including both master planning and detailed planning) which have been approved by the competent authority must be publicly and regularly displayed at the authorities at all levels and public places in the zone which is the subject of planning for the purposes of implementation and inspection of implementation by the people.

6.4 Financing

6.4.1 Sources and Volume of Sector Financing

Rural water supply has mainly been developed by the population without support from the State. Since 1981 capital investment for construction work has been supported by UNICEF with CERWASS as the implementing agency within WATSAN Program. Funding for capital investment is contributed by UNICEF, central government, provincial government and by the beneficiaries with approximately 25% each and has in recent years amounted to US\$ 10 million annually. At present however, the UNICEF Program is limited to a few communes

in mountain areas. Consequently, rural water supply is one of the few water sector activities with a tradition for user participation in the capital investment of infrastructure. However, the support has been investment-oriented with neither provision for maintenance of facilities, nor assistance to communities to establish user organizations for operation and maintenance, thus leading to rapid deterioration of many shared water supplies.

The most common rural water supply system comprises a dug well and an electric pump. The costs may vary considerably but typically a well can be estimated at about one million Vietnamese dong and a pump some 500,000-700,000. In some difficult conditions the cost of deep dug wells have been as high as 6-7 million VND. It has been estimated the unofficial investments are at least twice as high as those in the WATSAN Program. Otherwise, there are no statistics available and even the actual coverage is impossible to estimate accurately.

The official statistics are based on the WATSAN Program. The Government's central funding of the sector has been primarily provided in conjunction with the WATSAN Program. Additional support has been provided for minority ethnic groups as part of the resettlement programs associated with the development of the New Economic Zones. The statistics compiled in the process of the preparation of NRWSS are summarized in Table 6.1 below.

Table 6.1 Investment in rural water supply in US\$ million

	1991-1995 (Total)	1991-1995 (average)	1991-1995 (actual)	1991-1995 (estimate)	Total 1991-1997
UNICEF	18.75	3.75	2.66	1.89	23.30
Other international donors	2.77	0.55	2.44	0.67	5.88
Sub-total of donors	21.52	4.30	5.10	2.56	29.18
Central ¹ government	4.06	0.81	4.24	4.37	12.67
Provinces and users ²	8.22	1.64	1.36	1.65	11.23
Total	33.80	6.76	10.70	8.58	53.08

The major trends in the 1990s have been the gradual reduction of UNICEF financing through the WATSAN Program and the substantial increase of the central financing. The total financing has been about 7-11 MUS\$ per annum.

¹ The figures for resettlement, forestation, support to ethnic people etc cannot be estimated/obtained and are, therefore, not included in the total central funding.

² The user funding only refers to the schemes funded by the government and/or donors, not private water supply in general.

The estimated investment in association with the National Program for rural water supply for 2001 is about 1,800,00 MVND, equivalent to about 120 MUS\$. This would mean huge increase in the sector financing in comparison with earlier years. It is likely, however, that the basis of calculation is somewhat different.

6.4.2 Revenues from piped water supply schemes

The outcome from the interviews carried out in the audit of existing piped schemes quite consistently suggests that the initial contribution from households to the connection to a piped system is 600,000-1000,000 VND. This covers the actual connection and a share of the distribution line.

The water tariffs of the rural piped schemes are quite low, in the range of 1,500-2,500 VND/m³ in pumping systems and 800-1,000 VND/m³ in the one audited gravity system. The tariffs have typically been decided at provincial level in a highly political process. Tariffs are normally insufficient to cover the full cost of operation and maintenance leading to sub-optimal operation and limitation of maintenance to emergency repairs. Furthermore, the financing mechanisms have built-in incentives for capital investment which make it financially attractive to renew rather than maintain facilities.

6.4.3 External support

(1) Donors

Donor support to the water sector has been dominated by irrigation and urban water supply until recently. In water supply and sanitation, strategies have been developed for urban areas with support from Finland and for rural areas with support from Denmark. The NRWSS Strategy applies proven approaches to the rural water and sanitation sector, yet it will require substantial reorientation of the national program and broad capacity building for this to succeed.

UNICEF has adopted the NRWSS Strategy for its future assistance. UNICEF has secured co-finance for RWSS from United Kingdom (UK) and the Netherlands.

The Department for International Development (DFID) from UK will continue its support through UNICEF at least until the end of 2002 and it is considering long term direct support to the rural water supply and sanitation sector and will station an adviser in CERWASS to assist with the IEC aspects of the national

strategy. DFID will also co-finance rural water supply, among other rural services, through Community Based Rural Infrastructure Project and Northern Mountains Poverty Reduction Project of the World Bank (WB) and Central Region Poverty Reduction Project of Asian Development Bank (ADB).

ADB's Rural Infrastructure Project will finance water supply among other sectors. It will include five communes in Kon Tum province (no overlapping with this project). The project focuses on quite low-cost technology; one of the criteria is that the maximum cost of water supply is 15 US\$ per capita.

Australian Aid (AusAid) is in restructuring its assistance towards a sector program approach with water and agriculture as the main sectors and the Mekong Delta as the geographic focus. In the water sector Australia will focus its assistance in water resource management and rural water supply and sanitation. In rural water supply and sanitation Australia considers support to five provinces in the Mekong Delta and is prepared to adopt the NRWSS Strategy.

(2) DANIDA's Sector Program Support

DANIDA's Sector Program Support (SPS) to the water sector in Vietnam consists of four main components:

- ❑ national capacity building (Component 1),
- ❑ rural water supply and sanitation (Component 2),
- ❑ integrated water resources management (Component 3), and
- ❑ urban water supply and sanitation (Component 4).

The first component is aimed at supporting the creation of an enabling environment for key government reforms in the water sector namely: the LWR and the NRWSS.

Component 2 will assist the GOV to achieve its goals for water supply and sanitation services in rural areas, particularly in the geographic focus areas for Danish assistance to the water and sanitation sector in Vietnam, i.e. the North Central Coast and the Central Highlands. DANIDA will initially provide assistance to three provinces (Ha Tinh, Dac Lac and Nghe An). The immediate objectives of the geographical sub-components are identical:

- ❑ sustainable institutional framework for provision of water supply and sanitation services including access to credit facilities and competent staff,

- ❑ community managed water supply and sanitation facilities based on user demand and reflecting the needs of women and the poor, and
- ❑ increased awareness of the linkage between improved hygiene and sanitation and health and improved hygiene practices.

The most relevant components and sub-components to this project are support to implementation of the NRWSS and RWSS in Dac Lac province.

The support to implementation of NRWSS is strategic in nature. Successful promotion and adoption of the strategy will have a far reaching effect on the poverty alleviation impact of future investments in rural water supply and sanitation. However, there are a number of institutional concerns. This function is new and there is not yet full clarity over roles. Political negotiation and uncertainty can be expected for some time to come. A considerable investment will be required to build up the capacity at central level while at the same time making sure that the approach does not become too centralized. The sub-component will train CERWASS headquarters staff, develop guidelines and design pilot projects to be tested in Component 2.

The institutional anchorage of the sub-component is CERWASS. The sub-component will be implemented by CERWASS assisted by a Senior DANIDA Adviser and a team of short term consultants providing specialist inputs. The resources of the sub-component will be coordinated with the contributions from other donors especially DFID who will also provide an adviser to CERWASS. A sub-component management group will be formed composed of senior staff of CERWASS, the DANIDA Senior Adviser and the team leader of the short term consultants.

The support to the implementation of NRWSS by DANIDA is by far the most important donor intervention to this project and it will be of outmost importance to closely follow up its progress, build on its experience, adopt procedures and mechanisms developed within its implementation, and coordinate and collaborate with it. It is very fortunate that one of the pilot areas of Component 2 of the SPS is Dac Lac.