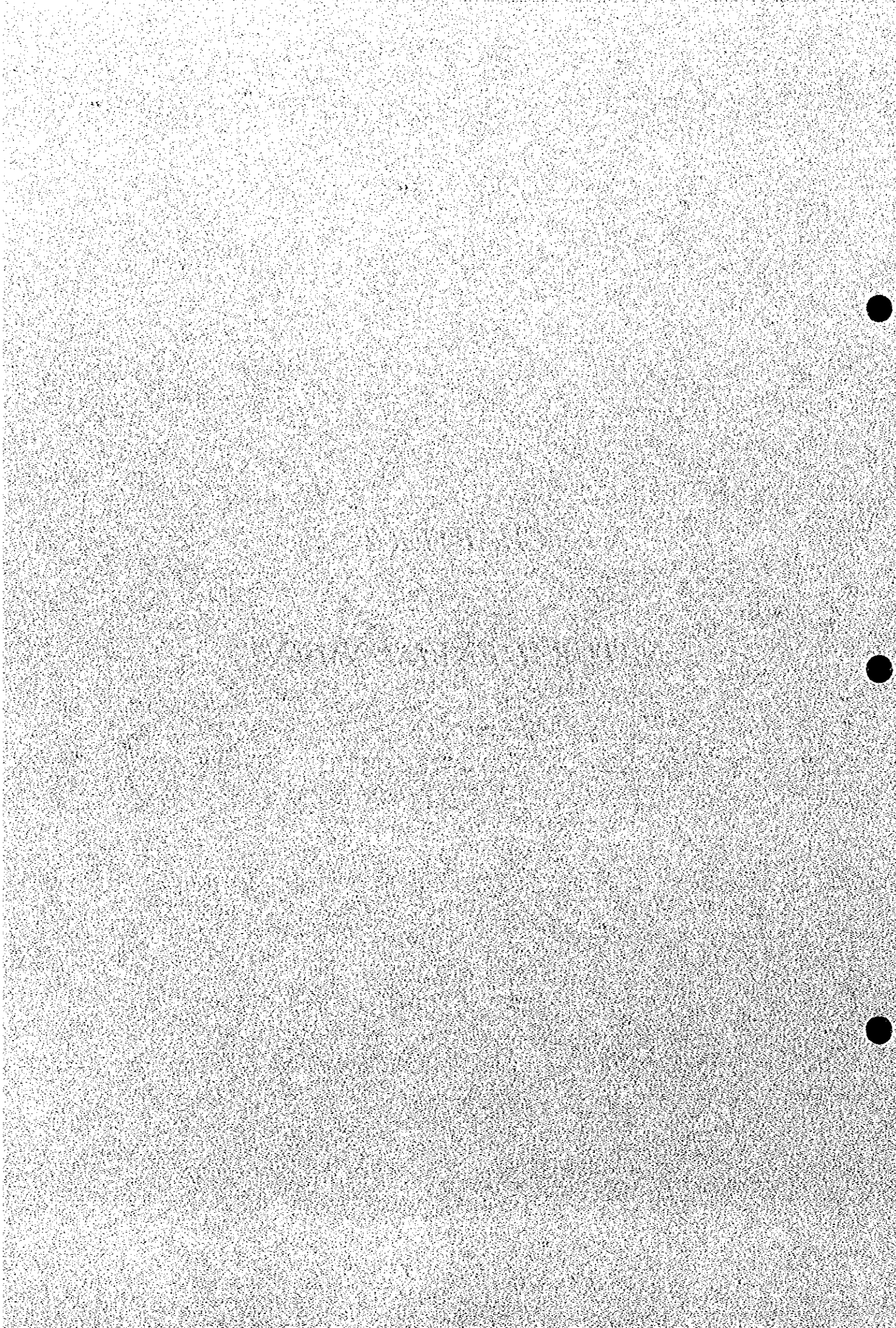


***CHAPTER 2***

***NATURAL ENVIRONMENT***



## CHAPTER 2 NATURAL ENVIRONMENT

### 2.1 Geomorphology

Vietnam is divided into the following 4 regions:

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

Highlands make up the northern region as the southern section of the Yunnan Plateau of China spreads out all the way to this region. Fan Si Pan (3,143 m in elevation), the highest peak in Vietnam, is located close to the Chinese border. To the east of the northern highlands is the Red River which faces the Bac Bo Gulf and forms the Red River Delta. The Annamese Highland extends from the southeast to the northeast on the western section of Vietnam, forming the central backbone of the country together with the narrow but extensive coastal plains in the east. Mekong River runs through Laos and Cambodia all the way to the East Sea. From the Cambodian border to the river mouth, Mekong River forms a wide but low-lying delta.

Thai Nguyen, one of the five provinces covered in the Study, is located on the northern side of the Red River Delta. It is formed by a stretch of limestone mountains and gently undulating hills. Hanoi Province is also on the Red River Delta, while Ninh Binh is on the southernmost end with limestone hills sporadically situated on the western side. Thanh Hoa is located within the small delta of Ma River, and is made up of coastal sandy hills and a hilly and mountainous zone on the west side, with the mountains extending all the way to the Annamese Highland. The small delta of Ca River and the hills that independently run east-west within the delta form the Ha Tinh and Nghe An Provinces.

The target communes in Thai Nguyen Province are located on flat lands in mountainous areas and hilly areas. The target communes in Hanoi Province are located on the right side of the Red River where the geomorphology is classified into an alluvial plain of the Red River Delta. In Ninh Binh Province, Yen Thang Commune is located on a coastal plain with hilly areas while Quan Song Commune is located on a hilly area with limestone mountains. Dong Phong Commune is on an intermountain basin.

In Thai Nguyen Province, Vinh Loc Town and Vinh Thanh are located on an alluvial plain along the Ma River with small hills. Dinh Thuong Commune is located on a flood plain between Ma River and Cho River. Thieu Hung Commune is located on the left side of Cho River whereas Thieu Do Commune is situated on the right side of Cho River. Both are on an alluvial plain along the Cho River. Nong Cong Town and Van Thang Commune are located on an alluvial plain and hilly areas along the Muc River. The target communes in Ha Tinh Province are located on the right side of Ca River and La Giang River where the geomorphology is classified into an alluvial plain.

## **2.2 Meteorology and Hydrogeology**

### **2.2.1 Meteorology**

Vietnam is tropical in the south and subtropical in the north, which is frequently subject to subtropical monsoons. Heavy rains brought on by the monsoon fall from May to September. On the other hand, the central region gets a lot of rain from August to January during the typhoon season. Rainfall amount in Hanoi in the north, Hue in the central region, and Ho Chi Minh in the south varies: 1,680 mm, 2,956 mm in Hue, and 1,949 mm, respectively (see Figure 2.1).

The annual average temperature in Vietnam is 27 °C in Ho Chi Minh in the south, 23 °C in Hanoi and 25 °C in Hue. Accordingly, the annual maximum and minimum temperatures in the southern region exceeds that of the north from 3 to 5 degrees.

According to the meteorological data observed at the provincial capitals in the Study area during the past 30 years, some differences can be found in rainfall, rainfall pattern and evaporation. Hanoi has the least mean annual rainfall among the five provinces amounting to 1,683.3 mm. The mean annual rainfalls in Thanh Hoa and Ninh Binh are 1,728.8 and 1,860.6 mm, respectively. In the northern part of the Study area, Thai Nguyen has the second largest mean annual rainfall of 2,049.7 mm. Ha Tinh has the largest of 2,719.9 mm. In general, the rainy season in the northern part of Vietnam starts from May and lasts until October, however, the peak of mean monthly rainfall occurs early in the northern part of the Study area and late in the southern part. The peak can be seen in July at Thai Nguyen, August at Hanoi, September at Ninh Binh and Thanh Hoa, and October in Ha Tinh.

The mean annual temperature at Hanoi is 23.0 °C; the average monthly temperature of 16.6 °C in January is the lowest and that of 28.8 °C in July is the highest.

Evaporation is low in February to March and high in May to July at the five provinces. There are two peaks of the monthly average evaporation except Ha Tinh. The former peak can be seen in May to July and the latter can be seen in October. The average monthly evaporation takes a wide range in the south, ranging from 60 to 100 mm/month at Thai Nguyen and Hanoi, from 40 to 105 mm/month at Ninh Binh and Thanh Hoa, and from 25 to 135 mm/month at Ha Tinh. On the other hand, the mean annual evaporation is the highest in Hanoi, having 976.5 mm. Then the mean annual evaporation decreases from north to south; Thai Nguyen has 956.9 mm, Ninh Binh has 851.6 mm, Thanh Hoa has 816.0 mm, and Ha Tinh has only 800.9 mm.

### 2.2.2 Hydrology

There are 16 river basins in Vietnam holding a total catchment area of more than 266,000 km<sup>2</sup>. Ten of these basins make up over 10,000 km<sup>2</sup> of the total catchment area, that is approximately 80 % of the national territory (331,000 km<sup>2</sup>). In addition, 80 % of the national population reside in these basins and 70 % of the GDP is produced therein.

Mekong River is the biggest river in Vietnam and has a mean annual discharge of 520.6 billion cubic meters (BCM). It is followed by Red River and Thai Binh River both having a mean annual discharge of 137.0 BCM.

Among the five provinces in the northern part of Vietnam where the target communes are located, the provinces of Thai Nguyen, Hanoi, and Ninh Binh belong to the Red River basin, whereas Thanh Hoa Province and Ha Tinh Province belong to Ma River basin and Ca River basin.

The Red River is the second largest river in Vietnam. It originates in China and flows into Vietnam from northwest to southeast. Out of 169,000 km<sup>2</sup> of the total catchment area, about half area (587,400 km<sup>2</sup>) lies within Vietnam. The Red River Delta, which has an area of 17,000 km<sup>2</sup>, occupies about 20 % of the basin that falls in Vietnam (World Bank etc., 1996).

The Ma River, which originates from Lai Chau and Son La Provinces of Vietnam as well as Laos, flows from Son La Province to Thanh Hoa Province through Laos. The total catchment area of the Ma River is 28,490 km<sup>2</sup>, in which an area of 17,810 km<sup>2</sup> falls in Vietnam. The mean annual discharge is 20.1 BCM (World Bank etc., 1996).

The Ca River basin is located on the south side of the Ma River basin. The Ca River, which

originates from Laos, flows in Nge An Province from northwest to southeast, and flows into the Gulf of Bac Bo at east of Vinh City. The total catchment area of the Ca River basin is 27,200 km<sup>2</sup>, in which an area of 17,730 km<sup>2</sup> falls in Vietnam. The mean annual discharge is 24.2 BCM (World Bank etc., 1996).

## **2.3 Geology**

### **2.3.1 Geology of Vietnam**

The geology of Vietnam consists of various kinds of sedimentary rocks, igneous rocks and metamorphic rocks from the Archean to Holocene ages. The general geology of Vietnam is described in "Vietnam National Atlas" (1996).

The most oldest rocks are ultrametamorphic rocks found in the Kontum massif in the central Vietnam. Proterozoic rocks are mainly found in the Kontum Massif and west of Bac Bo (northern Vietnam). The rocks of Upper Proterozoic to Lower Cambrian mainly consist of weakly metamorphosed schists, distributed in north and west of Bac Bo, north of Trung Bo (central Vietnam), and the Kontum Massif.

Paleozoic sedimentary rocks are widely distributed in Vietnam. Lower to Middle Cambrian formations distributed in Bac Bo consist of quartz-sericite schist and cherty-calcareous shale. Limestone bearing apatite is found on the right side of the Red River. Green schist from mafic effusive occurs in the basins of the Ma River and the Lo River. Upper Cambrian to Lower Ordovician formations are found in Bac Thai, Cao Bang, Ha Giang, and west of Bac Bo. The main facies is calcareous shale with quartzite and sandstone. Lower Ordovician is unconformably overlain by Ordovician to Silurian formations, that are composed of rhythmic terrigenous sediments and chert. The Ordovician to Silurian formations are distributed in Bac Bo and north of Trung Bo.

Silurian to Lower Devonian formations consist of shale, sandstone, and limestone, distributed in north and west of Bac Bo, and north of Trung Bo. The Lower Devonian formations are comprised of conglomerate, sandstone, siltstone, and shale, distributed in east and north of Bac Bo. Lower to Middle Devonian formations are widely distributed in northern Vietnam. They consist of sandstone, shale, and limestone with corals and brachiopods. Middle Devonian formations consist mainly of limestone in Bac Bo, and of sandstone and shale in north of Trung Bo. Middle to Upper Devonian formations comprise limestone, claystone, and sandstone, distributed in wide areas of north Trung Bo. Upper Devonian formations are

characterized by cherty shale, sandstone, shale, and banded limestone bearing manganese, distributed in west of Trung Bo.

Carboniferous formations are composed of conglomerate, sandstone, siltstone, shale, chert, calcareous shale, and limestone. The limestone of Carboniferous to Permian has 500 to 2,000 m in thick, widely distributed in Bac Bo and north of Trung Bo. Except limestone, Upper Carboniferous to Permian formations contain basalt in west of Bac Bo and andesite, dacite, and rhyolite in Central Highlands and Nam Bo (southern Vietnam).

Upper Permian formations having a new sedimentary cycle unconformably overlie the previous formations. They consist of limestone, siltstone, shale and contain bauxite in east of Bac Bo, north of Trung Bo and Nam Bo. Thick basalt beds are found in west of Bac Bo.

In Mesozoic sediments, Lower Triassic formations have more than 2,000 m in thickness, consisting of siltstone and shale. Felsic effusive is found in north of Bac Bo and mafic effusive is found in west of Bac Bo. Middle Triassic formations are composed of terrigenous sediments and felsic effusive in east of Bac Bo whereas limestone to terrigenous sediments in west of Bac Bo. Middle to Upper Triassic formations are characterized by continental red beds in east of Bac Bo while they are represented by black shale, sandstone, and limestone in west of Bac Bo.

Lower to Middle Jurassic sediments are classified into two types of sequences; one is continental red sediments distributed in north of Bac Bo, the other is marine formations with gray terrigenous sediments distributed in central Trung Bo and north of Bac Bo. Upper Jurassic to Cretaceous formations mainly consist of terrigenous sediments with felsic and alkaline effusive in west of Bac Bo and sandstone and andesite in south of Trung Bo. There are two types in Upper Cretaceous; one is continental red sediments in west of Bac Bo and north of Trung Bo, the other is felsic and subalkaline effusive in west of Bac Bo and dacite and rhyolite in south of Trung Bo.

Cenozoic sediments containing conglomerate, sandstone and siltstone, are thick in Hanoi and Cuu Long depressions. Neogene formations comprise coal bearing terrigenous sediments in Bac Bo, whereas they consist of terrigenous sediments with thick interbeds of basalt in south of Trung Bo and Nam Bo. Plio-Pleistocene sediments are widely distributed in the Mekong Delta, the Red River Delta, and other areas. Tholeiitic basalt and doleritic basalt are distributed on Bao Loc Plateau and in Song Be, Xuan Loc, and Vinh Linh, dated as Late Miocene to Pleistocene. Quaternary basaltic layers are distributed in south of Trung Bo and Nam Bo. Pleistocene to Holocene sediments are widely distributed in the Mekong Delta, the

Red River Delta, and other coastal plains.

### **2.3.2 Tectonics**

Vietnam is a part of south East Asian lithosphere plate, which consists of Precambrian continental block, Paleozoic folded belts, different superimposed structures and present marginal sea.

On the basis of analyzing structural-formational complexes in combination with plate tectonics concept, the Vietnamese territory is divided by Tran Van Tri and other (1986) into the main tectonic units as follows:

- The Vietnam-Laos Folded Belt
- The Sino-Vietnamese Folded Belt
- The Indochina Folded Belt
- The Mesozoic superimposed structures
- The Cenozoic superimposed structures
- The structures of eastern Vietnam marginal sea.

The boundaries between the main folded belts are often marked by deep-seated faults which are associated with melangeophiolite assemblages in connection with the activities of Benioff of Paleopacific type in Sino-Vietnamese and Paleotethys one in Vietnam-Laos folded belt.

In the northern part of Vietnam, NW-SE strikes are dominant in major geotectonic lines. However, the strikes are vended in the areas from Thai Nguyen to northeastern part of Vietnam, showing E-W to NE-SW strikes.

### **2.3.3 Mineral Resources**

The minerals in Vietnam are various in sources and rich in quantity with high density per surface units. As metallic resources, Vietnam possesses iron, chromite, manganese, lead, zinc, copper, gold, tin, titanium, stibium, boxite, rare earths, and radioactive minerals. Non-metallic resources include coal, Neogene lignite, graphite, oil and gas, apatite, kaolin, siliceous sand, materials for construction such as cement, etc.

In Thai Nguyen Province, there are mines of titanium, tin, iron as well as baryte, lead-zinc, and gold. Ninh Binh Province possesses cement, iron, mercury, and pyrite. Thanh Hoa Province yields precious stones, copper, chromium, iron, and titanium. In northern part of



Nge An Province, there are mines possessing tin, chromium and arsenic. Ha Tinh Province has mines of titanium and iron.

**CHAPTER 3**

***SOCIO-ECONOMIC CONDITIONS***

## CHAPTER 3 SOCIO-ECONOMIC CONDITIONS

### 3.1 National Economy and Regional GDP

#### 3.1.1 National Economy

The population of Vietnam was estimated at 75 million in 1996. According to World Development Report, 1996, World Bank, it will increase to 83 million in 2000 and 118 million in 2025.

Since 1990, Vietnam has experienced a transition from a centrally planned economy to a market economy. Over the last ten years, the country has achieved a high growth rate at 9 % per year. Agriculture growth achieved a 4 to 5 % growth during the last few years. Rice continues to lead agricultural growth, reaching a record level of production (over 26 million tons) in 1996. Industry output growth has averaged 13.5 %. In spite of this significant growth, Vietnam remains one of the poorest countries in the world, whose GNP per capita is estimated at US\$ 250 (World Development Report 1996). There has been a relatively low rate of urbanization and 80 % of the total population resides in rural areas.

Infrastructure in most cities and towns, built at the end of the 19<sup>th</sup> and beginning of the 20<sup>th</sup> centuries, has not been adequately maintained or upgraded because of resource constraints. An economic report by the World Bank (Vietnam, Deepening Reform for Growth) points out that there are still several trends inconsistent with long-term equitable growth. Substantial inefficiencies persist (average rural income was barely one fifth of urban incomes in 1995) and growth is inward-looking, increasingly capital-intensive and biased toward urban dwellers. There is increasing evidence that the financial performance of state enterprises is deteriorating. The World Bank report notes that deeper reforms are needed to build a less biased incentive framework which will channel resources into areas of economic activity most likely to promote rapid labor absorption, and in which Vietnam can compete internationally.

#### 3.1.2 Regional Economy

The following table shows the Gross Domestic Product (GDP) of each province in the Study Area.

**Table 3.1 Gross Domestic Product of Target Area, 1997 (VND billion, estimated)**

Province	Agriculture, Forestry and Fishery	Industry and Construction	Services	Total	GDP per capita (VND million)
Ha Noi	913 (4 %)	7,300 (36 %)	12,094 (60 %)	20,307 (100 %)	8.6
Ninh Binh	877 (55 %)	309 (19 %)	417 (26 %)	1,603 (100 %)	1.8
Thai Nguyen	805 (37 %)	753 (34 %)	634 (29 %)	2,192 (100 %)	2.2
Thanh Hoa	3,352 (43 %)	1,746 (23 %)	2,661 (34 %)	7,759 (100 %)	2.2
Ha Tinh	1,440 (55 %)	298 (11 %)	878 (34 %)	2,616 (100 %)	1.9
National	295,696 (26 %)	77,520 (31 %)	92,357 (43 %)	125,819 (100 %)	1.6

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

GDP per capita of the target provinces except for Ha Noi is mostly at the same level as the national average, and heavily dependent on the agricultural sector. GDP per capita of Ha Noi is four times as high as that of the other four provinces, with the service sector accounting for 60 % of the production.

The following are the major characteristics of the industrial structure in each province.

**(1) Ha Noi**

Ha Noi City's per capita GDP by sector is shown in the table below:

**Table 3.2 Per Capita GDP by Sector, Ha Noi (1996)**

	GDP (VND billion)	Number of workers	Production per worker
Agriculture, Forestry and Fishery	886.5 (5 %)	412,400 (38 %)	VND 2.1 million
Industry and Construction	6,031.9 (35 %)	315,800 (29 %)	VND 19.1 million
Services	10,373.9 (60 %)	368,400 (33 %)	VND 28.2 million
<b>Total</b>	<b>17,292.3 (100 %)</b>	<b>1,096,600 (100 %)</b>	<b>VND 15.8 million</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

Ha Noi's high GDP is largely due to its large commercial and government sectors. Thus the industry/construction and service sectors represent 95 % of the city's regional GDP, while the agricultural sector accounts for only 5 % of the economy. On the other hand, a third of the workers in the city are working in the agricultural sector, and their production per capita (VND 2 million) is much lower than that of the other two sectors (VND 19 million for industry and construction and VND 28 million for services). It

should be noted, however, that since farmers in Ha Noi have chances to work as unskilled labor in the city, their cash income may be higher than the statistics indicate.

The two target communes of the Study in Ha Noi (Xuan Dinh and Dong Ngac) are located in rural areas. The following table shows the surface size of major crops in Ha Noi. The total sown area is 87,800 ha, of which rice paddies represent more than 60 %. Although no statistical data is available on horticulture, it appears to be the farmers' important sources of cash income.

**Table 3.3 Surface Size of Major Crops, Ha Noi (1996)**

Land Use	Area ('000 ha)
Spring Paddy	25.3
Winter Paddy	29.5
Maize	11.1
Sweet potatoes	4.7
Cassava	0.3
Sugarcane	0.1
Peanut	3.7
Soy bean	2.4
Tobacco	0.1
Tea	0.5
Others	9.1
<b>Total</b>	<b>86.8</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

**(2) Ninh Binh**

Ninh Binh Province's per capita GDP by sector is shown in the table below:

**Table 3.4 Per Capita GDP by Sector, Ninh Binh (1996)**

	GDP (VND billion)	Number of workers	Production per worker
Agriculture, Forestry and Fishery	766.0 (55 %)	325,200 (77 %)	VND 2.4 million
Industry and Construction	270.1 (19 %)	40,800 (10 %)	VND 6.6 million
Services	363.6 (26 %)	55,600 (13 %)	VND 6.5 million
<b>Total</b>	<b>1,399.7 (100 %)</b>	<b>421,600 (100 %)</b>	<b>VND 3.3 million</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

Agriculture is dominant in the regional economy, representing 55 % of the production and 77 % of the employment. Production per worker in the agriculture sector is relatively low: VND 2.4 million per year.

The following table shows the surface size of major crops in Ninh Binh. Two thirds of the sown area is used for rice production.

**Table 3.5 Surface Size of Major Crops, Ninh Binh (1996)**

Land Use	Area ('000 ha)
Spring Paddy	41.3
Winter Paddy	26.1
Maize	6.9
Sweet potatoes	3.3
Cassava	1.3
Rush	1.2
Sugarcane	1.4
Peanut	4.7
Soy bean	0.1
Tea	0.5
Others	10.5
<b>Total</b>	<b>97.3</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

### (3) Thai Nguyen

Thai Nguyen Province's per capita GDP by sector is shown in the table below:

**Table 3.6 Per Capita GDP by Sector, Thai Nguyen (1996)**

	GDP (VND billion)	Number of workers	Production per worker
Agriculture, Forestry and Fishery	769.9 (38 %)	335,500 (73 %)	VND 2.3 million
Industry and Construction	684.5 (34 %)	20,300 (4 %)	VND 33.7 million
Services	587.4 (28 %)	106,100 (23 %)	VND 6.5 million
<b>Total</b>	<b>2,041.8 (100 %)</b>	<b>461,900 (100 %)</b>	<b>VND 4.4 million</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

Agriculture is dominant in the regional economy, representing 38 % of the production and 73 % of the employment. Production per worker in the agriculture sector is

relatively low: VND 2.3 million per year.

The following table shows the surface size of major crops in Thai Nguyen. 60 % of the sown area is used for rice production. Tea production is also important in this province.

**Table 3.7 Surface Size of Major Crops, Thai Nguyen (1996)**

Land Use	Area ('000 ha)
Spring Paddy	21.4
Winter Paddy	42.2
Maize	7.3
Sweet potatoes	11.1
Cassava	2.4
Sugarcane	0.6
Peanut	6.0
Soy bean	2.3
Tobacco	0.1
Tea	9.2
Others	2.7
<b>Total</b>	<b>105.3</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

**(4) Thanh Hoa**

Thanh Hoa Province's per capita GDP by sector is shown in the table below:

**Table 3.8 Per Capita GDP by Sector, Thanh Hoa (1996)**

	GDP (VND billion)	Number of workers	Production per worker
Agriculture, Forestry and Fishery	3,019.8 (47 %)	1,283,100 (75 %)	VND 2.4 million
Industry and Construction	1,051.1 (16 %)	210,500 (12 %)	VND 5.0 million
Services	2,346.7 (37 %)	211,200 (13 %)	VND 11.1 million
<b>Total</b>	<b>6,417.6 (100 %)</b>	<b>1,704,800 (100 %)</b>	<b>VND 3.8 million</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

Agriculture is dominant in the regional economy, representing 47 % of the production and 75 % of the employment. Production per worker in the primary sector is relatively low: VND 2.4 million per year.

The following table shows the surface size of major crops in Thanh Hoa. Thanh Hoa has the biggest surface size (388,000 ha) used for agriculture among the five provinces in the study area. Two thirds of the sown area is used for rice production.

**Table 3.9 Surface Size of Major Crops, Thanh Hoa (1996)**

Land Use	Area ('000 ha)
Spring Paddy	114.2
Winter Paddy	137.0
Maize	36.9
Sweet potatoes	34.4
Cassava	15.1
Cotton	0.1
Jute	0.3
Rush	2.9
Sugarcane	11.1
Peanut	13.1
Soy bean	1.5
Tobacco	0.2
Tea	0.9
Coffee	0.1
Rubber	1.9
Others	18.6
<b>Total</b>	<b>388.3</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

**(5) Ha Tinh**

Ha Tinh Province's per capita GDP by sector is shown in the table below:

**Table 3.10 Per Capita GDP by Sector, Ha Tinh (1996)**

	GDP (VND billion)	Number of workers	Production per worker
Agriculture, Forestry and Fishery	1,409.7 (57 %)	458,700 (75 %)	VND 3.1 million
Industry and Construction	266.8 (11 %)	66,600 (11 %)	VND 4.0 million
Services	815.8 (32 %)	83,400 (14 %)	VND 9.8 million
<b>Total</b>	<b>2,492.3 (100 %)</b>	<b>608,700 (100 %)</b>	<b>VND 4.1 million</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)



Agriculture is dominant in the regional economy, representing 57 % of the production and 75 % of the employment. Production per worker in the primary sector is relatively low: VND 3.1 million per year.

The following table shows the surface size of major crops in Ha Tinh. Over 50 % of the sown area is used for rice production.

**Table 3.11 Surface Size of Major Crops, Ha Tinh (1996)**

Land Use	Area ('000 ha)
Spring Paddy	55.4
Autumn Paddy	33.4
Winter Paddy	19.6
Maize	2.9
Sweet potatoes	18.7
Cassava	2.4
Rush	0.1
Sugarcane	0.8
Peanut	13.7
Tobacco	0.1
Tea	0.6
Rubber	0.1
Others	19.8
<b>Total</b>	<b>167.6</b>

(Source: Socio-Economic Statistical Data of 61 Provinces and Cities in Vietnam, 1997, Statistical Publishing House.)

## 3.2 Social Conditions

The social conditions of the study area are presented based on the results of the interview for Farmer's Union and Women's Union, group mapping and questionnaire for Commune PC, household questionnaire and PCM workshops.

### 3.2.1 Family Members and Occupation

The household survey results suggest that about 50 % of family members are less than 4. 57 % of the household have been living in the commune more than 30 years in average except the communes of Thanh Hoa (see Figure 3.1).

The residents mainly engaged in agriculture and agriculture related occupation. Commerce, private service and hand craft occupy 15.1 % while public service 15.8 %. As for the residential space, 46 % of the residents have 50~100 m<sup>2</sup> while 35 % is more than 100 m<sup>2</sup>.

### **3.2.2 Agriculture**

Generally, winter-spring rice is prepared in January and harvested in April. Summer-Autumn rice is prepared in May or June and harvested in September or October. Vegetable is cultivated in remaining months.

Each commune has subtle differences for cropping system by geographical condition and agricultural technical guidance by Farmer's Union or the cooperative. Only Quang Son Commune is farming cash crop like sugar cane, tea and pineapple, because the land is not suitable for rice cultivation.

Almost all communes grow pigs, cows, buffaloes and chicken. Farmers in Xuan Dinh Commune and Nong Cong Town grow only pigs, probably because they belong to urban area and they do not have enough grazing land for cows or buffaloes.

Farmers purchase agricultural raw materials in the market, private shop, official agency and the cooperative. Farmers in five communes purchase cooperatively them. Cooperative purchase is not so common in 20 communes. Almost all farmers sell individually their agricultural products for merchants in the markets.

**Table 3.12 Water Sources of the Target Communes  
(Interviews with Farmer's Union and Group Mapping)**

No.	Commune	Farmer's Union		Group Mapping	
		Water Source	Condition of water source	Water Source	Condition of water source
1	Hoa Thuong	dug wells, ponds, rain water tanks	dug well = good, surface water = very bad	dug wells, rain water, some family = water from army camp always	northern area = lake in dry season, near army camp = water from army camp in dry season, north-west = mainly rain water
2	Dong Bam	dug wells	relatively clear	Each family has dug well.	Western area = because dry in dry season, water from public well in central area
3	Thinh Duc	dug wells	pollution by city's rubbish dumping and cemetery. Some wells are dry in some dry season	Each family has dug well.	
4	Nam Tien	dug wells	Some wells are dry in some dry season (alternatively from communal pond). Some wells is not good	dug wells	Northern hill area = because dry in dry season, water from village under hill(200m). Southern area = flood area, every year contamination by flood
5	Dong Ngao	dug wells & drilling wells(UNICEF)	iron component is high in some area	20% = electric pump, 50-60% = hand-pump, rest = dug wells	water level down in dry season. dug well user = water from neighbor's drilling wells in dry season. Red river side = river water in dry season
6	Xuan Dinh	dug wells before 1988, UNICEF drilling wells after	-	70% = electric pump, rest = dug wells	water level down in dry season
7	Dong Phong	80% = river water, 20% = dug wells	river = contamination, dug wells = quality in no good, quantity is not enough in dry season	4 public facilities with public wells, 100% = private dug wells	50% of dug wells = dry in dry season, west & south-east use canal and 30% of north use river, 50% of dug wells contains CaCo3.
8	Quang Son	30% = lake, 60% = dug wells, 10% = buying	lake = contamination, dug wells = no enough and high CaCo3, water price = 10,000don/4m3	25% = lake for all, 30% = dug wells for all, 45% = rain for drinking and lake & pond for washing	25% of dug wells = dry in dry season(Nov.-Feb.), 5% buy drinking water (18,000don/m3, 50,000Don/month/family) and other get from neighbor
9	Yen Thang	10% = drilling wells, 90% = rain for drinking and dug well for washing &	rain = no enough quantity, dug well = no good quality	80% = total 30 public wells by hamlets, 10% = rain water, 10% = private dug wells	80% of public dug wells and all private dug wells = because dry or level down in dry season, water from canal. Rain water user use canal in dry season.
10	Vin Loc Town	dug wells, drilling wells, rain water	wells water is yellow color.	20% = drilling wells, 80% = dug wells	90% of dug wells = because level down in dry season, dug wells for only drinking and cut down washing & bathing water, near mountain area is very hard condition. Totally bad quality and yellow color.
11	Vinh Thanh	river, dug wells, drilling wells	river = contamination, dug wells & drilling wells = yellow color	5% = drilling wells, 80% = dug wells, 15% = river water	20-30% of dug wells = because dry in dry season, drinking water from neighbor and washing from river. River water is contaminated.
12	Dinh Tuong	dug wells	to contain alum (sour taste) and iron (yellow)	95% = dug wells, 20 family = drilling wells, rest = get water from neighbor	detached area and near area (5-6% of total) = dry in long dry season
13	Thie Hung	dug wells, drilling wells, ponds	water is yellow(iron), dry and low level from Nov. to Dec.	95% = dug wells, 5% = drilling wells.	dug wells = level down in dry season, old 3 public wells is contaminated and is not used.
14	Thieu Do	river, dug wells, drilling wells	well water contains high iron quality	20% = river, 40% = dug wells, 35% = drilling wells, 5% = rain water in rainy and river in dry season	river = contaminated by factories, 80% of dug wells = dry or level down in dry season, northern uses river and southern neighbor's drilling wells
15	Nong Cong Town	river, dug wells, drilling wells, pond, lake	lower area suffered always by flood and drought, wells contain iron, river contaminated by factory.	40% = dug wells, 45% = drilling wells, 15% = river water	well water = yellow(iron), dug wells = because dry in dry season, to get water from drilling water. River contaminated by waste water from factory
16	Van Thang	dug wells, drilling wells	some wells contain alum and iron.	40% = drilling wells, 57% = dug wells, 3% = river or pond	60% of dug wells = because dry in dry season, get water from neighbor's drilling wells
17	Yen Ho	dug wells, rivers, ponds	dug well = high iron quality, offensive smells	30% = about 30 public wells, 40% = private dug wells, 30% = rivers or ponds	public wells = contaminated, dry in dry season, private dug wells = use iron filter tank, river = contaminated by pesticide & agri. chemical.
18	Trung Le	dug wells, drilling wells, river water, rain water	river = contaminated, wells = dry or level down in dry season, and no good quality	100% = public wells, 20% = for all, 80% = only for drinking and private well for washing & bathing	water level down in dry season, some family near canal = use canal for washing & bathing in dry season
19	Bui Xa	dug wells, rivers	river = contaminated, wells = yellow(iron) and sour taste(alum)	40% = La river, 30% = 19-5 canal, 10% = dug wells without concrete, 20% = dug wells with concrete	river & canal = contaminated, 80% of dug wells = dry in dry season
20	Duc Yen	dug wells, drilling wells, rain, river	some wells = yellow color & offensive smell	10-15 drilling wells = 1.2%, 48 families rain tanks = 5%, 363 dug wells = 46%, 4 public wells = 15%, river = 32-33%	La river = contaminated, wells without northern-west = sour taste & yellow, to become worse in dry season, use river, ponds, public well no.1

### 3.2.3 Water Use

Table 3.12 shows water sources based on information from interview for Farmer's Union and Group Mapping. Main water source is domestic dug wells in many communes, but river or canal is main water sources in some communes. Public wells are main water sources in Yen Thang and Trung Le Communes.

Household survey results also suggest that the main water source of the target communes is the dug well. However, in two communes of Hanoi sub-urban area, more than 90 % of the residents rely on the private bore hole (tube well). In the target communes of Ninh Binh and Ha Tinh, the percentage of the public dug wells is higher than other provinces (see Figure 3.2).

As for the distance, most of the water source are located within 25 m from their residence (see Figure 3.3). However, several commune people have to spent two hours fetching water in case they do not have private dug wells. Water storage in households is women's responsibility in eleven communes. Usually people store water in jar, pot or tank. Every person has custom to drink boiled water.

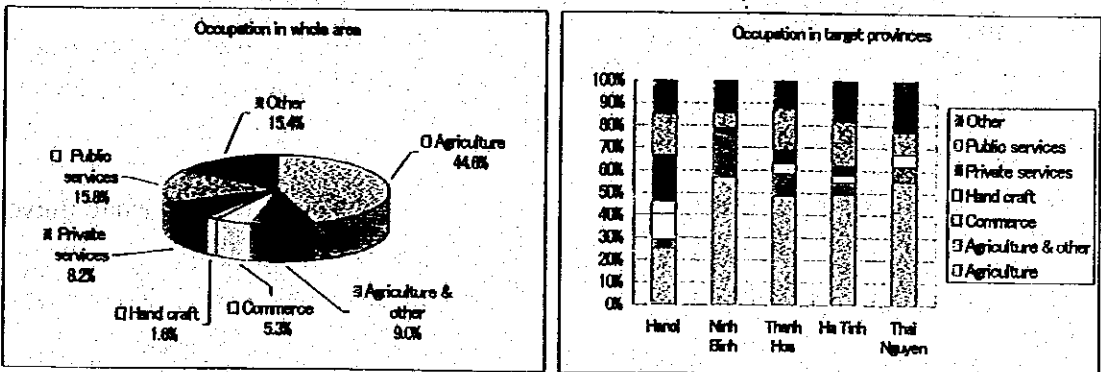
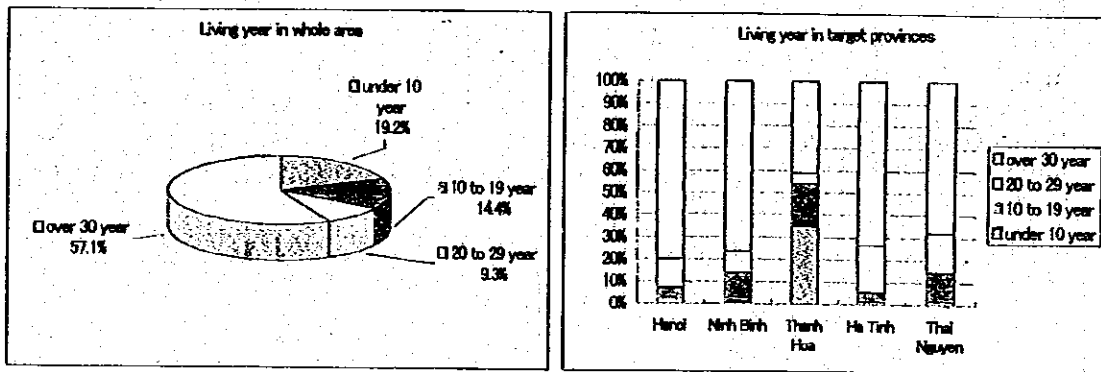
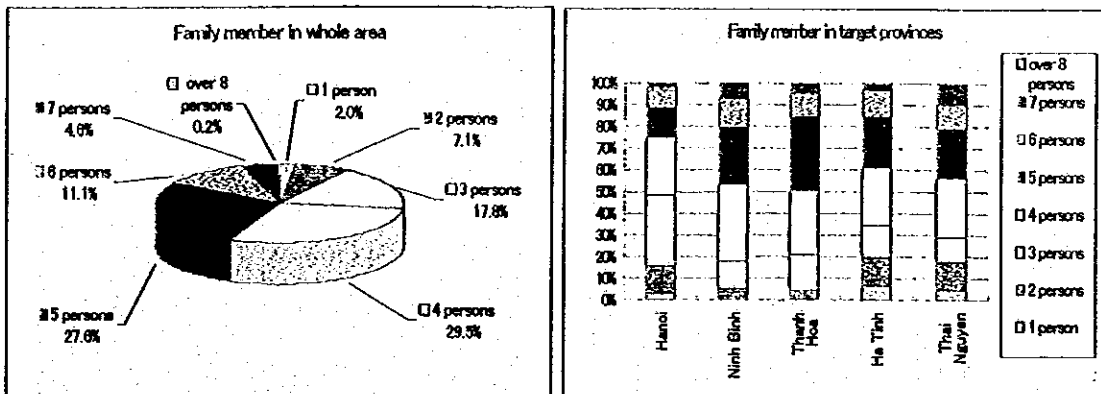
There are public wells in eight communes and there is a communal pond in a commune. The operation and maintenance are implemented by people and they are repaired by users, if they would be broken. Everybody has access to them in commune.

Important problems in water use are poor quality and shortage of water in dry season. Some dug wells dried up or water levels decline in dry season. Most of the dugwell water contains high iron content. Generally, the surface water nearby the commune is contaminated by waste water.

Presently, people do not pay any water charge when they use public wells, however, some people buy water and pay about VND 17,500 to 25,000 per m<sup>3</sup> of water in dry season. The construction fee of dug well is about VND 1 million. Most of the people think the cost is reasonable.

People in seven communes answer reasonable water charge in future. All four commune in Ha Tinh answer VND 5,000 per month/family is reasonable water charge. Vin Loc Town and Vinh Thanh Commune answer about VND 15,000 per month/family is reasonable, and Thie Hung Commune answer from VND 1,500 to 3,000 is reasonable. These differences reflected the economic level of each commune and the value for safe water by people in commune.

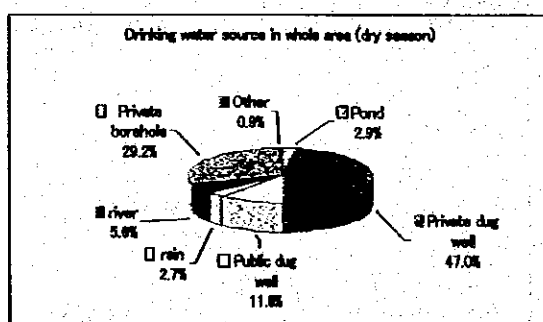
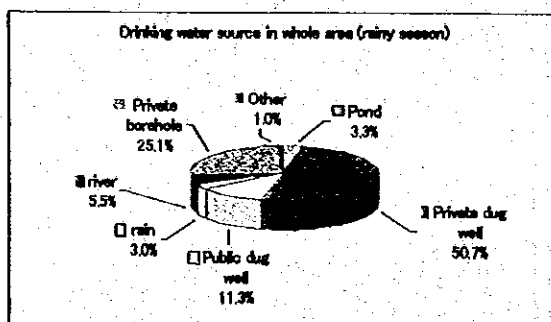
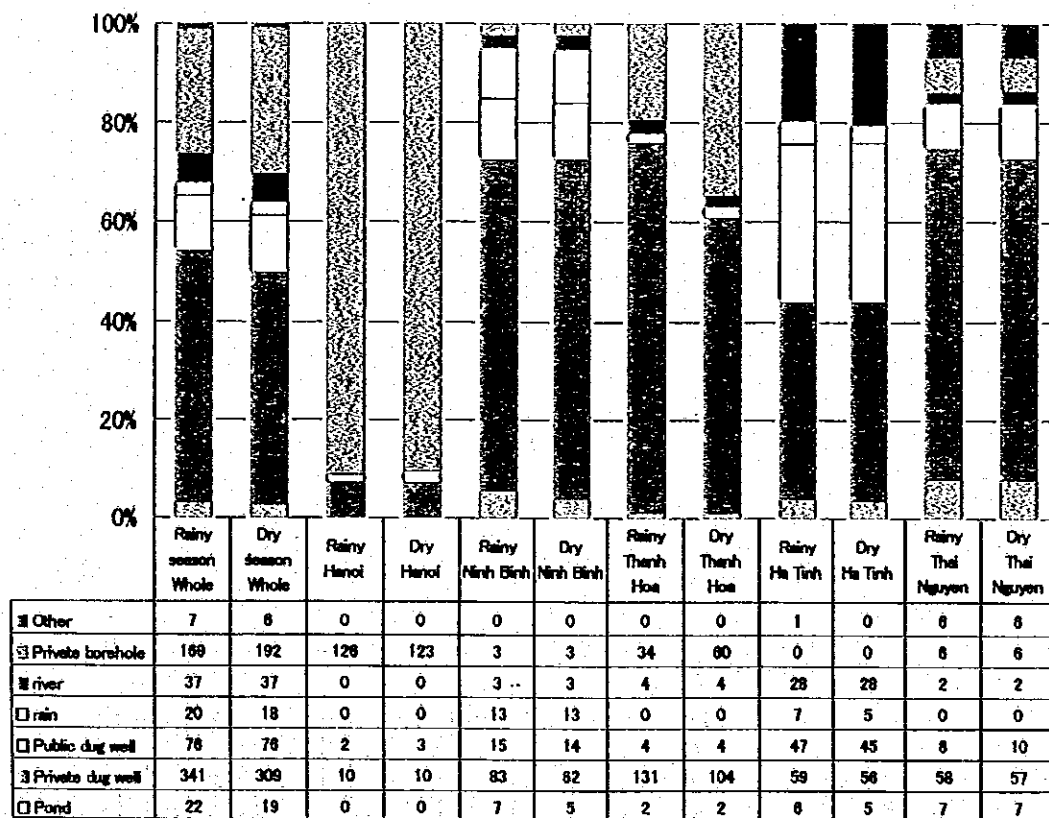
Figure 3.1 Living Conditions of the Communes



(Household Questionnaire Survey)

Figure 3.2 Comparison of Drinking Water Source

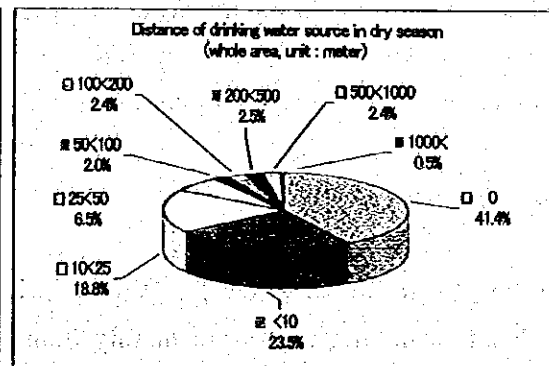
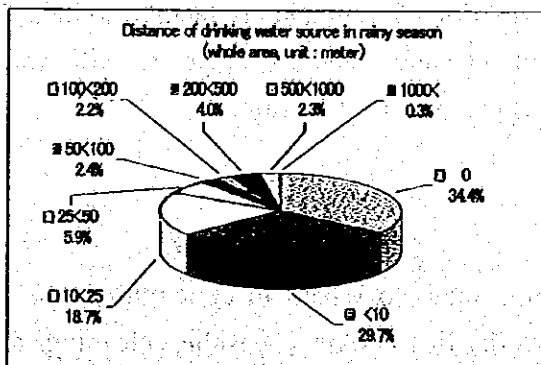
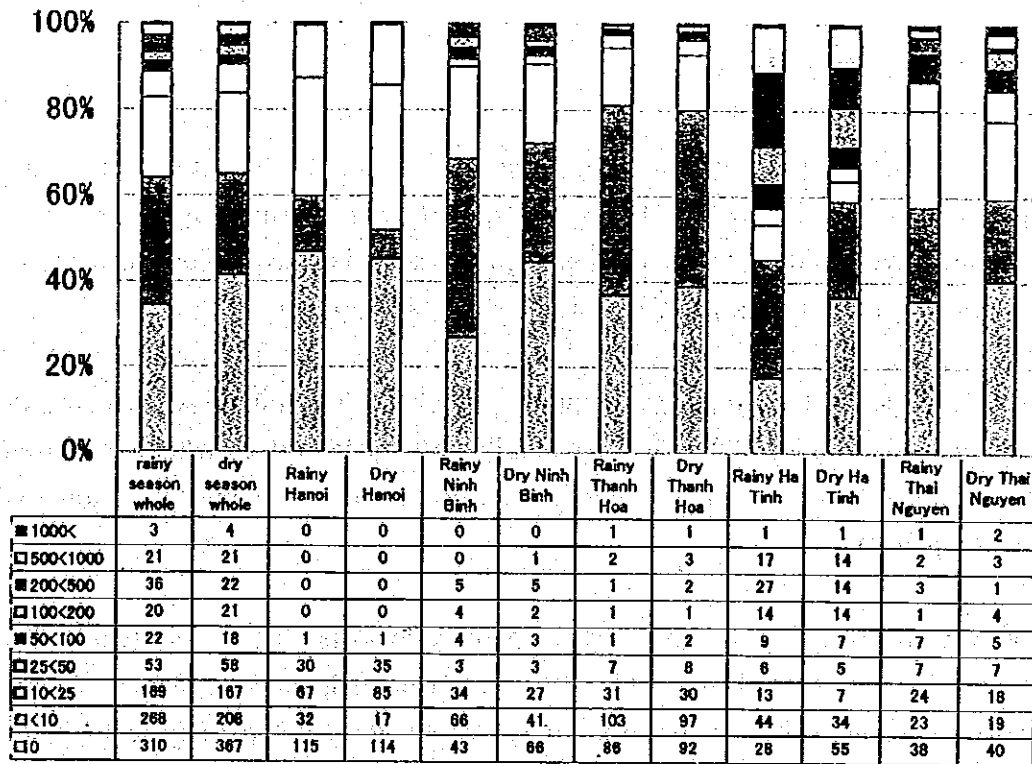
Comparison of drinking water source



(Household Questionnaire Survey)

**Figure 3.3 Comparison of Drinking Water source In Distance**

Comparison of drinking water source in distance  
(unit : meter)



(Household Questionnaire Survey)

All communes, answered for questionnaire survey for Commune People's Committee, have high needs for water supply service, high willing to establish the organization of water supply service. However, five communes answer problematic for budget to establish the organization of water supply service.

#### **3.2.4 Public Participation**

All communes have some unions as mass organization. People have experiences of social participation through the activities of these unions. Moreover, some communes organize the social cooperative work like road construction, school construction, irrigation canal construction and so on. People provide their labor or cash for them.

Men have experience to participate to public works like constructions of roads, that are organized mainly Commune PC. They voluntarily participate to them without reward, on the other hand it includes an element of compulsory work, because they must pay money, if they do not participate to it.

Most of women do not have experience to participate to public works organized mainly Commune PC or Women's Union. Five Women's Unions have the experience, participate voluntarily to it and get some reward. If somebody does not participate to it, there is punishment in three communes, but is not in two communes.

Men and women are willing to participate to construction of water supply facility, to help the collection of water charge and operation and maintenance, and to cooperate with water committee, if it is established for commune water supply service in future.

#### **3.2.5 Gender Issues**

According to group interview for Women's Union, men work hard in agriculture. On the other hand, women's works are mainly house works like cooking, washing, cleaning, and taking care of family. Selling agricultural products is also a work by women. Sometimes, women becomes some kinds of agricultural workforce although they are the main carers in the family and the organisers of the rural household. Collecting water is a work by men and women in eight communes and a work of women in one commune.

Men and women have equal access to resources and both men and women have access for furniture, TV, bicycle and livestock. However, land belongs to men in almost all communes. Women have mainly access for cooking tools.



Men and women have equal access for income and expenditure in household. There are not any kinds of income, that only women have ownership. Generally, men and women have equal right to decide domestic payments. There are items like food, that only women have right to decide payments, but there is not item, that only men can decide payments. Women hold the family purse strings. Men and women can participate to decision making in commune and households.

Men and women have equal right in daily life. The rate of women in important position in Commune PC, party committee and commune council is not so high. Generally, rural people think traditionally social things are to go better, when women hold men in high esteem.

According to group interview for Women's Union, in busy agricultural season, average working hours of women is 15.4 hours and average working hours of men is 12.6 hours. Women work more than 2.8 hours longer than men in busy agricultural season. In off-agricultural season, average working hours of women is 11.7 hours and average working hours of men is 9.0 hours. Women work more 2.7 hours longer than men in off-agricultural season.

### **3.3 General Health Situation**

#### **3.3.1 Overview**

##### **(1) Current Feature of Health in Vietnam**

Since Vietnam initiated its renovation policy in 1986, the health sector has dynamically changed. In general, the health care system has benefited from the open door policy of the government. Decentralisation of planning and decision-making in public health made it possible to create a demand-pull system of health care by demand, enhanced establishment of private sector and promoted health services with cost recovery system. These results are expected to have positive impacts on the sector in the long term.

The focus of MOH (MOH) on education and basic health care system for all has enabled Vietnam to achieve a very low level of mortality rate for its income. Infant Mortality Rate (IMR) and Under-Five Mortality Rate (U5MR) have decreased significantly. Oral Re-hydration Salt (ORS) is commonly distributed and used in the whole country, reducing deaths from dehydration caused by diarrhoeal diseases, particularly among for children.

Table 3.13 Change of IMR and U5MR per 1,000 live births

	1970	1990	1995
IMR	100	46	36
U5MR	-	81	66

Source: General Statistical Office

Nevertheless, these policies have created new difficulties. For example, decentralisation of financing to lower levels and disappearance of financial support from the agricultural co-operative system to the health staff has weakened financial basis of health worker wages that were already too low. As a consequence, the delay of payment has resulted in low staff morale. In addition, the length of service providing hours at Commune Health Station (herein after CHS) has shortened since the new policies were introduced. Also, drugs and other supplies are no longer subsidised by the government, which causes frequent shortage of basic supplies at CHS (UNICEF, SRVN-UNICEF Country Program of Cooperation 1996~2000, 1996).

Even though Vietnam achieved remarkable reduction of mortality, its main health problems are still infectious and parasitic diseases, similar to most developing countries. Profile of morbidity in Vietnam is characterised heavily by the diseases linked with water and sanitation.

Environmental health is becoming a new big issue in Vietnam. The influence of deteriorating environmental condition on quality of life is evident in Vietnam. Water-washed diseases, which are caused by contact with pathogens and chemicals in water, are very significantly.

## (2) Health Development Plan and Strategies

Prevention is highly focused in the National Health Development Plan. Overall country program strategies of 1996~2000 focused on following issues:

- prevention of malnutrition and communicable diseases,
- reduction of population growth rate,
- reduction of occupational and environmental hazards,
- reduction of congenital malformations, and
- improvement of people's physical health status, especially that of mothers, children and elderly people.

The program strategies also set out indicators as goals for the year 2000. Among them, there are indicators in relation with water and sanitation as follows:

- reduce IMR from 45/1,000 to 30/1,000 live births,
- reduce U5MR from 81/1,000 to 55/1,000 live births,
- 80 % of the population will have access to clean drinking water<sup>1</sup>,
- 60 % of the households will have standardised sanitary latrine,
- increase the coverage of CHS from 90 to 100 % of all communes, and
- increase the number of CHS with (having) medical doctor from 20 to 40 %.

However these indicators are based on the existing health data reporting system, which needs to be improved in terms of efficiency and validity (National Rural Water Supply & Sanitation Strategy Study, Volume 3 Social and Hygiene Situation, 1997).

The Planning Section of MOH renews the National Plan for health every year. The Provincial Planning Section proposes plans at the provincial level preceding the national plan. Even though main issues are devised in each province reflecting local conditions, following issues are commonly given priority in all provinces:

- Child health including Expanded Program of Immunisation (EPI),
- Control of Diarrhoeal Diseases (CDD),
- Mother and Child Health (MCH) and
- Health education.

### **3.3.2 Health Situation in Relation with Water and Sanitation**

Health statistics of target area show that water related diseases remain priority issues to be solved. Both water-borne diseases and other water-washed diseases are urgent problems in all target area. Intestinal worms and diarrhoea are highly prevalent and people can be easily threatened by menace of cholera and typhoid because of poor sanitation. Among water-washed diseases, trachoma and gynaecological infection are very prevalent.

Thanh Hoa and Ha Tinh had severe epidemics of influenza in 1998, resulting in about 112,000 cases and 45,000 cases respectively. More than 6,600 cases of amoebic dysentery and 1,900 cases of bacillary dysentery (shigellosis) are reported to Thanh Hoa Provincial

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<sup>1</sup> Clean drinking water includes piped water, bore hole water, rainwater and dug-well water without contamination.

Health Department in 1998. Malaria remains big health problems in provinces of the target area, particularly in the mountainous area. Epidemics of dengue fever occur once in several years causing serious health problem for habitants. Thanh Hoa had epidemics of dengue fever in 1998 with nearly 3,000 patients reported. Typhoid and hepatitis remains prevalent in some provinces of the target area.

Epidemics of cholera have not occurred recently. Schistosomiasis, which used to be very prevalent in all Southeast Asian countries, is rarely found in these years.

Table 3.14 Leading Causes of Cases Treated in Health Facilities by Province (Cases treated in all health facilities, Cases/100,000)

Thai Nguyen	Ha Noi	Ninh Binh	Thanh Hoa	Ha Tinh	All Provinces
Acute pharyngitis and acute tonsillitis (582, 590.3)	Dental caries (77324, 3281.3)	Trachoma (100866, 11134.3)	Pneumonia (6051, 170.3)	Diarrhoea and gastro-enteritis of presumed infectious origin (17990, 1324.1)	Diarrhoea and gastro-enteritis of presumed infectious origin (340080, 449.4)
Acute bronchitis and acute bronchiolitis (4229, 424.4)	Other symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified (71209, 3021.8)	Diarrhoea and gastro-enteritis of presumed infectious origin (17634, 1946.5)	Acute bronchitis and acute bronchiolitis (5987, 168.5)	Malnutrition (9567, 704.1)	Pneumonia (306915, 405.6)
Pneumonia (2159, 216.6)	Acute pharyngitis and acute tonsillitis (51705, 2194.1)	Acute bronchitis and acute bronchiolitis (8432, 930.7)	Dental caries (4143, 116.6)	Iodine deficiency related thyroid disorder (347.7)	Other symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified (276816, 365.8)
Other diseases of the respiratory system (1932, 193.9)	Other infectious and parasitic diseases (51163, 2171.1)	Pneumonia (6172, 681.3)	Other diseases of the digestive system (3529, 99.3)	Rabies (4020, 295.8)	Acute pharyngitis and acute tonsillitis (221845, 2194.1293.1)
Other diseases of the digestive system (1928, 193.5)	Acute bronchitis and acute bronchiolitis (31684, 1344.5)	Rabies (5774, 637.3)	Gastritis and duodenitis (3481, 97.9)	Medical abortion (3240, 238.4)	Acute bronchitis and acute bronchiolitis (212791, 281.2)
Accidents and injuries (1895, 190.1)	Other diseases of the respiratory system (28769, 1220.8)	Dental caries (4557, 503.0)	Other diseases of the respiratory system (2734, 76.9)	Respiratory tuberculosis (3002, 220.9)	Other diseases of the respiratory system (210075, 277.6)
Other symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified (1823, 182.9)	Inflammation of eyelid (24789, 1051.9)	Iodine deficiency related thyroid disorder (3150, 347.7)	Other diseases of the musculo-skeletal system and connective tissue (2598, 73.1)	Mental and behavioural disorders (1420, 104.5)	Dental caries (205739, 271.9)
Diarrhoea and gastro-enteritis of presumed infectious origin (1789, 179.5)	Malnutrition (18427, 781.9)	Malaria (2764, 305.1)	Unspecified injuries (2419, 68.0)	Shigellosis (990, 72.8)	Other infectious and parasitic diseases (163107, 215.5)
Unspecified injuries (1688, 169.4)	Essential (primary) hypertension (15749, 668.3)	Other symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified (2107, 232.5)	Malaria (2318, 65.2)	Acute pharyngitis and acute tonsillitis (989, 72.8)	Malaria (158181, 209.0)
Other infectious and parasitic diseases (1667, 167.3)	Other diseases of the digestive system (15108, 641.1)	Asthma (1851, 204.3)	Accidents and injuries (2294, 64.5)	Acute bronchitis and acute bronchiolitis (898, 66.1)	Trachoma (133572, 176.5)

Source: Health Statistics Yearbook 1997

## **(1) Water-borne Diseases**

### **1) General conditions**

Water-borne diseases such as infectious and parasitic diseases of gastro-enteritis, amoebic and bacillus dysentery and hepatitis are very prevalent in the target area. Menace of cholera always exists because of poor condition of sanitation and many opportunities of people's frequent behavior to contact with human excreta. However deaths by diarrhoeal diseases are in a decreasing trend in consequence of national CDD program.

Sanitary messages such as "boil water for drinking" and "wash hands before eating" are well known among habitants of communes. But people's behavior of using raw water from dug-well for drinking and washing vegetables, and hardly washing hands with soap keeps water-borne diseases persisting.

Use of dug-well is traditionally common in the target area, particularly in rural area. Actually water of dug-well is highly contaminated by coli bacillus and presumably by other pathogens.

A survey conducted in Thai Nguyen Province in 1995 showed the relation between type of water sources and IMR. IMR is higher in order of "households without specific water sources", "households with dug well" and "households with tap water." Although it is not statistically significant, it implies a close relation between water quality and IMR (Ministry of Health: Commune Survey: Cases of Children Deaths —Under 5 Years Olds in 6 Districts of Thai Nguyen, 1995).

### **2) Findings commonly observed in all the target communes**

Messages such as "wash hands after toilet and before eating" and "boil drinking water" are commonly disseminated. Several good customs to prevent water-borne diseases were found in communes.

- Almost all households have custom to boil water.
- Necessity to wash hands after toilet and before eating is widely recognised.
- Some schools prepare kettles with boiled water and guide students to drink only this water.

These customs should be supported for further enhancement. However, the Study team found the following customs that are possibly making water-borne diseases persistent.

- Many habitants drink unboiled water in farms and markets where they work in daytime.
- Habitants eat vegetables washed with dug-well water (which manifested more than 90 % of contamination with colitis).
- The habitants rarely wash hands with soap.

### 3) Conclusions

Health education focused on microbiological pathogens and sterilisation should be further strengthened and that will be an essential requirement for control of water-borne diseases. However health education alone cannot change conventional customs in a short term. Access to chlorinated water should be increased. Future domestic water supply plan should consider supply of chlorinated water.

## (2) Water-washed Diseases

### 1) General conditions

Diseases caused or worsened by shortage of safe water, such as skin diseases, gynaecological infection and trachoma are highly prevalent in the target area. Contact with contaminated water is very frequent in the life of rural habitants. For example, they work in rice paddy fields and cut plant in muddy swamps. Access to safe water, which is not contaminated with pathogens, is quite limited in the target communes, and the condition severely worsens in dry season.

There is an evident necessity to use clean water for bathing and washing off pathogens and chemicals. However, most habitants do not have access to clean water. Access to clean water (even not clean water) severely becomes difficult in dry season.

A survey conducted in Thai Nguyen Province showed relationships between prevalence of skin diseases and sources of water, i.e. spring-water, stream and dug-well water. Prevalence of skin diseases in member of the households using spring water is as high as 15 %. The rate is slightly less in the households using stream and dug-well water (Ministry of Health: Cases of Skin Diseases in High Mountain Commune —Cho Don District, Thai Nguyen, 1997).

### 2) Findings commonly observed in all target communes

Among presumable water-washed diseases, gynaecological infection is highly prevalent in the target area. In some of the target communes, MOH conducted a clinical examination for all women. According to the result of this examination, 35 to 90 % of women had gynaecological infection.

There are several possible reasons for high prevalence of gynaecological infection.

- Women bathe and wash inside of genital part with contaminated water.
- Women are too busy to bathe well.
- Labor conditions of women in farm and market is not hygienic.
- There are very few places where women can bathe with privacy.
- Women don't have toilet with privacy.

### **3) Conclusions**

The opportunity for women to bathe well with safe water is necessary to reduce gynaecological infection. Enhancement of health education on pathogens by contact with skin and mucous membrane is essential for control of water-washed diseases. Use of safe water for bathing should be strongly promoted.

### **(3) Water-based and Water-based Vector Borne Diseases**

#### **1) General conditions and common findings in all the target communes**

Every target commune has a threat of dengue fever. Breeding places of *Aedes* mosquitoes can be found everywhere near households because of the custom to dispose solid wastes in open places. Although the target commune is outside of menace of Malaria, it is still very common and important disease in mountainous area of each province. Schistosomiasis is rarely reported in these years.

It is necessary to be aware that diagnosis of parasitic disease based on laboratory examination is difficult in almost all the CHSs.

#### **2) Conclusions**

Periodical screening of parasitic diseases is necessary to prevent their outbreak. Elimination and clearance of breeding places of mosquitoes and other hosts of parasite should be enhanced.

### **(4) Seasonal Fluctuation of Water-related Disease**

#### **1) General conditions and common findings in all target communes**

Table 3.2.3 shows an example of seasonal change of water-related diseases and other infectious diseases based on an investigation conducted in Thanh Hoa in 1996.



**Table 3.15 Seasonal Change of Infectious Diseases**

Diseases	Dry Season (November~April)	Wet Season (May~October)
Diarrhoea	27,693	29,855
Bacillus dysentery	281	895
Amoebic dysentery	599	962
Hepatitis	314	473
Typhoid	82	172
Influenza	35,681	65,101
Suspected rabies	3,270	4,952
Dengue fever	0	352

Source: Providing Health Service Centre (PKSC), Department of Health, Thanh Hoa

These numbers are based on cases of treatment services provided in the health facilities in Thanh Hoa. Diarrhoea is prevalent throughout the year. Other water-borne diseases such as dysentery (particularly bacillus dysentery), hepatitis and typhoid are more prevalent in wet season. Possible reasons of high prevalence of diarrhoea even in dry season were obtained through discussions with the commune health staff.

- In dry season, some habitants have no choice but drink any water such as pond water, dug-well water and water remained in container, even it is apparently dirty.
- Frequency of washing hands and body extremely decreases in dry season.

Skin diseases and other diseases caused by shortage of safe water are more serious in dry season.

## 2) Conclusions

Future domestic water supply plan should fully consider supplying enough water even in dry season without lowering its quality.

### 3.3.3 Health Education and Knowledge on Health

Health education is stressed in national health development plan. It is conducted through schools, health facilities and naturally at home.

#### (1) Health Education in Schools

Health education is strengthened in elementary school and junior high-school based on

the national plan from 1995. Textbooks of each grade contain comprehensive health aspects including prevention of health, hygiene practices, sanitation at home, tooth health and environmental health.

Students have one class of "health" every week using a special textbook prepared by the government for each grade. As this is a newly introduced subject in school education, teachers need to learn method to teach. The MOH requests teachers to participate in health education seminar every year. Sometimes CHS staff visit school to make health talks to students.

## **(2) Health Education in Health Facilities**

Explanation of diseases is provided in health facilities during daily treatment. However, general health education for habitants is rarely conducted in health facilities. Medical specialists, for example ophthalmologists, sometimes visit communes to treat patients intensively. At the same time, they hold seminars for inhabitants according to their specialities. However this is not a regular activity. In some communes, CHS staff visit elementary schools, Women Union and Farmers Union to make health talks.

In some communes, staff of commune health station have another responsibility to make health talks using broadcasting in coordination with People's Committee.

## **(3) Health Education at Home**

In many households, mothers are substantial leaders of health in family. MOH conducts health education for mothers with assistance of Women's Union of each commune. However, the coverage of this activity is restricted by financial reasons. In general, opportunities to learn health issues are still very limited for a majority of fathers and mothers. At least, children can introduce what they learned in school.

TV and radio programs are important sources of information for adults. Since illiteracy rate is very low in Vietnam, habitants also learn from written materials when they are available.

## **(4) Knowledge on Sanitation**

### **1) Human Excreta Management**

Knowledge on sanitation is less disseminated than that of water. Although habitants know that urine and excreta can cause diseases, they are not so interested in improvement of sanitary facilities. Household leaders did not have a concrete idea to improve their latrines. Knowledge of Ventilation Improved Pit-latrine (VIP), which is

promoted by UNICEF and the government, is not commonly known.

A more important issue regarding the knowledge on sanitation is usage of human excreta for agricultural fertiliser. Almost all people believe that human excreta, even fresh excreta, is necessary for farmland. However, human excreta should be conserved for several months to use as compost. From a hygienic point of view, human excreta should be conserved long time to reduce pathogens.

Thus, the following recommendation should be considered for dissemination of the knowledge on sanitation:

- Necessity of conservation of human excreta for several months before using them,
- Dissemination of knowledge on construction of improved latrines.

## **2) Knowledge on Household Wastewater Management**

Future-available water supply, particularly piped water supply, will automatically increase amount of household wastewater. Actually in majority of houses, household and animal wastewater is left only to flow surrounding places, making puddles of stagnant water. Only some houses are using it for vegetable garden.

Habitants know that stagnant water can cause breeding of mosquitoes and flies. Although they also know that mosquitoes and flies can transmit diseases, only a few households have a ditch for wastewater.

Thus the following point should be considered in the future water supply project:

- Promotion of construction of simple ditch to dispose household and animal wastewater to vegetable garden or farmland.

## **(5) Conclusions**

According to the results of the household survey, in general, knowledge on hygiene is widely disseminated among habitants of all income levels. The Government of Vietnam has strengthened health education in the last years and the program is supported by high literacy rate of both urban and rural habitants.

Sanitary messages such as "boil water for drinking" and "wash hands before eating" are well known among habitants of communes. However, people still use raw water from dug-well for drinking and washing vegetables and hardly wash hands with soap.

Thus, emphasis of hygiene education should shift to deepen the knowledge of people rather than enlarging the coverage. Important issues to be emphasised are as follows:

- mechanism of transmission of infectious diseases,
- necessity to wash hands and vegetables with disinfected water, and
- washing hands, body and clothes with soap can reduce possibilities of infection.

### **3.3.4 Environmental Sanitation**

Environmental pollution from neighboring factories and plants is widely recognized in all provinces of the target area. Moreover, unrestricted use of agricultural chemicals is commonly found, which further deteriorates environmental condition. These two environmental issues are highly recognized by habitants. Compared with these issues, however, pollution caused by household wastewater dose not seem to be highly recognized.

Main rivers in the target area are polluted by industrial and household wastewater without exception. Water pollution is the most serious and urgent problem among environmental pollution, followed by soil pollution.

#### **(1) Industrial Wastewater**

The MOH and the Ministry of Science, Technology and Environment (MOSTE) are jointly responsible for supervision of industrial waste management at the provincial level. They check condition of waste disposal by industries with the national standard and inform the results to Provincial People's Committee (PPC). The PPC gives instruction to the corresponding factory or plant if necessary (see Figure 3.2.1).

However, their supervision cannot cover medium and small-scale factories, even they have responsibility to check all factories and plants. Actually there is no restriction for many small industries for waste disposal in surroundings. Solid wastes are also disposed in vacant plots, which can be spread over the surrounding area in case of flood (Some of the target communes suffer from flood almost every year).

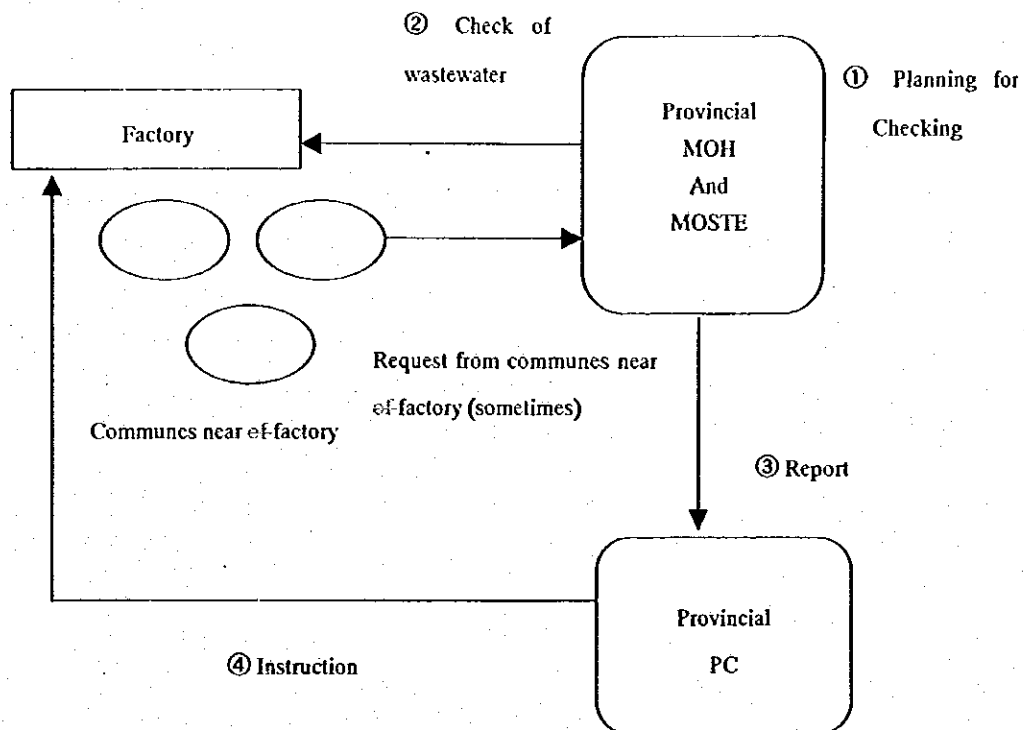


Figure 3.4 Checking System of Industrial Wastes

**(2) Unrestricted Use of Agricultural Chemicals**

Complaints among habitants in the target area about skin diseases are increasing because of effluent of insecticide from farmlands. The Ministry of Agricultural and Rural Development (MARD) holds seminars for farmers about safe use of agricultural chemical with assistance of Farmers Union. However, this activity is limited in a scale. Further training and restriction for the use of agricultural chemicals is needed.

**(3) Household and Animal Wastewater Treatment**

The rate of households with toilet is as high as more than 90 %. However, very few toilets are maintained in a good condition. According to the results of direct observation of household, interest in improving toilets is lower than that in improving other facilities, such as main-houses and wells. Priority of improving toilet is even lower than improvement of animal shelters in most households.

In rural communes, majority of household wastewater and animal wastewater is just discharged to surrounding of houses. Only a few households are using wastewater for vegetable gardens. In towns, such as Xuan Dinh and Dong Ngac in Hanoi Province, household wastewater is discharged through simple ditch to stabilising pond. In other

communes, activities to treat animal wastewater, such as construction of bio treatment system, are promoted.<sup>2</sup>

**(4) Protection of Environment**

Activities in relation with environmental protection are conducted only in small scale in the target area, even though awareness of environmental issues is widely disseminated among people. Environmental protection is a necessary and urgent issue in the whole country. Establishment of standard and restriction for environment, such as restriction of industrial wastewater disposal, deforestation, use of watershed area and use of groundwater should be strengthened in the near future.

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<sup>2</sup> Bio treatment system of animal wastewater: a storing system of animal wastewater in plastic tanks with pipe for exhaust gas generating from the wastewater. That gas is used as fuel for cooking.