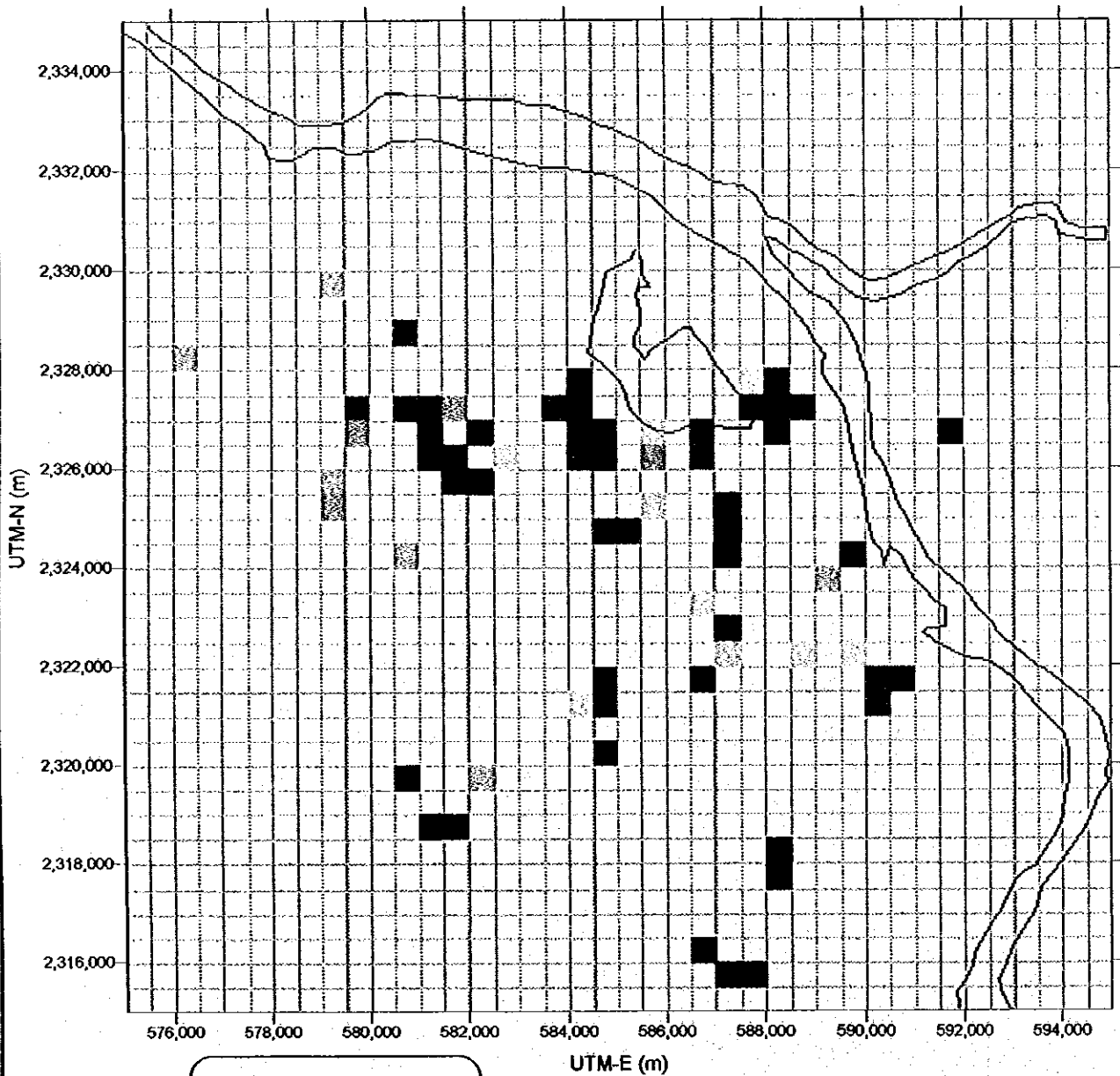
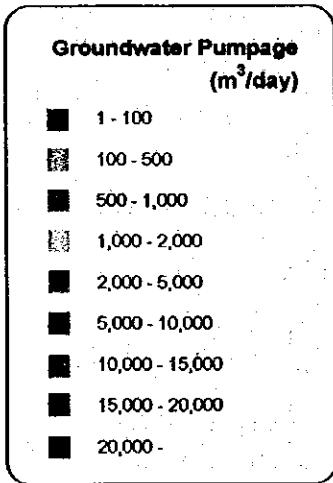


# Input Groundwater Pumpage in 1991



UTM-E (m)

Top View: Layer 4 (Main Confined Aquifer)

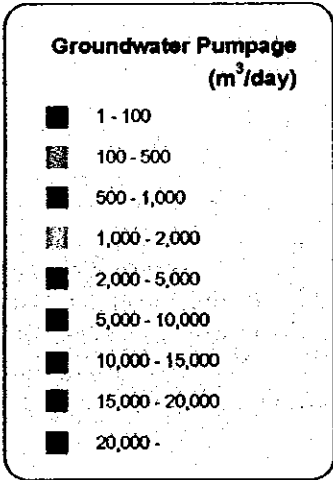
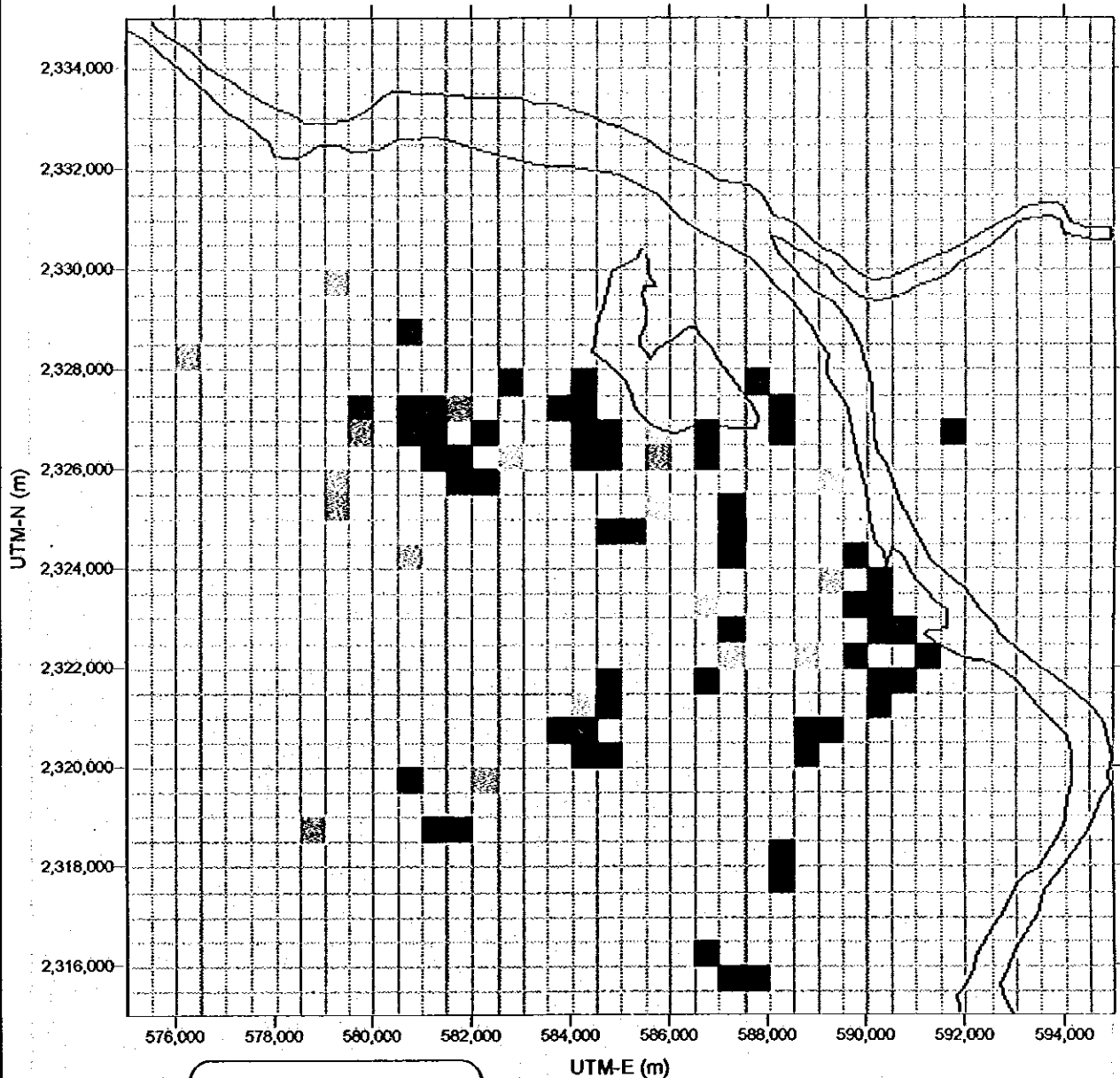


**Figure 4.11**      **Input Groundwater Pumpage in 1991**

THE STUDY ON GROUNDWATER DEVELOPMENT IN THE RURAL PROVINCES OF NORTHERN PART IN THE SOCIALIST REPUBLIC OF VIETNAM

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# Input Groundwater Pumpage in 1996



UTM-E (m)  
Top View: Layer 4 (Main Confined Aquifer)

<b>Figure 4.12</b>	<b>Input Groundwater Pumpage in 1996</b>
<b>THE STUDY ON GROUNDWATER DEVELOPMENT IN THE RURAL PROVINCES OF NORTHERN PART IN THE SOCIALIST REPUBLIC OF VIETNAM</b>	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

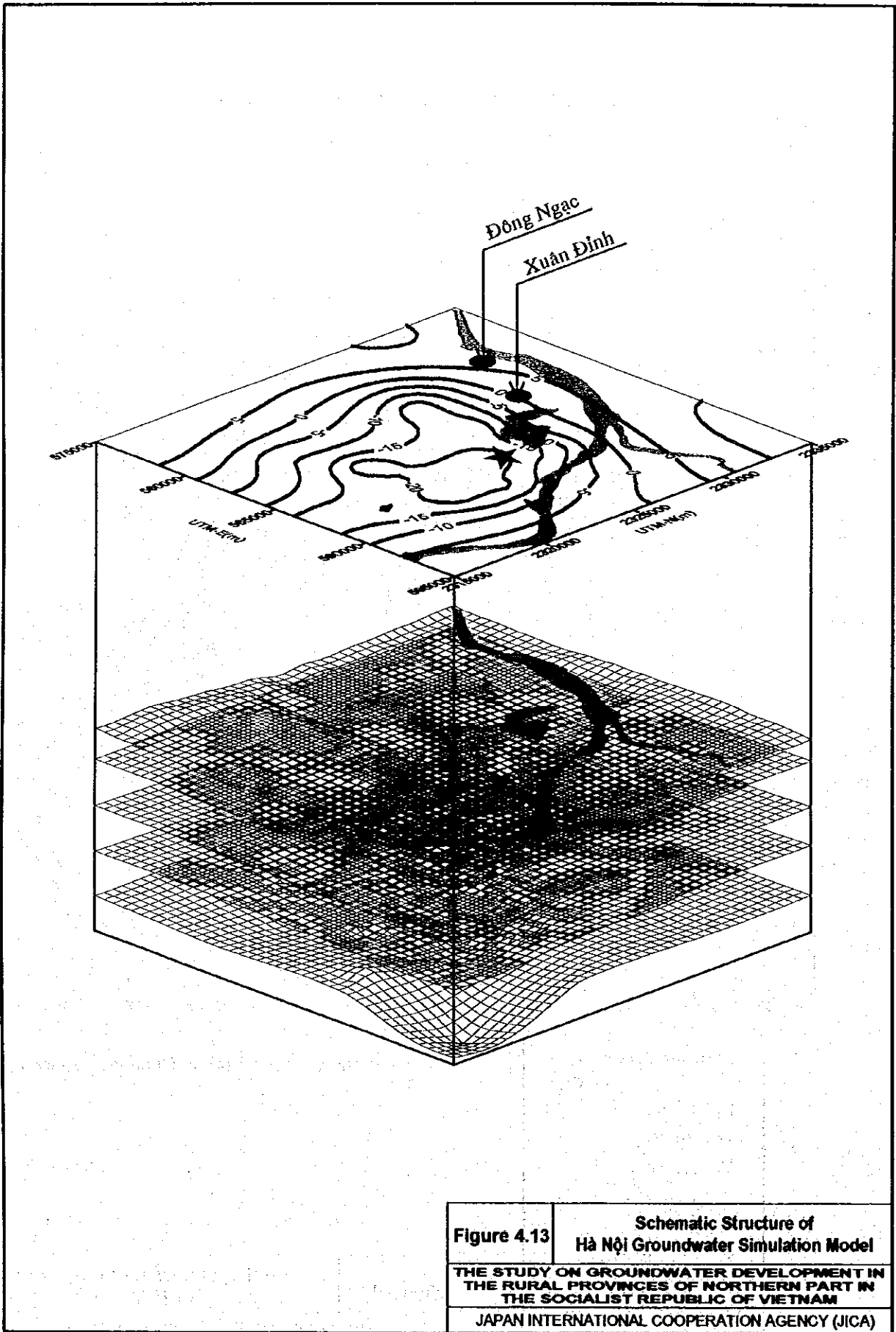
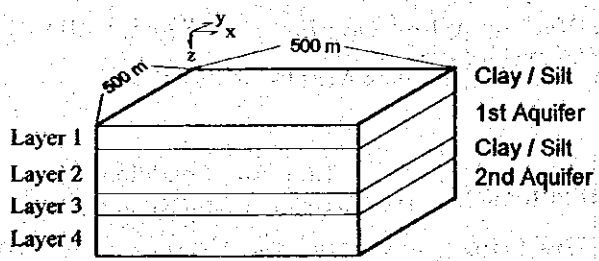
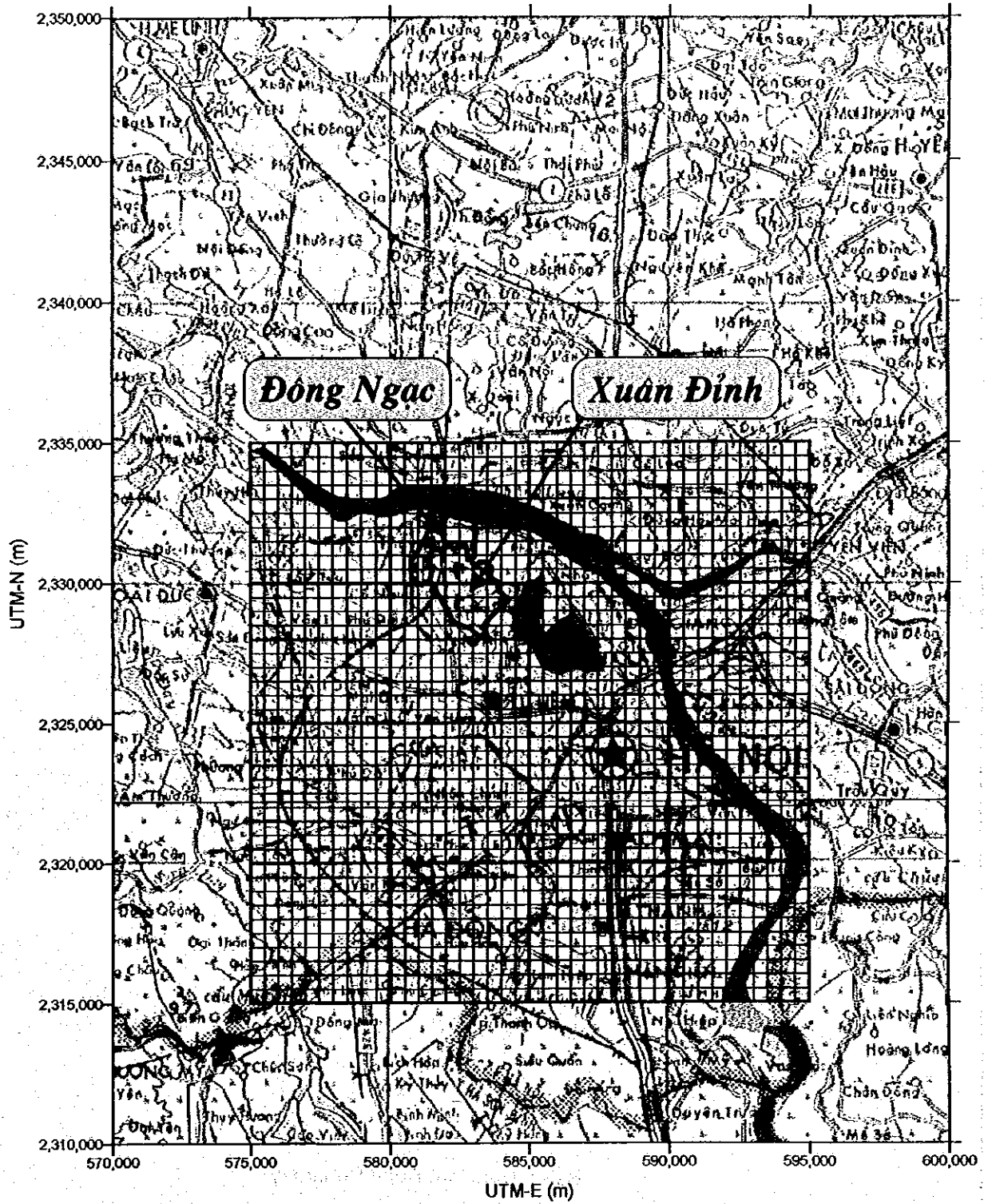


Figure 4.13	Schematic Structure of Hà Nội Groundwater Simulation Model
THE STUDY ON GROUNDWATER DEVELOPMENT IN THE RURAL PROVINCES OF NORTHERN PART IN THE SOCIALIST REPUBLIC OF VIETNAM	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

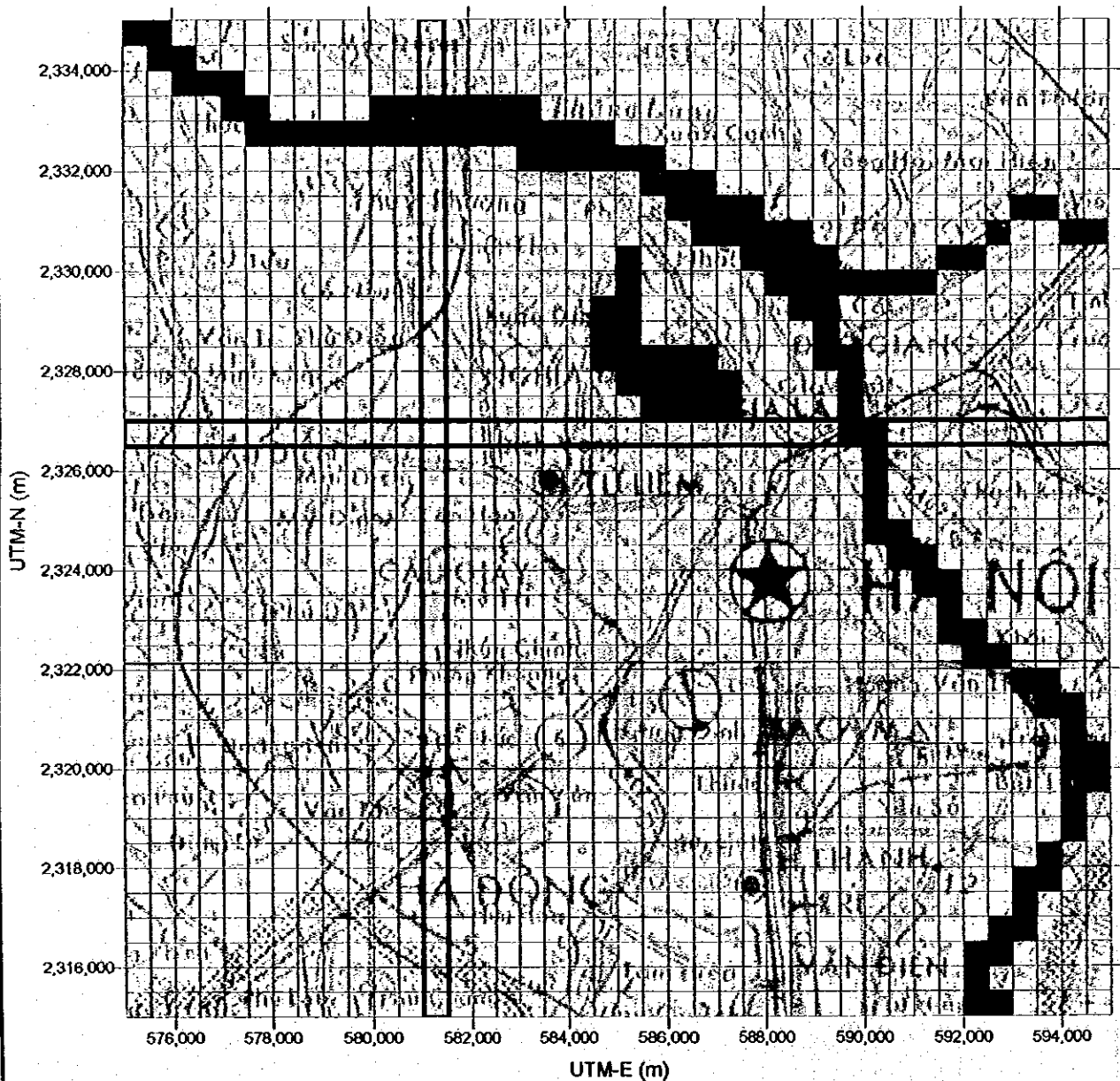


**Figure 4.14** Model Grid for Groundwater Simulation Applied to Hà Nội Area

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## Boundary Conditions of Layer-1



Constant-Head Boundary

Constant-Head Boundaries are set at Red River (Sông Hồng), Duong River (Sông Đuống) and West Lake (Hồ Tây).  
 No Constant-Head Boundaries are set in Layer-2, Layer-3, and Layer-4.  
 Water levels at Constant-Head Boundaries are given from the data of Surface Water Observation Points.

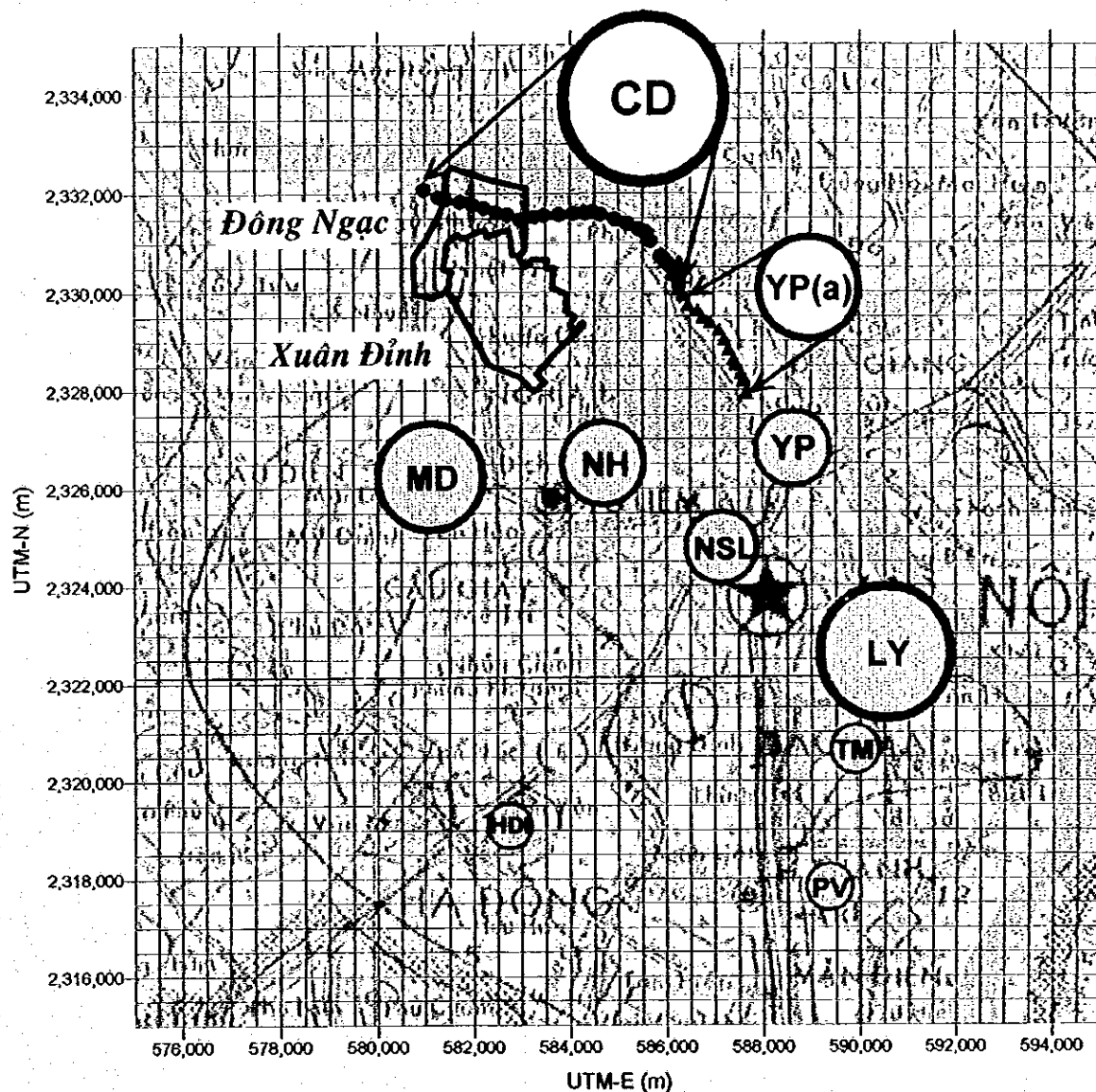
**Figure 4.15**

**Boundary Conditions of  
Hà Nội Groundwater Simulation Model**

**THE STUDY ON GROUNDWATER DEVELOPMENT IN  
 THE RURAL PROVINCES OF NORTHERN PART IN  
 THE SOCIALIST REPUBLIC OF VIETNAM**

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## Future Major Groundwater Well Fields in Hà Nội Area



- Proposed Well Location of Cao Dinh Well Field
- ▲ Proposed Well Location of Yen Phu Well Field

	Name of Well Fields	Number of Wells	Pumping Rate (m <sup>3</sup> /day)
1	Cao Dinh	26	97,964
2	Yen Phu (additional)	13	60,777
	<b>TOTAL</b>	<b>39</b>	<b>158,741</b>

[Data source: NHEGD-DGM (1998)]



Existing Well Field



Proposed Well Field

(Symbol size is proportional to its pumpage.)

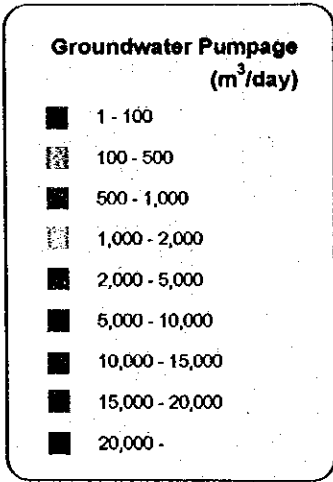
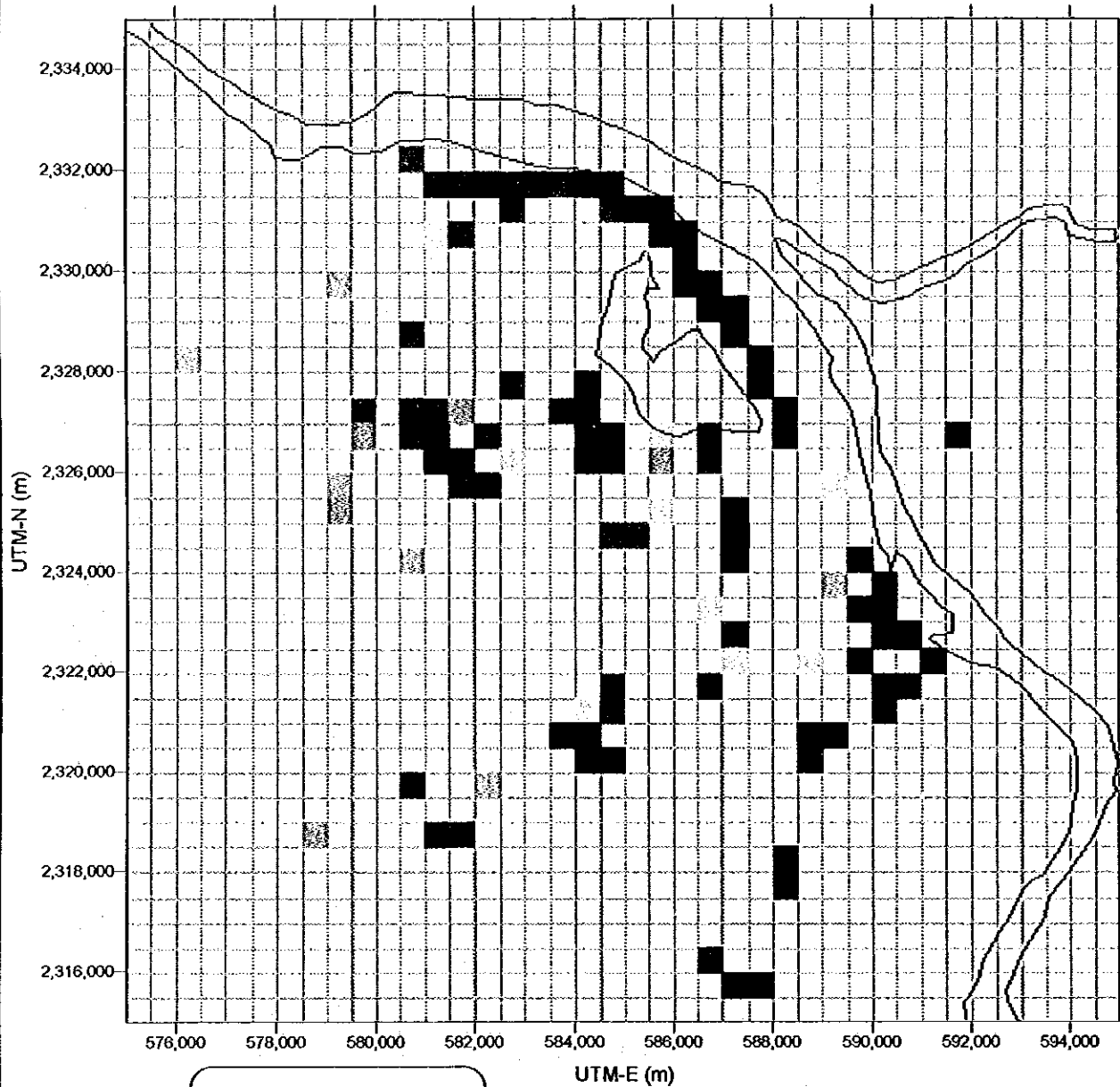
**Figure 4.16**

**Future Well Fields in Hà Nội Area for Future Prediction (Case-0)**

THE STUDY ON GROUNDWATER DEVELOPMENT IN THE RURAL PROVINCES OF NORTHERN PART IN THE SOCIALIST REPUBLIC OF VIETNAM

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# Input Groundwater Pumpage for Case-1



Top View: Layer 4 (Main Confined Aquifer)

**Figure 4.17** Input Groundwater Pumpage for Case-1

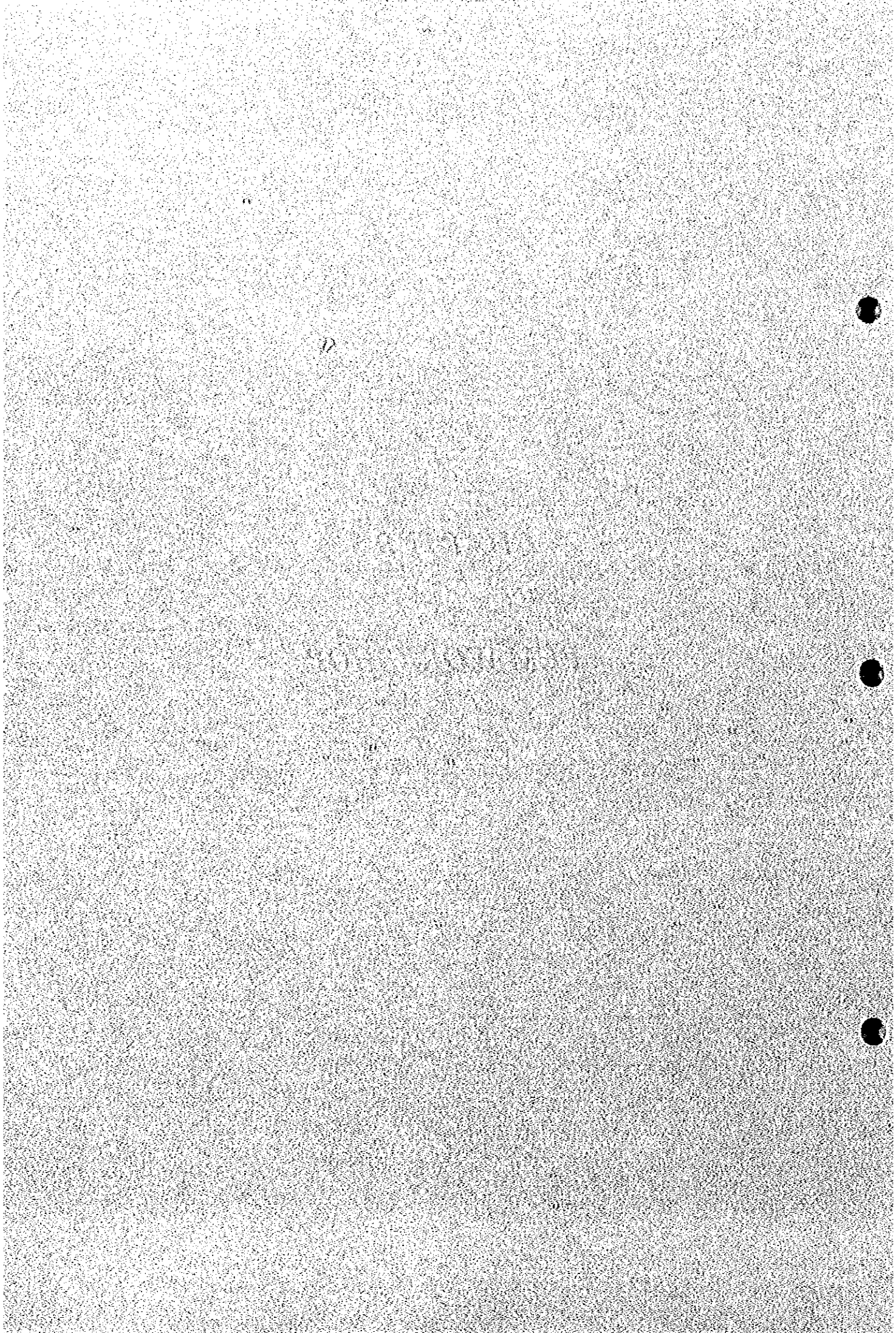
THE STUDY ON GROUNDWATER DEVELOPMENT IN THE RURAL PROVINCES OF NORTHERN PART IN THE SOCIALIST REPUBLIC OF VIETNAM

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***CHAPTER 5***

***PCM WORKSHOP***





## CHAPTER 5 PCM WORKSHOP

There were three main objectives for PCM workshops as follows.

- To analyze participants, problems, objectives and approaches of the future water supply and sanitation project using PCM method.
- Training of commune representatives, district planning staff, and provincial and central CERWASS staff for social mobilization with participatory method.
- To inform about concept and program of the Study for M/P and feasibility study.

Participants of this workshop are expected to be initiative group in their commune to manage social mobilization using workshops, during feasibility study and implementation of the future project.

Summary of the workshop is shown at Table 5.1.

### 5.1 Overview of PCM workshops

PCM is a planning method that is widely used in international cooperation. Using this method appropriately can strengthen following points.

- Consistency;
- Logical planning;
- Consensus orientation by participatory approach; and
- Transparency

Process of this method can be divided as follows.

#### [Analytical process]

- Participation analysis;
- Problem analysis;
- Objective analysis; and
- Alternative analysis

### **[Planning process]**

- Formation of Project Design Matrix (PDM)\*<sup>1</sup>
- Formation of Plan of Operation (PO)

### **[Monitoring and evaluation process]**

- Monitoring and evaluation using components of PDM.

As a first step of introduction of this method, analytical process is conducted with representatives of target commune, district-planning staff and provincial and central CERWASS staff.

#### **5.1.1 Participation Analysis**

The main objectives of this analysis are to identify the individual characteristics, the problems and the potential of all parties involved in the project and identify a "target group," the major beneficiary of the project. Additional purpose includes motivating future project participants and assessing the project, making any necessary adjustments to maximize its effectiveness.

Figure 5.1 shows an example of Participation Analysis.

#### **5.1.2 Problem Analysis**

The objectives of this analysis are to identify the main problems facing the target group and set up cause-effect relationships for each problem.

Figure 5.2 shows an example of Problem Analysis. In all workshops, necessity of clean water supply system is found to be outstanding.

#### **5.1.3 Objective Analysis**

The objective of this analysis is creating an objective tree by reversing the negative expression into positive one. This helps to identify ways to solve the problems. This tree shows relationships of components with mean-ends relationships.

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\*<sup>1</sup> Project Design Matrix: a matrix, which manifests components of a project (such as overall goal, project purpose, outputs and activities and inputs), relation of each component and extent of the project.

#### 5.1.4 Alternative Analysis

The objectives of this analysis are to identify approaches to achieve the objectives, based on the Objective Analysis, and select one or more priority approaches to devise a specific project strategy.

Figure 5.3 shows an example of Objective Analysis and Alternative Analysis.

In all workshops, centralized water supply system is identified as the best approach to achieve the Core Objective. Core objectives and priority approaches of all workshops are shown in Table 5.2.

### 5.2 Findings taken from discussion in workshops

In each workshop, there were exchange of questions and discussion to clarify the meaning of opinions proposed by participants. It must be worth much presenting some results of their discussion in this section. Appropriateness of the contents of these discussions will be checked by results of social investigation such as reference analysis, rapid rural appraisal and questionnaire investigation and will be incorporated in draft final reports.

Meanings of abbreviation are as follows.

TN: Thai Nguyen;

HN: Hanoi;

HT: Ha Tinh;

TH: Thanh Hoa; and

NB: Ninh Binh.

#### Issue 1: Who will determine water tariff?

- Commune can decide price, but approval of district will be necessary. (TN, HN and TH)

#### Issue 2: How much will be a maximum for water fee?

- VND 1,000 per m<sup>3</sup> will be a maximum (TN).
- VND 800 per m<sup>3</sup> will be a maximum (18 out of 21 participants in TH).
- VND 1,000 per m<sup>3</sup> will be a maximum (1 out of 21 participants in TH).
- VND 1,200 per m<sup>3</sup> will be a maximum (2 out of 21 participants in TH).
- VND 1,000 per m<sup>3</sup> will be a maximum (NB).

In one commune near of Hanoi (Lien Ha), they first set VND 1,500 per m<sup>3</sup>. But habitants did not pay that amount. So actually they are collecting VND1,200 per m<sup>3</sup> (HN).

**Issue 3: How much piped water will be used in each household?**

- About 5 m<sup>3</sup>/person/month (TN)
- About 10 to 12 m<sup>3</sup>/household/month (NB)

**Issue 4: How much each household can pay for household connection?**

- VND 400,000 to 500,000 per household will be a maximum for household connection. For many of habitants, a bank loan with low interest will be necessary to get house connection (TN).
- VND 800,000 to 1,000,000 may be a maximum for household connection (TH).
- VND 300,000 per household is considered to be a maximum for household connection. That is about VND 120,000 for water meter, and VND 180,000 for pipe connection (NB).
- Loan from Bank for Agriculture or commune fund will be necessary. Commune people had experience for this type of fund when electricity connection was installed (TH and NB).

**Issue 5: Estimation of increase of household connection**

- Before passing 1 year: 30 to 50 % of total households,
- After 1 year: 50 to 80 %
- After 2 years: 95 % (TH)
- After 3 months: 50 % of total households,
- After 1 year: 75 %
- After 3 years: 95 % (NB)
- In case of electricity, 80 % of households connected within 1 to 2 years. So for water, it is assumed the same way (TH).

**Issue 6: How to secure the adequate construction?**

- CERWASS should provide a clear request of design for construction, both for quality and quantity (HN).
- Selection of design company should be based on clear TOR and major list, then tendering (HN).

**Issue 7: If water fee is not enough for O&M, what measures will be taken?**

- Thinking ways to reduce cost, such as reducing salary for O&M workers (TN).
- If it is by accident, such as natural disaster, water committee should borrow money from

commune PC. If it is not by accident, water fee should be increased (HN).

- After one month of operation, calculation should be done again. Increase of water fee or temporary financial assistance from commune budget should be considered (TH).

#### **Issue 8: What are good ways for mobilization?**

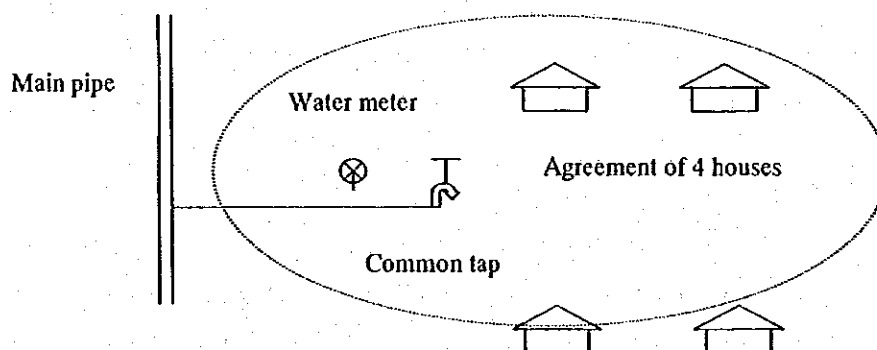
- PC, Unions, schools and health centers should be responsible for mobilization (HN).
- Visiting households is good way for dissemination. One propagandist can visit 40 to 50 houses per month. This activity will be done by voluntary basis (HN).
- Loudspeaker by PC and social organizations (TG,HN,HT, and TH)
- Social organizations (TH)
- Meeting in hamlets (each hamlet, one people will be in charge of mobilization for water project) (TH)

#### **Issue 9: How to reduce water loss?**

- The major causes of water loss in Vietnam are illegal water taking by free charge (from schools and health centers) and leakage from pipe system (NB).
- Measures for reducing water loss are follows:
  - O&M workers have to check the leakage of pipe (Training for worker will be necessary.).
  - Propaganda and mutual check for protection and prevention of illegal water use. Special regulation will be set up. For the people who violate the regulation, a penalty will be condemned (TH and NB).
  - Household connection should be done under supervision of committee of water supply (HN).

#### **Issue 10: Usage of common taps for remote houses**

- There will be 2 types of common tap. One type of common tap is for school, health center and offices. They will have water meters and will be managed without problem. Another type is for farmers of remote houses, this will be very problematic(NB).
- New type of common tap is possible to consider. If some households agree to have common tap only for these houses, it is possible to share construction cost for connection and have common tap (See Figure 3.2.4, They had similar experience when they had electricity.). But in any way, common tap is temporary measure in transition time. Design capacity should be based on the estimation that every household will have individual connection (NB).



**Figure 5.4 Image of common tap with agreement of some households**

- Schools and health centers can have common tap with water meter and if the usage is under a certain level, commune can cover water fee (TH).
- Very difficult to protect and collect money (TH)
- People will fight each other to collect water (TN);
- Impossible to collect water fee (TN);
- Impossible to know quantity used by each households (TN);
- If public tap is far from houses, it is difficult to convince them to collect water. (TN)

#### **Issue 11: How to set a rule about subsidy for poor people**

- For the people who cannot pay water fee on time by poverty, there should be subsidy (NB).
- According to households economy level, the households with special difficulty (less than VND 50,000 per person/month) will be subsidized for water fee. These households will be about 2 to 3 % of all households (NB).
- For those who are not in poverty and do not pay water fee, it will be requested using loudspeaker system (HN).

#### **Issue 12: What will be O&M workers' activities and their training?**

- At first, training cost should be included in initial investment of project. Later this cost will be managed by water fee of each commune (HN).
- Before operation, O&M workers from communes should have training of 3 to 6 months. The training should be done by Provincial CERWASS (TH).
- Trainers should be invited from Provincial CERWASS (HN).
- The workers should visit existing water supply system in other communes (TH).
- About 3 to 5 of fulltime O&M workers will be necessary (TN, HN, TH and NB).
- Their main activities will be operation of plant, control and repair of system and water fee collection (NB).

- Their salary will be about VND 350,000 per month. It is easy to find good worker with this salary level (NB).
- Criteria for these O&M workers are healthy, good behavior, ability, knowledge, no economic problem and responsibility (TN,TH and NB).

**Issue 13: How to secure the protection of public facilities?**

- By regulations for community property, propaganda, penalty and fence for facilities (HN).
- It is possible to complete vigilance in hamlet level (HN).
- Before construction, a propaganda and meeting are necessary for mobilizing people for regulation. For those who do not obey the rule, kind of punishment will be necessary (NB).

**Issue 14: How much contribution for construction can be expected from habitants?**

- People can offer manpower as well as necessary (TH).
- For manpower contribution, about 50 to 75 % of workable population can be expected (NB).
- For monetary contribution for construction, a rule will be determined through discussion. A range of VND 50,000 to 100,000 per household will be determined (NB).
- In a range of VND 200,000 per household (TN)

**Issue 15: What will be compensation for the landowners of the site of water facilities?**

- PC has about 5 % of land. They will have compensation of land from this land (So PC will loose income from this land.) (TH).

**Issue 16: Comparison of private water treatment and piped water system?**

- Filtration for dug well water needs about VND 2,000,000 and not economic (TH).
- Rainwater tank can reserve only 2 months of water (TH).
- In any case, centralized water system has economic and hygienic merit than private water treatment (HT and TH).
- No international assistance is available for household water treatment in target commune of Thanh Hoa (TH).
- There are about 10 UNICEF wells in each commune. And few houses are helped from DANIDA for material of drilled water (TH).



**Issue 17: How is income and expenditure level of average commune people?**

- In average one workable person can get 200 kg of rice grain in 2 Saos<sup>\*2</sup>. One kilogram of rice grain is equivalent to VND 1,500. Thus, in one harvesting, 200 kg<sup>3</sup>VND 1,500 VND 300,000 is income per person. Average harvesting times is 2 times. So standard income by rice production is VND 600,000 per person per year (NB).
- For pesticides, irrigation fee and tax, about VND 50,000 per person is necessary for each harvesting. Thus 2 times of harvesting needs VND 100,000 per person (NB).
- In total, yearly VND 500,000 per person is average income by rice production.(NB)<sup>\*3</sup>.

**Issue 18: How to maintain authority care?**

- In case they have difficulties by their own effort in commune level, representatives of commune request authority care for district and provincial level (HN and TH).

**Issue 19: How to get international assistance?**

- Requesting letter and some NGOs can visit communes for investigation (HN and TH).
- There is no way to request international assistance directly from commune or district. Only authority of provincial level can request (NB).

**Issue 20: What are measures for improvement of sanitary facilities?**

- Actually 70 % of double compartment toilet with self-filtration is used. Material donation will be necessary for promoting this toilet (TH).

**Issue 21: How to reduce usage of fresh dung as fertilizer?**

- Actually 60 to 70 % of human and animal dung is stored in field. They are easily thrown in surroundings by flood (NB).
- Construction of storage facility is necessary (NB).

**Issue 22: What are measures for domestic wastes?**

- District Solid Waste Management is responsible for collecting solid wastes. They collect and transfer to city landfill site (HN).
- Every week habitants should clean road and canal (TH).
- Domestic wastes collector should be contracted and dump in a remote place (TH).
- Every hamlet has a designated place for dumping solid wastes. They should have treated

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<sup>\*2</sup> 1 Sao is 360 square meters.

<sup>\*3</sup> Besides of rice production, a lot of households have other sources of income, such as vegetable cultivation, livestock breeding and small business, although rice production is basic income source in most households. The household-interview survey conducted by Study Team shows average income level of low, medium and high economic level in target communes. (See Table 3-2-3.)

properly with landfill method (NB).

**Issue 23: How to disseminate appropriate use of pesticides?**

- Cultivation of strong species should be promoted (TH).
- Inspectors of the DARD are visiting periodically (NB).
- People's understanding is different and more propaganda is necessary (NB).

**Issue 24: How to assure industrial wastes to be treated?**

- Paper mill factory is discharging liquid waste directly to the river. Commune made several requesting letters to district and provinces. But still they continue to discharge (TH).

**Issue 25: How to increase people's income? (In Hanoi, this was one of the approaches to achieve health improvement)**

- By improving infrastructures and creating more business (HN).
- By tax policy (HN)
- New cultivation in agriculture (HN)
- Handicraft (HN)

### **5.3 Recommendation for F/S**

Although findings through workshops should be checked by other sources of information, they are consensus of participants and worth considering carefully in feasibility study and implementation stage.

Through the workshops, some staff of central CERWASS are highly skilled as moderators of PCM workshop. And representatives of each commune, district PC staff and provincial CERWASS are also familiarized with this method. Thus conducting this type of workshops at commune level, during the detailed design and implementation stage is highly recommended to make sure preparation and mobilization of commune habitants. This workshop will be farther useful conducting at the same time with training for commune WATSAN committee, so that smooth continuation to the implementation of the future project shall be achieved.

***CHAPTER 6***

***SOCIAL CONDITIONS***

## **CHAPTER 6 Social Conditions**

### **6.1 Social Conditions**

Field Survey for the social analysis/ public participation was implemented in two periods from 23 August 1998 to 6th October 1998 and from 2nd January to 31st January 1999.

In first period, firstly the existing data was examined, and then the questionnaire survey for Commune People's Committee (after this, referred as "Commune PC"), the interview for Farmer's Union as representative group of main economic activity, the interview for Women's Union as object of gender analysis, the group mapping by commune people were implemented in each target commune. Moreover, the questionnaires for households were distributed for each commune.

In second period, the questionnaires for households were collected from each commune and supplementary survey was implemented. The method to input the answers of questionnaires for households to Computer was carried out. The results of answers of questionnaires for households were analyzed in from June to September 1999.

In the following, results of each survey without the questionnaires for households were explained. The results of questionnaire survey for Commune PC show the general condition of each commune. The results of the interview survey for Farmer's Union show mainly condition of agriculture as main economic activity, water use condition and needs for groundwater development from male standpoint. The results of the interview survey for Women's Union show mainly results of gender analysis, water use condition and needs for groundwater development from female standpoint. The results of group mapping show the geographical understanding by commune people for their commune, mainly environmental condition and water use.

### **6.2 Results of Household survey**

The questionnaires for households survey were distributed for 20 communes in September to October 1998, The questionnaires for households were collected from 20 communes in January 1999. The detailed analysis was carried out from August to September 1999. The Items of questionnaires are as follows;

#### **6.2.1 Items of the Questionnaire**

##### **(1) General conditions;**

Sex, age, marriage, religion, ethnic group, living year, home town, literacy, family member, No. of adult, last school of men and women, head of family, address of relative, reason of

separate living.

**(2) Residence and life environment;**

Space of house, space of garden, space of irrigated land, space of non irrigated land, space of other land, space of borrowed house, space of borrowed garden, space of borrowed irrigated land, space of borrowed non irrigated land, space of other borrowed land, number of rooms, constructed year of house, kinds of livestock, number of cow and bull, number of buffalo, number of pig, number of chicken, number of bicycle, number of motorcycle, number of car, number of TV, number of radio, number of electric fan, number of hand tractor.

**(3) Economy;**

Gender of income holder, occupation, income, remittance from relative, remittance to relative, income from rice, income from vegetable, income from fruit, percentage of self consumption of rice, percentage of self consumption of vegetable, percentage of self consumption of fruit, tax, irrigation fee, electricity charge, fuel other than electricity, borrowing money, propose of borrow, interest rate (year/month), sum of saving money, saving place.

**(4) Water;**

Drinking water source in rainy season, drinking water quality in rainy season, distance of drinking water source in rainy season, drinking water source in dry season, drinking water quality in dry season, distance of drinking water source in dry season, washing water source in rainy season, washing water quality in rainy season, distance of washing water source in rainy season, washing water source in dry season, washing water quality in dry season, distance of washing water source in dry season, cost of dug well, construction year of dug well, cost of borehole, construction year of borehole, cost of iron remove device, water vender, price of water, problem of water source type of toilet, how to dispose domestic waste water(solid waste).

**(5) Water quantity;**

Drinking and cooking, laundry, shower, livestock, other use, total use (rainy season and dry season), washing hands before eating, washing hands after work, washing hands after toilet, washing hands after touching livestock, washing hands in other case, drinking water of adults, drinking water of children, how to boil, how to boil water.

**(6) Payment ability for water supplies;**

Willing to pay for private piped water, cooperation for construction of water supply system, cooperation for cleaning of water supply system,

**(7) Health hygiene;**

Knowledge of disease to drink dirty water, to wash body or eye with dirty water, to wash foods and table ware with dirty water, insects or warms live in water bring disease.

Name of disease to drink dirty water, to wash body or eye with dirty water, to wash foods and table ware with dirty water, insects or warms live in water bring disease.

No. of sick person in family in last 6 months, sick person in last 6 months, source of hygiene knowledge, consultation of health problem, mass communication(TV, news paper, books).

**6.2.2 Analysis of the households survey**

**(1) Family member**

Figure 1 shows the number of family member in the target commune of Hanoi. It is understood that three person family and four persons family are main groups in the household survey result. It is analyzed that Xuan Dinh commune and Dong Ngac commune are making to the nuclear family because both communes are near Hanoi.

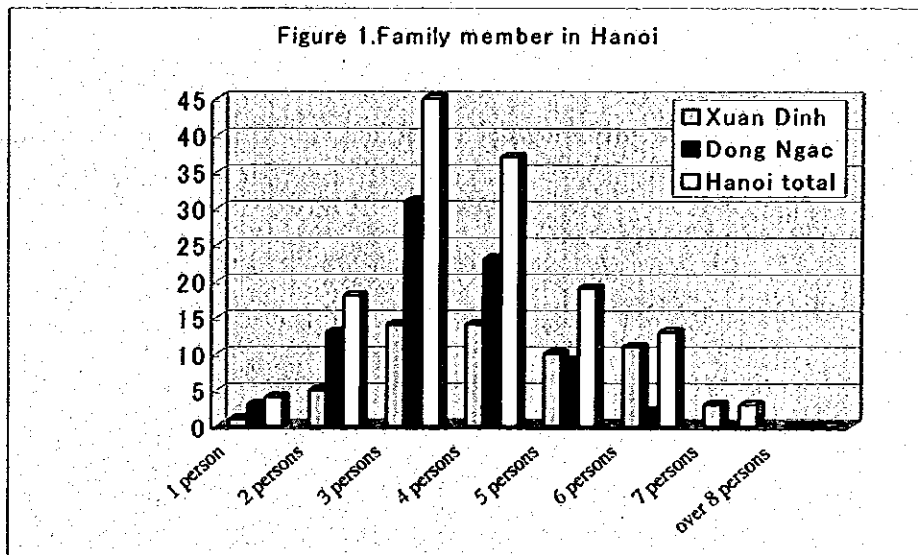


Figure 2 shows the number of family member in the target commune of Ninh Binh. It is understood that four person family and five persons family are main groups in the household survey result.

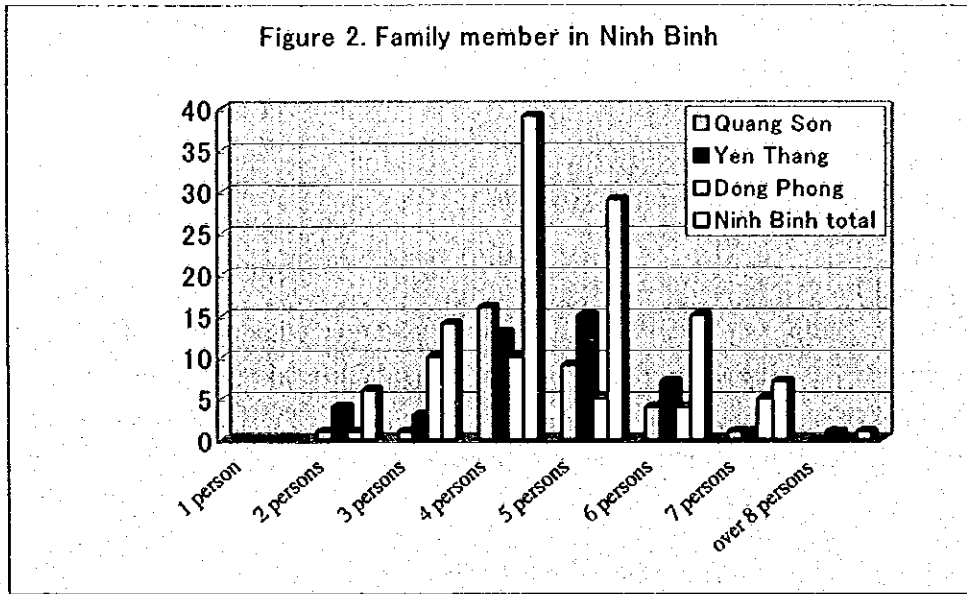


Figure 3 shows the number of family member in the target commune of Thanh Hoa. It is understood that five person family and six persons family are main groups in the household survey result.

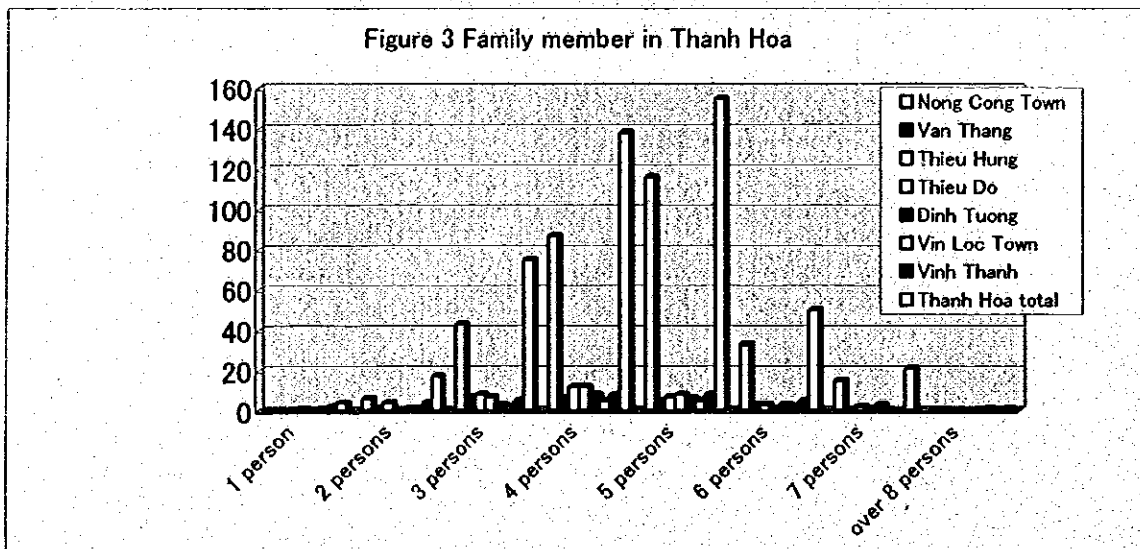


Figure 4 shows the number of family member in the target commune of Ha Tinh. It is understood that five person family and six persons family are main groups in the household survey result.

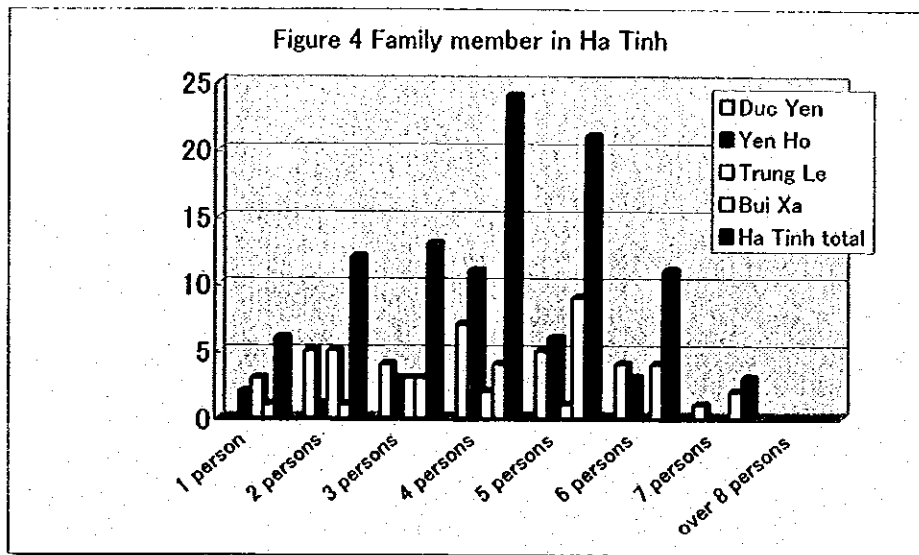
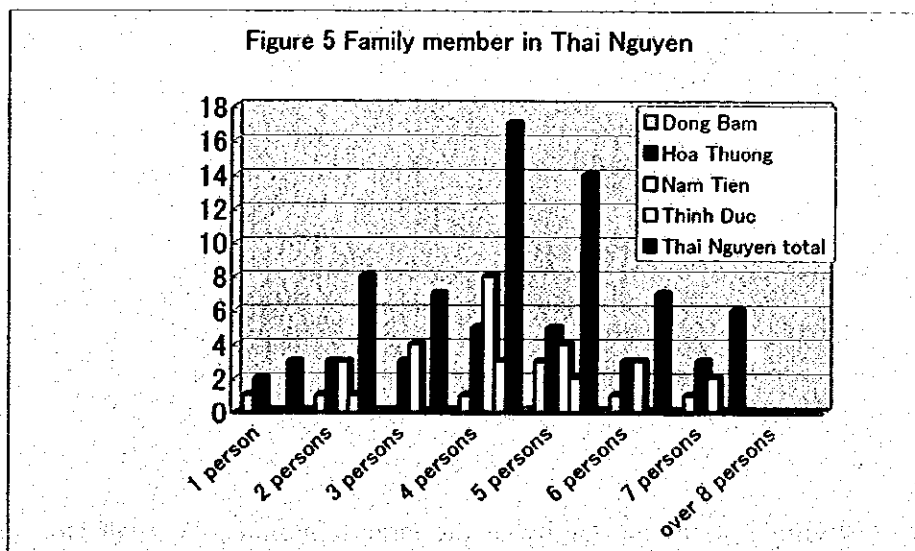


Figure 5 shows the number of family member in the target commune of Thai Nguyen. It is understood that five person family and six persons family are main groups in the household survey result.





**(2) Living year**

Figure 6 shows the living year of the family in the target commune of Hanoi. It is understood that family in the target area is settling down for 30 years or more.

Xuan Dinh commune and Dong Ngac commune are located around Hanoi, however many families are living for long term. It is understood that the reason for the family engaged in agriculture.

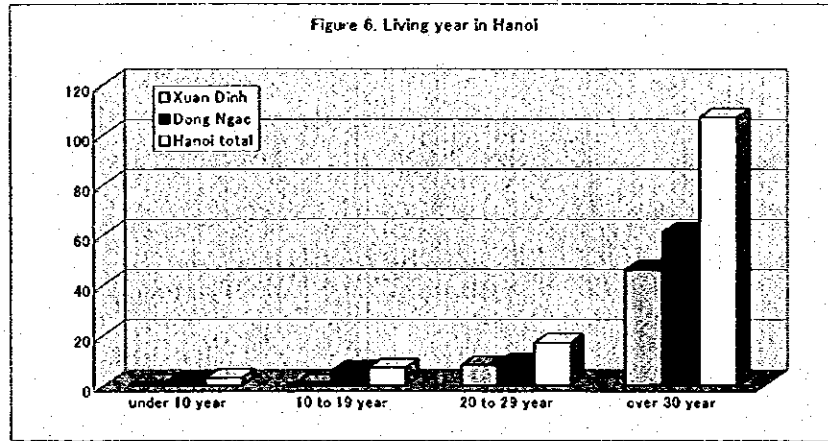


Figure 7 shows the living year of the family in the target commune of Ninh Binh. It is understood that family in the target area is settling down for 30 years or more same as Hanoi.

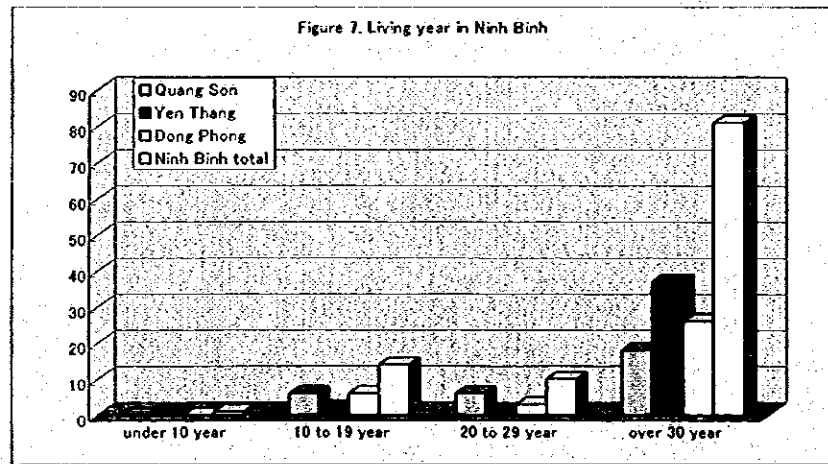


Figure 8 shows the living year of the family in the target commune of Than Hoa. It is characteristic that only family of Nong Cong Town and Vinh Loc Town is living under 10 year, In these communes, urbanization is advanced in recent years. Other families living in target commune is settling down for 30 years or more same as Hanoi.

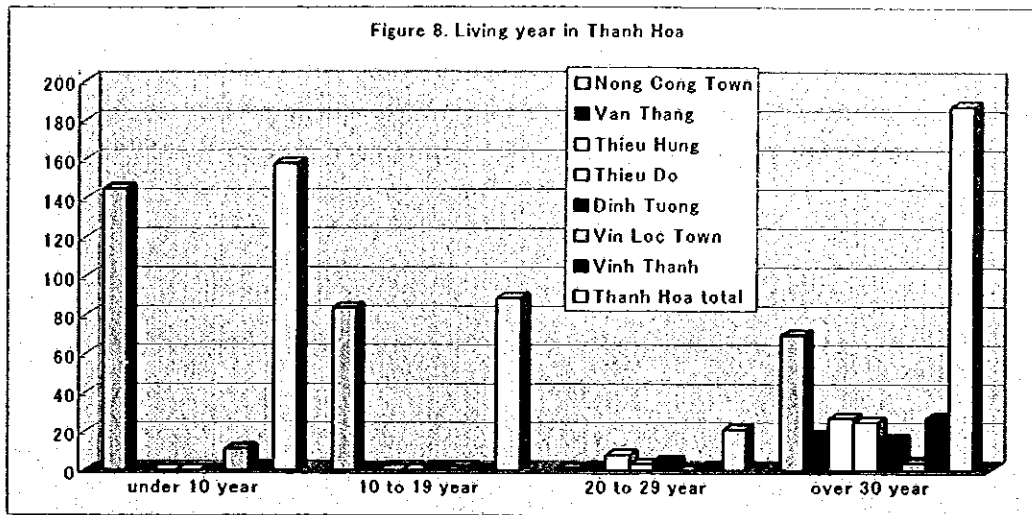


Figure 9 and figure 10 shows the living year of the family in the target commune of Ha Tinh and Thai Nguyen. It is understood that family in the target area is settling down for 30 years or more same as Hanoi.

