Vietnam agricultural science institute

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Assessing Participatory Rural Environmental Management in the Craft Villages

(Cat Que commune, Hoai Duc district, Ha Tay province)

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Abbreviations and Acronyms

AD	Administrative Departments
CPC	Commune People's Committee
LMO	Local Mass Organizations
PRA	Rapid Rural Appraisal
SWOT	Strength, Weakness, Opportunity and Threat
VASI	Vietnam Agricultural Science Institute
VND	Viet Nam Dong

Part I - Introduction

1.1. THE IMPORTANCE OF ASSESSING RURAL ENVIRONMENTAL MANAGEMENT

The history of rural development in Vietnam is closely linked to villages and craft development in rural areas. The craft village represents the bridge connecting agriculture and industry, rural and urban. The most important thing is to create jobs for villagers and contribute an important role in improving farmers' living standards in rural areas. Therefore, craft village activities contribute an important role in village development and the improvement of farmers' living standards in rural areas.

During the last decade, along with rapid national economic development, craft villages have been significantly promoted. Many craft villages are currently developing without guidelines and planning briefs from local authorities. The underlying causes of small industrial development at village level are from the farmers' urgent living demands, however this development provokes many challenges. The most urgent challenge in the small-scale industrial villages so far is environmental pollution. This challenge is on the one hand, attributable to the rapid development of craft villages', and on the other hand impacted by villagers' community. The damages and consequence of environmental pollution not only affect local community health and weaken the ecological balance but also negatively impact on neighboring villages and challenge the sustainable development in the small industrial village.

Local communities need to play a central role in solving these challenges, since the capacity of local authorities is limited with regards to budgets and management capacity etc. The activities of local people cause the environmental pollution and they are also the victims of the pollution.

Under the framework of Project UNDP/FAO/ VIE/00/018/08, in 2003 a trained team of VASI's researchers conducted an in-depth assessment on participatory rural environment management in selected craft villages in Ha Tay province.

1.2. OBJECTIVES

1.2.1. Overall objectives:

- Assessing the level of public concerns and collaboration between various stakeholders, especially the participation of local communities in managing the local environment within craft villages.
- Drawing out feasible recommendations on improving institutional and policy aspects to achieve better rural environment management.

1.2.2. Specific objectives:

- Assessing the current situation of environmental pollution in the craft villages, based on local communities' perception,
- Assessing the cooperation and collaboration between villagers, mass organizations and local authorities in rural environmental management. Appraising community participation in environmental management and protection,
- Conducting SWOT Analysis on craft villages' rural environmental management,
- Together with local communities, working out feasible solutions and action plans on participatory rural environmental management.

Part II - Content and methodologies

2.1. CONTENTS

- Research the current environmental pollution situation and assess its damage to village community health base on community opinion.

- Evaluate the factors that cause environmental pollution and the subsequent effect on the environment based on the community opinions.

- Assess the role of administrative offices, mass organizations and community in environmental management and protection

- Evaluate the limitations, strengths, opportunities and threats in rural environmental management.

- Provide support to villagers to enable the establishment of active plans in environmental management with a focus on villager participation.

- Suggest solutions to improve and overcome environmental pollution

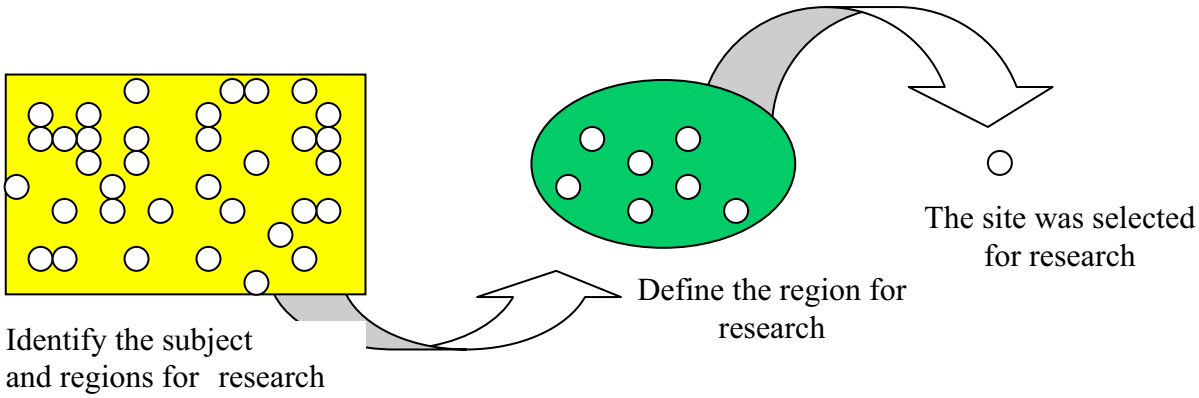
2.2. SELECTED RESEARCH SITE:

2.2.1. The basis to select research site:

Selection of the research site was based upon meeting the project objectives and content requirements. After agreement with local authorities and villagers, a site was agreed to where environmental pollution has become an urgent matter. Villagers' willingness to participate was also highly regarded in the selection of the research site.

2.2.2. The following steps were carried out to select the research site:

Fig. 1. The process of selecting the research site



- *Identify the subject and region for research:* Based on the project objectives and contents in the Terms of Reference, the research team gathered relevant documents and discussed the subject of the research. From the research and discussion the team defined the broad region for study.

- *Define the region for research:* After the study of regional documents, preliminary research group discussions and consultation with the National Coordinator and various consultants the selected region was further defined for research.

- *Selected site for research:* From the defined region, the research site was selected as it was considered representative of the greater research region, and it allowed for the required activities of the project to be completed.

Following these criteria, Cat Que commune, Hoai Duc district, Ha Tay province was selected for research. Cat Que is a small industrial village concerned primarily with food processing and animal husbandry was selected for research to appraise the role of the community in environmental management. Cat Que is one of three communes involved in large scale food processing in Ha Tay province, it is also faced with the biggest problem of environmental pollution. Cal Que is a small village producing environmental pollution and also receiving pollution from neighboring locations.

In Cat Que commune, communities such as Xuan Thang and Tam Hop villages were selected to conduct in - depth research on community participation in environmental management. In Xuan Thang village, locations No.1 and No.6 were selected to organize a meeting of community participation in environmental management. Both of these communities have homogenous characteristics of production. However their neighboring communities experience different levels of economic benefits and knowledge. Thus, after appraisal it was concluded that these communities would suit the research requirements.

2.3. RESEARCH SCOPE:

This research concentrates specifically on community evaluation and participation within environmental management in the rural small industrial village of Cat Que commune, Hoai Duc district, Ha Tay province.

2.4. METHODOLOGIES

2.4.1. The level of information collected:

Provincial level: The research team collected data and information from administrative officers and technicians from the departments of Resource and Environment, Agriculture and

Rural Development, Center of Spare Health and other offices relevant to rural environmental management in Ha Tay province.

District level: Data and information relating to environmental management activities in Ha Tay province was collected from the Department of Rural Infrastructure's Management and the Department of Statistics of Hoai Duc district.

Commune level: Data and information relating to environmental management was collected from the Chairman of the People's Committee, land survey staff, literary staff and other staff members who have a responsibility within environmental management. The data and information was collected by interviews and discussion groups.

Villager community level: This group consisted of people that created environmental pollution and those that lived with its effects. They were involved in group discussion and assessment of environmental pollution within their village.

2.4.2. The kind of information collected

- A secondary data source was from documents published in Journals, Statistical Year Book, and reports from authorities related to environmental management. The findings were analyzed and summarized for use in the report.

- Community meetings were held in the village and were designed to collect the required data.

2.4.3. Methodologies applied in data collection:

- Rapid Rural Appraisal (PRA) application:

PRA technique was applied to collect the secondary data. A questionnaire was designed to interview villagers and staff members. This process was applied as follows:

- With the available data: The research team visited departments of the Province, District and Commune levels involved in environmental management. The research team consulted the National Coordinators and related consultants to set up the questionnaire (See Appendix 1) This questionnaire was comprised of both open and closed questions. The initial questionnaire design was trialed, and amended twice before the final questionnaire was produced and applied to the research site.

- *Participatory Rural Appraisal (PRA) was applied:*

The PRA application aims to collect information relating to community opinion. The information presented was agreed upon by the community as a whole, rather than individuals. In using this method, the researchers play a passive role in the discussion, they record information discussed by community members and will at times direct the discussion to ensure

that the content is relevant. PRA measures included: Village history; Time line; Transect map; Venn diagram; Planning for action, etc. PRA application was carried out as follows:

- The available information was discussed and enumerated to suit the requirements of the project.
- A community meeting was held in the village and included the elders, youth, women, animal producers (small and large scale), food processors (small and large scale), processing workers, Village Party Secretary, Head of Village and representatives of the mass organizations present in the village. They participated in an assessment of the rural environment around their village. The selection criteria of participants focused on the individuals representing the diverse components of the village. The Head of Village was encouraged to invite participants to the meeting held under the guidance of the research team. The research team provided guidance on the subjects to be discussed and then played a passive role, recording information discussed amongst participants.

2.4.4. The method for analyzing and summarizing information

- *Information summarization:* The collected data was summarized using Microsoft Excel. Many of the key indicators used in these reports were identified by applying this programme.

- *Analyzing method:* Integrated statistical indicators were used for analysis. A qualitative social approach was applied to analyze the relationship between perceived community responsibility and actual environmental management. The logistics analysis framework was also applied in writing this report.

- *SWOT and* Reference methodologies with in-depth analysis were also used in this report. SWOT was used to analyze the strength, weakness, and opportunities and threats identified in environmental management with the community's participation. The reference method was used to confirm the research results. The progress report was presented to villagers and commune staff and feedback was encouraged. The report was then consolidated and presented to the regional meetings to encourage comments from province and district officers. The final report is the result of research and comments from relevant authorities.

Part III - Overview Craft villages and environmental pollution

3.1. THE HISTORY OF CRAFT VILLAGES

Following the collation of available documents by the research team, it became apparent that there was a lack of information relating to the history of craft villages. There was no basis with which to affirm the correct time to establish a craft village. Further research produced historical data that indicated the ideal time to establish craft villages was dependent on the specific characteristics of the period and the current and predicted demand for craft village outputs. The collected documents showed that craft villages have traditionally been established under specific conditions and within particular historical periods. The establishment and development of craft villages is dependent on a period of economic development and institutional strengthening within a specific historical period. In the history of Vietnam's social development, paper production of Yen Thai, silk village of Van Phuc, hand-made pottery village of Bat Trang and the painting village of Dong Ho all used to be famous for their unique traditional product, all of which played an important role in the civilization of the Vietnamese people.

After the liberation of Vietnam, the north and south united under a social communist government that controlled the economy. At this time the private economy was not recognized as a component of the national economy, as a result private enterprise did not have the opportunity to develop resulting in many craft villages failing to be sustainable, some even disappeared altogether. The reduction and slow disappearance of craft villages is seen to be naturally occurring due to both subjective and objective reasons. Moving to a free market economy from the traditional decision making economy, all components were recognized as playing an important role. During this period, many of the craft villages were restored and redeveloped.

Until now, we have been unable to determine the correct time for the establishment of craft villages. The decline, maintenance or development of craft villages has depended on the historical period and their potential benefits for the national economy.

3.2. THE CRAFT VILLAGE DEVELOPMENT

The Vietnam Party Congress No. VI helped to move Vietnam into a new era based on economic development. The economy moved from a decision making to market economy a

result of the directive from the social communist party. The policy for economic development included multiple components, the private sector was now recognized as an important component in the national economy. This view was central to the stimulation of craft village development. Many craft villages that had previously been in decline began to restore the local economy and rapidly develop beyond.

The statistics show that Vietnam has 1,400 craft villages. Of this, the Red River Delta has 731 craft villages accounting for over 50% of the total in Vietnam (Duong Ba Phuong, 2001). The average annual laborers who work full time in each craft village is 813 peoples, this figure does not include the large number of seasonally hired labor. Of the 731 craft villages, traditional craft villages only account of 29.4%, while new craft villages account for 70.6% (Table 1).

This finding is very interesting and can be explained as follows: Traditional craft villages made their products by hand which required a high degree of skill. Often machines used in the production process were misapplied, such as in painting and pottery villages. The produce of the new craft villages was made dependent on the market demand for the items.

The success of newly established craft villages is the basis with which to affirm their contributions to the modernization and industrialization of rural economies and agricultural structures. In 1995 (4 years after moving to a market economy), the total number of craft villages in Red River Delta was 439, accounting for only 34% of the total of craft villages in the country, in 1998 the same area had 731 craft villages (an increase of 308). The Red River Delta has many provinces rapidly developing craft villages, including Ha Tay, Ninh Binh, Thai Binh, Bac Ninh, Nam Dinh. In 1996 Ha Tay province only had 839 craft villages including 88 craft villages (10.4%) fit for the province standard of craft village, however by 2000 Hatay had 972 craft villages (an increase of 133 craft villages) accounting for 66.6%. In comparison the total number of villages in the province, in this case 120 craft villages (12.3%), are fit for province standard (Khuat Huu Son, 2001). By 2003 Ha Tay had 1,116 craft villages, accounting for 76% of the total number of villages in the province, including 160 craft villages fit for province standard (Hatay Journal, No 2915). Like Hatay, Thai Binh province had 40 craft villages in 1994, by 1998 this figure had increased to 82 including 14 traditional craft villages and 68 new craft villages.

The role of craft villages in the **"§oi moi (Renovation)"** has proved to be very important in creating employment for farmers in rural areas. In these craft villages, many thousands of laborers have permanent employment with a relatively good income. In 1998, craft villages in Bac Ninh employed 34,000 labors including 31,000 locals and 3,000 labors from neighboring villages. In 1996 in Ha Tay the total number of laborers in craft villages was

110,900, this increased to 161,000 in 2001 and 2003. 75,000 farmer households consisting of 230,000 laborers have permanent employment in craft villages (Hatay Journals, No 2915).

As well as creating employment, craft village production contributed to the diversification of products in both local and export markets. Yearly production quantities from craft villages has meant that they account for a significant total of the national economy. In Ha Tay the total revenue from 120 craft villages was 1045 billion VND (equal to US$70 million) accounting for 35% of the total of industrial production in the province (Khuat Huu Son, 2001).

The development of craft villages has resulted in a marked increase in the industrialization of rural areas. Industrial production in craft villages was primarily conducted by advantaged households. On average, the provincial industrial production account has increased from 60% to 80%. This rate is expected to increase further in the coming years (Duong Ba Thu, 2001).

Benefits to craft villages is dependent on micro directional government planning. Craft village growth has contributed to economic development, modernization and industrialization of rural areas in Vietnam, particularly in the employment of villagers (unemployment in Vietnam's rural areas has proved to be extremely difficult to overcome). Craft village development also assists to conserve valuable cultural traditions. These precious traditions are taught to the next generation as well as introduced to international destinations through the export market. However, craft village development also induces environmental degradation and pollution.

Table 1: Craft villages and employment in Red River Delta (1998)

Province	No of craft village(*)			Employments (People)
	Total	Traditional craft village	New establishment of craft village	
Thai Binh	82	14	68	88,505
Ninh Binh	165	20	141	87,221
Nam Dinh	90	19	61	52,132
Ha Nam	37	16	21	38,802
Hai Duong	42	30	12	34,440
Hung Yen	39	11	28	22,394
Hai Phong	80	15	65	33,762
Bac Ninh	58	31	27	34,120
Ha Noi	40	20	20	68,679
Ha Tay	**88**	20	68	**113,956**
Vinh Phuc	14	9	5	20,595
Total	**731**	**215**	**515**	**594,303**

(*) Craft villages fit for national standard

Source: Duong Ba Phuong, 2001.

3.3. ENVIRONMENTAL POLLUTION IN CRAFT VILLAGES

Although, craft villages contribute a significant amount to the national economy, the problem of environmental pollution has increased rapidly resulting in a very serious situation. Soil, water and air in and around craft villages have all been found to contain high levels of pollution. Research team summarizes the results as follows:

- Water resource:

Surface water in the majority of craft villages was found to be seriously polluted. The sort and level of pollution found depended on the production methods used in the specific craft village. The current condition of surface water in food processing and animal feeding villages were found to not support life of animals or plants.

Tam Da commune (Yen Phong district, Bac Ninh province) has 900 households participating in the production of wine. Annually, this commune has consumed approximately

12,000 – 13,000 ton of cassava slice and 22,000 – 23,000 m^3 water to produce 1.2 – 1.3 million liter of wine. The waste water from wine production and animal husbandry has resulted in the surface water turning dark in color and emitting an odor, affecting villagers' living in the commune and neighboring areas.

In Nam Dinh, statistics from the Department of Technological Science and Environment show that a total of 12,000m^3 liters of waste water per day from craft villages remains untreated. The mechanical village of Van Chang, Nam Truc district has 14 electroplating tanks. These tanks allow the flow of approximately 40 – 50m^3 liters of untreated waste water containing the toxic chemical substances H_2SO_4 and NaOH directly into the river. It is estimated that toxins levels in the water in this village would be over the acceptable limit.

Ha Tay contains the most craft villages in Vietnam, and the environment was found to be seriously polluted. During the dry season, water in the Day and Nhue Rivers (essentially romantic and beautiful rivers) became seriously pollution due to the waste water run-off from factories and companies, in particular from food processing villages in Phuc Tho, Hoai Duc and Quoc Oai districts. The water in these rivers was dark in color, and dense with a bad odor seriously affecting the agricultural production and living activities of farmers. The public is made aware of the environmental pollution through radio and television, despite this no solution to the problem currently exists.

-Air pollution in craft villages:

Almost all of craft villages experienced air pollution, the level of pollution depended on the kind of production. The level of air pollution was found to be more serious in villages involved in pottery, mechanics and carpeting villages rather than painting and food processing villages. Duong Ba Phuong (2001) showed that the measurement of suspended dust particles in the air in Van Chang village exceeded 5 to 10 times the allowable standard. In the areas of polishing metal, the suspended dust particles exceeded the Vietnam standard by 34 times. In Huong Canh (Vinh Phuc) suspended dust particles from brick and tile production are large in diameter, 21mg/m^3. In the aluminum, zinc and lead casting villages in Van Mon commune (Yen Phong, Bac Ninh district) large particles of dust containing heavy metals initially hung in the air, before covering trees, and roofs affecting the health of villagers. The amount of lead in this areas exceeds the standard level by 87.2 times. In Ha Tay, air pollution levels are similar to the previously mentioned province. Duyen Thai village, Thuong Tin district is the representative village for air pollution. Dust from paint products in Duyen Thai contaminated the air resulting in negative effects to villager’s respiration. In villages involved in metallic production, such as Phung Xa (Thach That), Thanh Thuy (Thanh Oai), air pollution also became a very serious issue, highlighted by the amount of smoke and dust.

In addition to the smoke and dust, foul odors originating from canals, small rivers and ponds contributed to making the air stale and unbreathable. Researches found that offensive odors occurred in every village involved in food processing and/or animal husbandry. In Bat Trang, CO rose 5 times over acceptable standard, in Huong Canh: 2 times. The concentration of SO_2 was over 10 – 15 times, in some locations this rose up to 25 times (Duong Ba Phuong, 2001). Temperatures in pottery, mechanical, metal making and food processing villages was found to be consistently higher than other villages. In the pottery village of Bat Trang, the temperate was 1.5 – 3.5^0C higher than neighboring villages. In the metal making of Da Hoi village (Tu Son, Bac Ninh), the temperate was higher from between 7 to 10 degrees than in neighboring villages (Nguyen Si Tien, 2003).

There are many factors involved in local pollution of the environment, these include: the production methods used, lack of planning and direction and a lack of villager awareness. A combination of these reasons has resulted in environmental pollution becoming a problem that has exceeded the ability of villagers to rectify the situation by themselves. The problems facing these villages are considered more serious when the producing plants lie in close proximity to densely inhabited areas that include elders and children. This research introduces and outlines the urgent problems of the environment based on the community participatory assessment. We feel that the results of the participatory assessment should be acknowledged by the appropriate authorities.

Environmental pollution in craft villages was easily identified by its damaging effects to the surroundings. Environmental management needs to acknowledge all aspects of the environment that have been adversely affected and work to improve and protect it for the activities of people in the village.

3.4. CRAFT VILLAGES IN HA TAY AND POLLUTION LEVELS

Ha Tay province, in which agricultural production is the main source of employment, is located close to Vietnam's capital of Hanoi. It covers 2192.9 square kilometers and has a population of 2.3 million, 90% of which live in the rural areas. Hatay consist of two provincial towns, 14 district towns and 310 communes.

Rural areas in Ha Tay display the characteristics of the greater Red River Delta region. Agricultural production is highly intensive compared to other provinces, however Ha Tay's point of difference is its diversity of craft villages. Statistical information from Ha Tay Industrial Department indicates that industrial production increased by 20.7% for the period of 2000 to 2003. Ha Tay currently has 1,116 craft villages accounting for 76% of Vietnam's total,

including 160 craft villages fit for provincial standard([1]). These range over 4 fields and include 14 different kinds of craft production (see Table 2). Craft villages in Ha Tay have attracted 75,000 households, therefore supplying thousands of laborers to participate in small industrial production.

The development of craft villages stimulated economic growth and benefits, however it has also caused environmental pollution. The Natural Resources and Environment Department has divided craft villages in Ha Tay into five regions based on craft production as follows:

- Food Processing villages (Region 1).

These villages play an important role in Hoai Duc, Phuc Tho, Quoc Oai and Thach That districts. In these districts food processing villages established include Tan Hoa and Cong Hoa, Quoc Oai district, Lien Hiep, Phuc Tho district, Cat Que, Duong Lieu and Minh Khai and Hoai Duc districts. These villages produce mainly cassava and canna flour, rice vermicelli, husked mungbean, crystal sugar, etc. These centers of food processing consume between 250,000 and 300,000 ton of cassava and canna materials annually.

[1] The province standard of craft village: over 50% household participating in craft production, value of craft production accounting for over 50% comparing with total revenue in the village per year (decribled in Decision No 1492/1999/Q§-UB dated 23 Dec. 1999 by Hatay People Committee

Table 2: Number of craft villages in Ha Tay distributing in district, 2003

Kind of craft production	Ha Dong	Son Tay	Ba Vi	Chuong My	Dan Phuong	Hoai Duc	My Duc	Phu Xuyen	Phuc Tho	Quoc Oai	Thach That	Thanh Oai	Thuong Tin	Ung Hoa	Total
I. Textile and consumed goods															**35**
1. Silk weave	1		1										1		3
2. Fabric weave and screen						3	1							1	5
3. Carpet and knitted wear						1			1						2
4. Embroider							2	2	1				10		15
5. Leather, cotton and fishing net								6				2	1	1	10
II. Food processing															**26**
1. Noodles, cake						2		1			1	4			8
2. Food processing			5		2	5		1	3	2					18
III. Forestry processing															**88**
1. Lacquer, enchasing								7					1		8
2. Sculpture						1						2	2		5
3. Carpentry					1			2			4		4		11

4. Other forestry processing					2							1			3
5. Bamboo processing			3	15			1	9		5	3	10	5	4	55
6. Incense making												3		3	6
IV. Metallic															**9**
1. Hammering	1														1
2. Mechanics											1	5	2		8
Total	**1**	**0**	**9**	**15**	**5**	**13**	**2**	**28**	**5**	**7**	**9**	**27**	**27**	**9**	**160**

Source: Department of Industry in Ha Tay, 2003

Over the past several years, producers in these craft villages have increased yields by 2 to 5 times through industrialization improvements, this has also increased waste and other pollutants. Almost all waste water and other wastes from food processing and animal husbandry run directly into irrigated canal systems, polluting the environment. As the polluted water spreads by natural water flow and leeching, three surrounding villages were affected. The Province People's Committee and Department of Natural Resources and Environment have made a commitment to solve the problem of environmental pollution in these areas. A factory worth 4 billion VND was established to treat waste water, but has had only a limited effect.

-Weaving and dyeing craft villages (Region 2).

On the outskirts of Ha Dong are Duong Noi (in Hoai Duc), La Khe and Van Phu (in Ha Dong), all of which are located opposite large factory sites such as HaDong Textile and Dye factory. The local environment has been seriously polluted by waste water. During production water was contaminated with toxic substances, which was subsequently allowed to run directly into the river, thereby adversely affecting villagers' health. Following reports from the Department of Science Technology and Environment in 2001 - SS, COD, BOD_5 substances exceeded 1 to 4 times the acceptable standard. A planning project was established by authorities that aimed to limit maximum environmental pollution within the province and also included downstream villages.

- Mechanics and wood processing villages (Region 3):.

Famous craft villages involved in wood processing include Trang Son, Huu Bang (in Thach That), Van Diem (in Thuong Tin). In these craft villages environmental pollution is caused primarily by paint products, cleaning chemicals and noise. The villages of Da Si (in Ha dong), Thanh Thuy (in Thanh Oai) and Phung Xa (in Thach That) are involved in the construction of wooden products using hammering techniques that create large amounts of noise which adversely affects the health of villagers', especially elders and children. Some of the households use chemicals to electroplate, the waste water created from this process has also created serious environmental pollution.

- Painting, bamboo processing and sculpture craft villages (Region 4).

Famous bamboo processing, lacquering and encasing villages include Phu Nghia, Truong Yen (Chuong My), Duyen Thai, Nhi Khe (Thuong Tin), Chuyen My, Phu Tuc, Dai Thang (Phu Xuyen) Binh Phu (Thach That). Today pollution levels in these villages is less than in the food processing villages. However, the use of chemicals for painting and drying have created poisonous waste for villagers, animals and plants. Duyen Thai (Phu Xuyen) is a typical example of this occurring.

- Brick and tile producing villages (Region 5).

Villages located on the edge of the Red River such as Sen Chieu, Van Nam, Hong Van, Kha Thais, Quang Lang villages in Phuc Tho, Thuong Tin and Phu Xuyen are involved in the crafts of brick and tile making. The smoke from the kilns pollutes the air, adversely affecting villagers' health. In areas that used kilns, and therefore created air pollutants, harvest yields were noted to have decreased. As a result, Ha Tay province restricted the use of kilns to specific areas in an attempt to minimize environmental pollution, however no notable change was achieved. Pollution levels depend on the kind of crafting production, as shown in Table 3.

Table 3. Classifying environmental pollution follows kinds of crafting production in Ha Tay, 2002.

Pollution level	Kind of crafting production	Representative village	Reasons
Less polluted	Hammering Lacquer, fine arts making Leather shoes making Weave fishing net Wood processing	Da Si (Ha Dong) Chuyen My (Phu Xuyen) Lam Dien (Chuong My) Gie Thuong (Phu Xuyen) Son Ha (Phu Xuyen) Son Dong (Hoai Duc)	Noise, chemicals and paints are primary factors involved in pollution
Medium pollution	Wood furniture making Bamboo processing.	Huu Bang (Thach That) Phu Nghia (Chuong My)	Cleaning chemicals, paint, noise and dust are primary factors in pollution
Serious pollution	Food processing Metal. Textile and dye Animal feeding	Cat Que, Duong Lieu, Minh Khai (Hoai Duc) Lien Hiep (Phuc Tho) Huu Hoa, Cong Hoa (Quoc Oai) Phung Xa (Thach That) Van Phuc (Ha §ong) Duong Noi (Hoai Duc)	Waste water, garbage from food processing, dung are primary factors in pollution. Chemicals used for electroplating, noise and paint also contribute significantly to pollution

Source: Hatay Department of Science Technology and Environment, 2001

3.5. ENVIRONMENTAL POLLUTION OF CRAFT VILLAGES IN HOAI DUC DISTRICT IN THE PRESENT

Hoai Duc is a district with active economic development, especially amongst small scale industrial production, a high percentage of this is attributable to rural craft production. Total revenue from industrial and craft production in 2002 was 380 billion VND; of which 120 billion VND in value was exported. In 2002 the rate of industrial and small industrial production achieved a growth of 18.8%. The private sector contributed significantly to the economic development of the district. While the public sector attained 15 billion VND (4%), cooperative: 15 billion VND (4%), private enterprise attained 150 billion VND (39.5%), household: 200 billion VND (52.5%) (Reported by Hoai Duc People Committee, 2003).

Development of the crafting industry in rural areas has brought about environmental pollution, particularly in localized areas. Hoai Duc has 13 craft villages that meet the provincial standard, however six of these villages are experiencing environmental pollution that is amongst the worst seen in Vietnam. They are food processing villages in Cat Que, Duong Lieu and Minh Khai communes and textile villages in Duong Noi commune. Pollution has affected these villages as well as surrounding areas.

Currently there is no effective solution to improve and protect the environment. Existing policies are aimed at the reduction and minimization of further pollution and, have not been institutionalized within the villages.

3.6. DOCUMENTS RELATING ENVIRONMENTAL MANAGEMENT

The decisions, instructions, directions and resolutions relating to environmental management were formulated by administrative offices. They were summarized as follows:

From administrative office in province level:

- Direction No 12 CT/UB dating 6 May 1994 was promulgated by Province People Committee on environmental protection. This direction regulated the role of environmental protection as necessary to protect the environment.

- Direction No 14 CT/UB dated 20 July 1994 was enforced by Ha Tay province People Committee on assessment of social economic projects and production plants impact on the environment.

- Direction No 16 CT/UB dated 5 May 1997 was promulgated by Ha Tay People Committee on mobilizing ‘Fresh Water and Environmental Sanitation Week’.

- Decision No 544/1998/Q§ - UB dated 5 June 1998 was promulgated by Ha Tay People Committee on regulating responsible management of two towns in Hatay.

- Direction No 38 – CT/TU dated 18 July 1999 was promulgated by Hatay People Committee on strengthening environmental sanitation.

- Direction No 60/CT – UB dated 9 May 1999 was promulgated by Ha Tay People Committee on carrying out the models "Farmer households keep environmental sanitation by applying biogas and produce organic fertilizers from dung and waste water after biogas disintegration".

- Decision No 739/1999/Q§ - UB was promulgated by Hatay People Committee on popularizing the regulation of environmental protection.

In addition, some of documents regulated on environmental protection in specific region as follow:

Temporary regulation of managing Huong Pagoda was promulgated by Ha Tay People Committee dated 6 June 1998.

- Instruction No 01/1999 KCM – Mtg dated 17 October 1999 was enforced by Department of Science Technology and Environment on guideline of carrying environmental protection in Ha tay province".

District level:

- Temporary regulations on environmental protection were promulgated by Hoai Duc People Committee in October 1998.

- Resolution No 06 NQ/H§ in 16 July 1998 was promulgated by Hoai Duc People Committee on strengthening environmental protection from 1998 to 2000.

- Environmental pollution was addressed in the hand over between district and commune leaders.

Commune level:

The commune level is responsible for announcements related to environmental protection in craft villages. Complaints relating to environmental pollution are initially resolved by commune leaders. Commune staff worked with villagers in Que Duong to write the convention of cultural villages, including terms of maintaining environmental sanitation. Commune authorities ensured the implementation of environmental protection techniques were possible.

Village and community level:

Although communities do not have the right to promulgate decisions, environmental protection was addressed in village meetings under the control of the Village Head. Opinions and ideas relating to the responsibility of environmental protection were recorded. Mass

organizations mobilized many actions relating environmental protection. The Elder's Association organized the collection of garbage and reminded descendants to maintain the environment. The Youth Union is extremely active in garbage collection and the cleaning of irrigation systems.

Part IV - Research results in Cat Que Commune

4.1. NATURAL CONDITIONS, BUSINESS AND PRODUCTION SITUATIONS IN CAT QUE COMMUNE

Cat Que commune is located in the north of Hoai Duc district, the north of the commune borders Duong Lieu commune, the east borders Duc Giang commune, the south borders Yen So and Sai Son (in Quoc Oai) and Lien Hiep (in Phuc Tho) are on the west side. The Day River runs over the border between Cat Que and Sai Son, Lien Hiep on the western side (see Fig. 2)

Cat Que Commune is separated into the village area and the plain area located close to the Day Dyke. The village area is Xuan Thang consisting of six hamlets (1, 2,3,4,5 and 6). In Xuan Thang the inhabitants support themselves with food processing and animal husbandry. The plain area has three villages of Thap Thuong, Cat Ngoi, Tam Hop. Tam hop village was divided into two hamlets (8 and 9). In Tam Hop, inhabitants primarily support themselves on pig husbandry, trading activities and home gardening. Inhabitants in Cat Ngoi village primarily support themselves through vegetable cultivation and pig husbandry. Inhabitants in Thap Thuong village (area 7) are mainly involved in animal husbandry and home gardening.

Cat Que is geographically narrow and has a very large population. The natural area of Cat Que is 410 ha, and it supports a total population of 14,000 people. The average land parcel per capita is very low, approximately 200 m^2 (see Table 3). Rice yield is 11 ton per ha with a rotation rate of 2.75 times per annum, however farming density only accounted for 19.1% of revenue.

Cat Que has 2,600 households with 14,000 people. The majority of these household's participate in animal husbandry, with 900 households (34.6%) participating in food processing. The commune has a total of 28,000 pigs (averaged 11 pig per household), 638 buffalo and cows. Cat Que provides about 2,200 ton of pig meat to local markets annually (see Table 3).

Craft production and food processing has developed rapidly and accounts for a large percentage of the economic development. Annually, Cat Que produced 8,350 ton of processed product, including 4,500 ton of cassava manioc flour, 1,200 ton of traditional maltose, 800 ton of sugar, 1,300 ton of husked mungbean, 300 ton of cana vermicelli and 250 ton of candy and cakes. The large scale of skilled animal husbandry and food processing in Cat Que qualifies it fit for recognition as a provincial standard craft village.

Historically Cat Que has been traditional craft village. Archaeological ruins in Bai Pagoda revealed that weaving and casting activities had been conducted by farmers in Cat Que

for thousands of years (Phan Huy Le and et al, 1980). In more recent years, the Cat Que people have invested large sums in capital to develop crafts with the aim of creating employment, increasing the average income and improving living conditions. Despite the current diversity in crafts, animal husbandry and food processing have traditionally received the greatest amounts of capital investment. In the ten years to now, investments have been made to renovate production technologies, resulting in a productivity increase of between two and three times. Product quality was also raised to meet market demand.

Rapidly developed animal husbandry and food processing industries has created large volumes of waste water, general industrial waste, dung and garbage. This waste has caused environmental pollution and adversely affected villagers' health.

Fig. 2. Distributed population and research sites

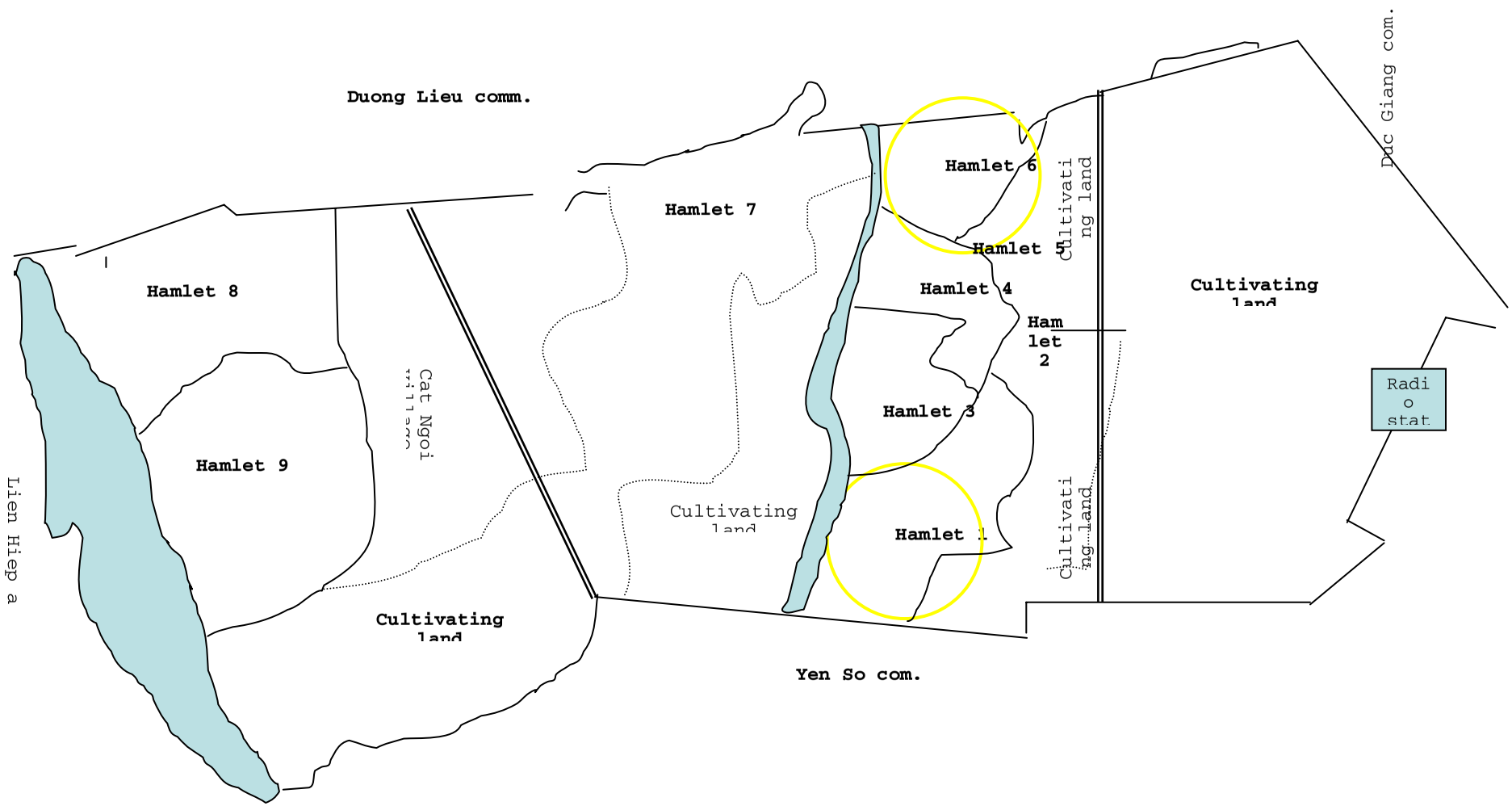


Table 3: General introduction of Cat Que commune, 2003.

No	Description	Unit	Quantity	(%)
I	**Land area**			
1	Total of natural land area	ha	411	100.0
1.1	Total of cultivating land area	ha	287	69.8
	- Average of cultivating land per capita	m^2	205	-
II	**Social economic condition**			
1	Total of population	Person	14.000	-
2	Total of household	household	2.600	
3	Total of labor	Person	7.000	-
4	Total of household participating in food processing	Household	900	-
5	Averaged rice yield per year	Ton/ha	11,46	-
6	Number of buffalo and cow	Animal	638	-
7	Number of pig	Animal	28.000	-
8	Pig meat produced per year	Ton	2.200	-
9	Total of cassava flour produced per year	Ton	4.500	-
10	Total of traditional maltose produced per year	"	1.200	-
11	Total of sugar produced per year	"	800	-
12	Total of mungbean husked per year	'	1.300	-
13	Total of cana vermicelli produced	"	300	-
14	Quantity of candy and cakes	"	250	-
III	**Environmental condition**			
	Drilled well following UNICEF standard	%	90	-
	Number of household use water from drilled well	%	100	-
	Biogas	Unit	230	-
	Invested for environmental	Mil. VND	226	-
IV	**Total of revenue**	**Mil. VND**	**36.000**	**100.0**
	Including: - Revenue from food processing	"	9828	27.3
	- Revenue from cultivating	"	6888	19,1
	- Revenue from livestock		11.772	32,7

	- Revenue from services	"	7.512	20,9
V	**Total of loan**	**Mil. VND**	**20.000**	**100.0**
	- Loan for food processing investment	'	8.500	42,5
	- Loan for animal livestock development	"	6.200	31.0
	- Loan for serving rural service	"	5.300	26.5

Source: Cat Que People's Committee, 2002

4.2. VILLAGER'S AWARENESS OF CRAFT DEVELOPMENT HISTORY IN CAT QUE COMMUNE

The research team asked villagers to record events related to their village history and development. The results are shown in Table 4. This period in history was recorded as follows:

Before 1975: At this time only Northern Vietnam was liberated. Land cultivation activities were centralized for cooperative production and operated within the decision making economy. During that time, the northern region was required to provide personnel and food to the south to combat the allied forces and install communism in the south. Rice farming is recorded as the main kind of agricultural production in Cat Que commune. Cloth weaving, sugar processing, cana vermicelli and animal husbandry had not yet developed. At this stage the environment was considered to be in very good condition, with fresh water sources and clean air. The water from ponds and the village well was used for everyday activities by the community. Health epidemics had not yet appeared.

Period from 1975 to 1985: With the north and south united, the whole country was governed under social communism. The national economy was based on a decision-making model. The decision-making economy had developed over a short period, and it became apparent that it had limitations, highlighted by the poor in rural areas lacking adequate food. At the same time war broke out on the northern border with China. In order to overcome these difficulties, cloth weaving, sugar processing and cana vermicelli was maintained and developed. In this period, crop cultivation was the main kind of production, animal husbandry had not yet developed. Water sources for everyday activities of villagers was still drawn from village wells and ponds. Health epidemics involving people and animals had not appeared.

Period from 1986 to 1991. This period contained many remarkable events. The most notable was Decision 10 and Directive No 100 which saw the transfer from decision making economy to a market based economy. Peasant and private economic components were now recognized equally under the national economy. Crafting production of cana vermicelli, cassava flour, molasses, maltose and animal husbandry developed rapidly during this period. However, craft villages in Cat Que commune experienced many difficulties. The exchange in 1985 caused high inflation, East Europe's collapse in 1990 reduced possible export markets and left Cat Que with the problem of where to sell their products. During this period molasses processing kilns were introduced and as a result air quality diminished. The village now relied on deep wells to provide water for everyday activities and production. Epidemics caused by environmental pollution had not appeared. However, hog chorea, swine pasteurellosis and neonatal diarrhea appeared in Cat Que.

Period from 1990 to 1995: This period saw a large increase of craft villages in the Cat Que commune. The Provincial Party promulgated a resolution for craft villages to restore and develop in the Province Party Congress No VIII. In Cat Que, animal husbandry, cassava flour, maltose and sugar processing developed rapidly. Molasses production decreased and cloth weaving disappeared altogether. The change in production focus seriously degraded the environment, waste and garbage was strewn across the village. Deep wells created by mechanical drilling supplied water for villager's activities and production. In this survey, villagers were not able to identify which diseases associated with environmental pollution occurred, however it was agreed that some had begun to appear.

Table 4. The craft villages in Cat Que commune and environment situations were reflected by community

Description	Before 1975	1975 - 1985	1986 - 1990	1991 - 1996	1996 up to now
Relating events	- Hot war in the south - North region strengthen production and help physical strength and food for south	- Historical liberation in the south. United country rose to social communism -Northern border war occurred	- Decision No 10 and Direction No 100 were promulgated - East European area collapse affecting export market. - Party Congress No 6th	- Province Party Congress No 6th popularizes Resolution on craft village restoration and development	- Five Year Plan No 2 - National economy develop rapidly, - Asia Monetary Crisis
Production	- Mainly cultivating - Cloth weave developed (1956) - Rais silkworms developed (1966) - Molasses started in small size - Animal feeding weakly develop	- Mainly cultivating. - Cloth weave develop. - Raise silkworms strongly develop - Carpet weave for exportation (1977) - Embroidering for export - Molasses developed strongly - Animal husbandry developed. - Cana vermicelli started developing	- Cana vermicelli strongly develop. - Starch processing start 1981. - Molasses strongly develop. - Traditional maltose started (1985). - Cloth weave only maintained - Carpet weave strongly develop, embroider went down (1988) - Sugar production occurred - Animal husbandry developed - Silkworms disappear (1986)	- Animal husbandry developed strongly - Cassava flour processing developed strongly - Maltose developed strongly - Sugar making develop. - Husked mungbean processing start developing. - Cloth weave reduced and disappeared (1992) - Woolen carpet weave and embroider reduced and disappeared - Molasses developed weakly	- Cassava flour processing developed strongly - Animal husbandry developed strongly - Husked mungbean processing developed strongly - Candy and cake production started developing (1996) - Maltose Factory was built (1998). - Crafting maltose production strongly developed in 1996-1997, then going down and non-maintenance. - Sugar production only perfunctorily maintains. - Non- maintenance of molasses.

Description	Before 1975	1975 - 1985	1986 - 1990	1991 - 1996	1996 up to now
Environment situation	No problem	No problem	- Air environment was polluted because of smoke from molasses kiln and cana vermicelli cooking	- Water in pond and lake were polluted by waste water and wastes from food processing - Air was polluted by coal smoke, and foul odors	- Water was polluted by food processing activities. - Air pollution increased

Description	Before 1975	1975 - 1985	1986 - 1990	1991 - 1996	1996 up to now
Water sources for villager's activities	Communal ponds and village wells	Communal ponds and village wells	Communal ponds and village wells	Deep well, drilled wells (hollow level)	Drilled wells (very deep level)
Human health	No problem	No problem	No problem	- Respiration and gynecological diseases increased	- Cancer, respiratory trouble, female and dermatological disease increased
Animal diseases	- None discrimination	- Swine pasterellosis, erysipelas appeared	- Erysipelas, swine pasterellosis and hog cholera appeared	- Erysipelas, swine pasterellosis and hog cholera appeared	- Mycroplasma pneumonia; neonatal diarrhea appeared. - Enzootic pneumonia

Period from 1996 up to now: Despite the Asian Monetary Crisis, craft production in Cat Que continued to develop rapidly, causing further environmental damage. The water in surrounding ponds and lakes was polluted and was no longer able to support aquatic animal life. Sources of fresh water were greatly reduced, leaving the village to rely on water from drilled wells for everyday activities and food processing. The incidents of terminal diseases such as cancer increased along with gynecological and dermatological diseases and mycoplasma pneumonia, neonatal diarrhea, etc.

4.3. THE MOST URGENT MATTERS WITHIN THE VILLAGER COMMUNITY OF CAT QUE COMMUNE:

Assessing these urgent matters attracted the enthusiastic participation of the community. The research team chose three locations and organized meetings to assess the situation: (1) Assessment in Tam Hop village included 13 participants (5 female, 11 males, all of whom participated in craft production); (2) Assessment group in Hamlet No1 (Xuan Thang village) included 16 participants(7 females, and 9 males) all were involved in craft production); (3) Assessment group in Hamlet 6 (Xuan Thang village) included 15 participants (4 female, 11 male) all were involved in craft production. The results are shown in Table 5.

Table 5. The urgent matters with villager community in Cat Que commune:

Urgent matters	Tam Hop village	Hamlet 1 (Xuan Thang)	Hamlet 6 (Xuan Thang)	Average (1)
I. The urgent matters with villager community in Cat Que commune				
6. Lack of employment	4	6	7	5,7
4. Lack of capital	5	8	8	7.1
5. Markets for output	6	7	7	6.6
1. Environmental pollution	8	10	10	9,4
3. Unsafe agro-products in the field	-	8	-	8
2. Animal disease	-	-	9	9
II. No of participants in group assessment				
Total participants	13	17	15	45
- Female	5	7	4	16
Participants attending crafting activities (2)	11	16	15	42

Note: (1) Average estimate by number of participants
(2) Crafting activities including animal husbandry and food processing
Marking scale: - 1 = matter not considered serious
-10 = matter considered very serious

Method of assessment: All participants are members of the village community. They discussed the issues amongst themselves and listed urgent matters which they believed needed to be addressed urgently. After discussion and listing urgent matters, the participants agreed to rank each matter on a scale of 1 to 10. A mark of 10 was given to the most serious matters, and 1 for matters not considered important. The final score of each matter was agreed upon by the community and is synthesized in Table 5.

The results in Table 5 show that the urgency of matters depended on kind of craft production. The community outlined six urgent matters which they are faced with in their everyday activities: (1) Unemployment; (2) Lack of capital; (3) Difficulty in accessing the consumer market; (4) Environmental pollution; (5) Use of dangerous agro-products; (6) Animal disease.

Of these six urgent matters, environmental pollution was considered the most serious (9.4 points). In Hamlet 6 (in Xuan Thang village) environmental pollution and animal disease were regarded as the two most serious problems, possibly implying that animal husbandry and development was closely related to environmental pollution. The research team then looked at the effects of animal husbandry on environmental pollution and the effects of pollution on animal disease.

4.4. ENVIRONMENTAL POLLUTION IN CAT QUE COMMUNE

4.4.1. The factors involved in Cat Que environmental pollution

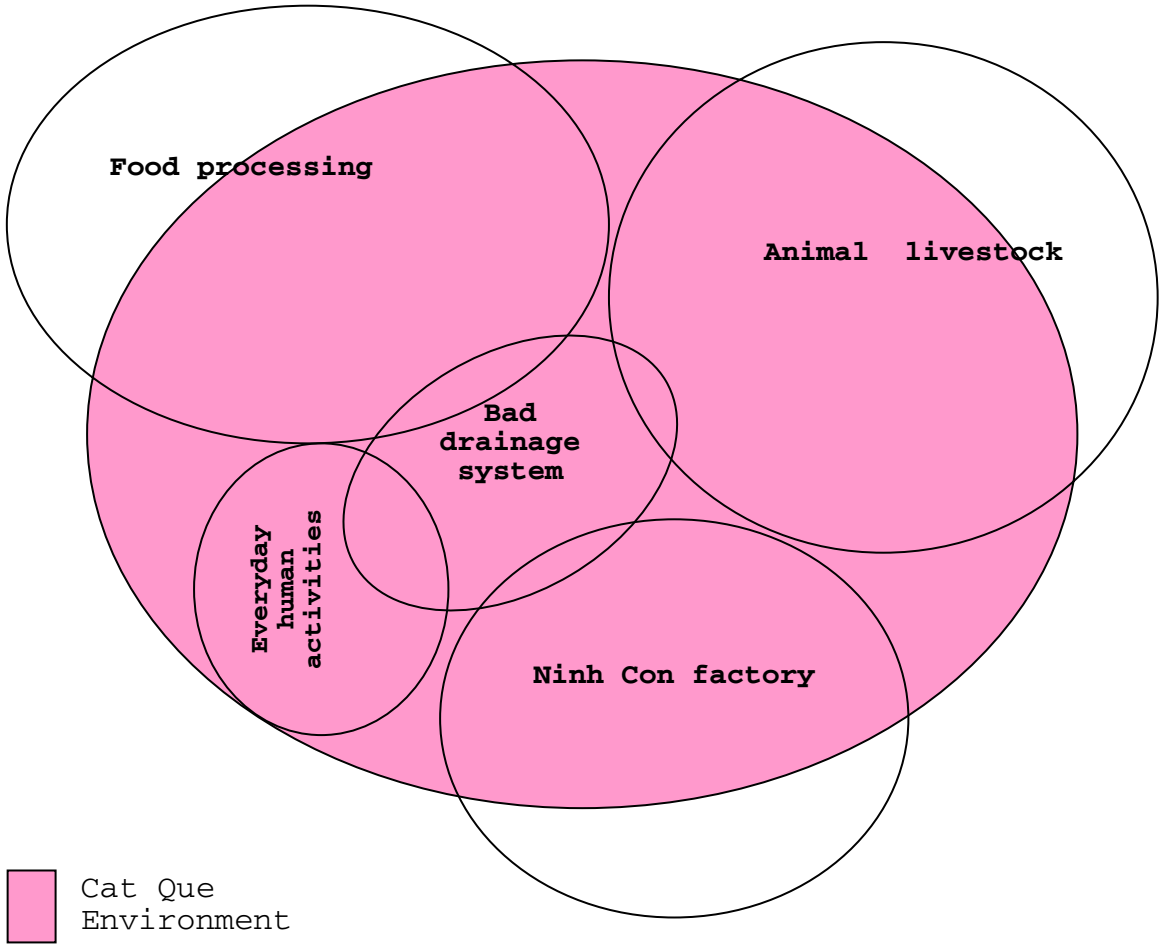


Figure 3. Factors involved in Cat Que environmental pollution as per participatory assessment

Through the use of participatory assessment a description of the factors damaging the Cat Que environment was drawn in Figure 3. The large colored circle illustrates the Cat Que environment. The smaller circles of different sizes display the different sources of damage to Cat Que environment. The results will be shown in Figure 3.

Figure 3 shows that the Cat Que environment was simultaneously adversely affected by the activities of animal husbandry, food processing, Ninh Con factory and human subsistence farming. Animal husbandry and food processing waste are the largest sources of environmental damage in Cat Que. Although Ninh Con is located outside of the Cat Que commune it shares the same drainage system and therefore damages the Cat Que environment. The area of circle outside the main environmental circle indicate that these factors also damage neighboring locations. Activities within Cat Que contribute to pollution in other locations, possibly creating conflicts between the villages involved.

These factors, combined with poor drainage systems have caused serious damage to the environment. The drainage system problem is shown in Figure 3.

4.4.2. ENVIRONMENTAL POLLUTION LEVEL IN CRAFT VILLAGES OF CAT QUE COMMUNE

Box 1. Village pond for fresh water became a tank of containing waste water

My family is big. I was a soldier returning from combat. I have six children. Not long ago I adopted an orphan. He is seventh member in my family. Four years ago the village ponds were fed young fishes and villagers came here to carry water for their life. At that time, everybody in this village agreed that waste water did not flow to this pond. But it was not long before villagers agreed and then accepted waste water from animal feeding coming here. At that time, I tried to protect the water but was not successful. Some people fought with me. My fight was not my over my benefit of fish feeding, my fight only for maintaining the ponds for getting fresh water. They said fish feeding will be better if animal dung flow here. Then, I could feed fish in this pond with full dung. And,.. surface of pond, you can see... Water was colored dark black, floating dung and very strong smell. He said, only fire the surface can burn. Seriously! His face seems bored. Beautiful village pond became a tank of containing waste water in the short time.

Applying the ranking reference of PRA, participatory assessment of polluted environments is shown in Table 6. It shows that the majority of environmental components in Cat Que were polluted. According to the community assessment, rivers, ponds and lakes, air and deep wells were all heavily polluted. Drainage systems were considered to be the most seriously polluted. Water in the drainage system was dark black in color, was less fluid and emitted a strong odor. The community assessed the drainage system as the greatest point of concern. The result in Cat Que also highlighted that there was no plan to improve the drainage system. The majority of the drainage system was built by villagers (each household individually built their own section) therefore it was not uniform and often ineffective. In addition, very few are covered and most are directed to the nearest stream or lake. Therefore the smaller ponds and lakes quickly became seriously polluted, while the larger ones took a little longer to show the same effects. The surface of ponds and lakes were covered by a yellow film, while underneath the water was dark in colour and had an odor. Aquatic animals were unable to live in these conditions.

Table 6. Description and assessment of environmental pollution

No	Component of environment	Description	Assessing point	Forecasting environment in the following years
1	**River system (Day River)[2]**	- Water was a dark color, muddy and emitted a foul odor - Aquatic animals were unable to survive	8	*****
2	**Pond and lake**	- Water was a dark color, thick and had a foul odor in the dry season. Water surface was covered by thick black film. If fire came, it could be burn in dry season - Aquatic animals were unable to survive	9	*****
3	**Drainage system**	- Water was a dark color, thick And emitted a foul odor	10	*****

[2] Day river runs over Cat Que commune

No	Component of environment	Description	Assessing point	Forecasting environment in the following years
4	**Deep well**	- Water was a dark color, surface covered by a yellow film. Underground water possibly polluted	8	*****
5	**Drilled well**	Water had fishy odor in the dry season. In general, water was not polluted	4	***
6	**Air**	Heavy air, sometime stuffy because of bad odor from drainage system and ponds. Coal smoke, dust from food processing polluted air.	8	*****
7	**Home garden**	Waste from food processing covered all areas of garden. Flooding in the wet season. Garden trees were not growing	6	****
8	**Field land**	Unable to identify exact pollution, however confident that pesticide utilization had caused pollution in the field	4	**

Note: *0 point = Non-polluted;*
10 points = Serious pollution
** Less tendency for serious pollution*
****** Greater tendency for serious pollution*

Pollution in drainage systems, ponds and lakes became dire when they were located in or near residential areas. Under these conditions resident's health was directly and immediately threatened by environmental pollution.

The Day River also contained extremely polluted water. This river distributed the polluted water to other locations through its natural flow.

Today even the water in deep wells can no longer be used for human consumption and craft production. Water in these deep wells is black in color, has a yellow film on the surface and omits an odor. The participatory assessment showed that underground water resources is

able to be polluted. This issue needs to be researched by a scientific institution to confirm the levels of pollution and possible solutions. However, the pollution of underground water resources can logically be linked to the accumulation of waste water in ponds and lakes over long periods of time.

Figure 4. A pond containing waste water and dung in Cat Que

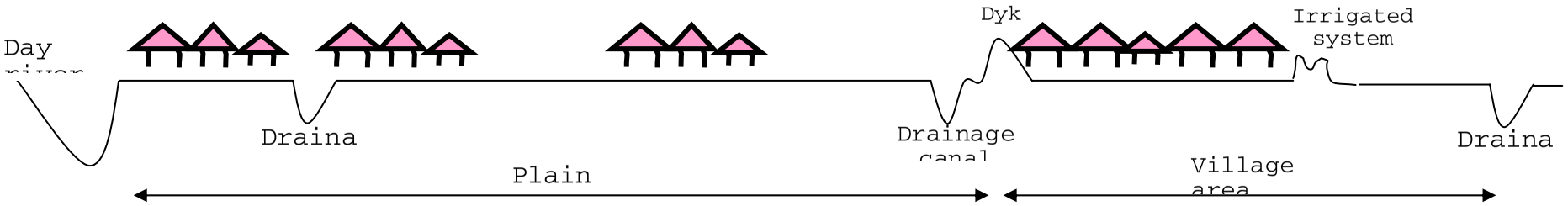
Villagers were not optimistic about finding a solution to current pollution levels. They believe that environmental pollution will continue increase.

In short: All components of the living environment in Cat Que were found to be seriously polluted, and it is believed that the situation will continue to worsen if policies and procedures are not changed.

4.4.3. Distributed environmental components which were polluted in Cat Que commune

Participants in the assessment group drew the transect map to identify polluted locations. The transect map is shown in Figure 5.

Figure 5. Transect map in Cat Que commune



Description	Tam Hop (Hamlet 8,9)	Cat Ngoi		Thap Thuong (Hamlet 7)		Xuan Thang (Hamlet 1, 2, 3, 4, 5, 6)	
Land use	Residential area	Residential area	Field land (three seasons/year)	Residential area	Field land (three seasons/year)	Residential area	Field land (three seasons/year)
Kind of production	Animal husbandry	Crop cultivation, animal husbandry(small scale)		Crop cultivation, animal husbandry	2 rice crops + winter crop	- Food processing - Animal husbandry	2 rice crops + winter crop
Environmental situation	- Pond and lake was seriously polluted by waste water from animal feeding. - Day river was polluted by waste water from food processing - Air was stuffy because of strong odor from drainage system	Pond and lake were polluted seriously	Soil was polluted by pesticide	Pond and lake were polluted by waste water from animal livestock and food processing	- Irrigated system was polluted by waste water from Ninh Con factory, animal livestock and food processing. - Air in 500m in distance along the drainage system had a bad odor affecting villagers health	Pond and lake were seriously polluted by waste water, dung and garbage from animal husbandry and food processing, also wastes from human activities - Air was stuffy	Drainage ending of Region 4 was polluted by waste and waste water from food processing villages of Cat Que, Duong Lieu and Minh Khai

Box 2. Could not leave my native way

I am 69 years old. In my life, environmental pollution never went to a peak like this time. One of these nights, I was sleeping but suddenly woke up. Bitter taste and stuffy in my throat, then I could not sleep again. To forget my obsession in the time of waste water spreading in my house, I planted ornamental trees and mountains and bird feeding. If I can get other work, I will give up food processing activity with its high pollution. If I can get another place to live I will go, but it is my native, I have no choice to change. Sometime, I tossed and turned all night, I could not sleep, I woke up and started to write poetry to describe environmental pollution to show to my son, daughter and nephew. Let me read it to for listening, he said with sad voice,…

Figure 5 illustrates that the majority of drainage systems present between the residential areas of Tam Hop, Cat Ngoi and Thap Thuong villages were polluted. The level of pollution was directly related to the level of economic and production development in these locations.

Following the results, it can be seen that while the use of pesticides in intensive cultivation creates pollution within the soil, environmental pollution is even more of a problem in crafting activities. The development of crafting villages has significantly increased environmental pollution. The pollution problem increased when poorly developed drainage systems were created between residential areas.

4.5. THE DAMAGE OF ENVIRONMENTAL POLLUTION TO VILLAGER COMMUNITY

An increase in environmental pollution is linked to the development of diseases within the communities that created the pollution and those that were affected by the pollution. An assessment of the common diseases is outlined in Table 7.

Table 7. Common diseases were damaged by environmental pollution

No	Kind of diseases	Catching disease level			
		Elder	Male	Female	Children
1	Aching bone, coxalgia, arthritis	*****	****	***	-
2	Respiratory disease	*****	*****	*****	*****
3	Allergies	*	**	****	****
4	Cancer	*****	*****	*****	-
5	Female diseases	-	-	*****	-
6	Skin-diseases	**	***	****	*****
7	Sore eye disease	*****	***	*****	*****
8	Digestive diseases	*****	*****	*****	*****

*Note: * Low catching disease level*
****** High catching disease level*

Following an assessment of the results from villagers, it has been concluded that there are 8 kinds of diseases prominent in polluted environments. The research team asked villagers to classify people by age and gender and to evaluate the likelihood of contracting one of these diseases. The results concluded that females were most likely to contract a disease, making them the group most likely to suffer from environmental pollution. Children were the second most likely group to catch a disease. Villagers who participated in pollution creating activities and those that lived within the polluted area were equally at risk of catching a pollution related disease. Assuming this information is correct, those people who are exposed to pollution because of where they live are at a significant disadvantage.

If this situation is allowed to continue, authorities will be required to solve and settle disputes between those people that create pollution and those that are passively subjected to it. We believe that local authorities need to arrange solutions to deal with these conflicts when they arise.

4.6. THE CAUSES OF ENVIRONMENTAL POLLUTION:

4.6.1. Pollution caused by improvements in technology for crafting production:

Figure 6. Process of cassava flour production

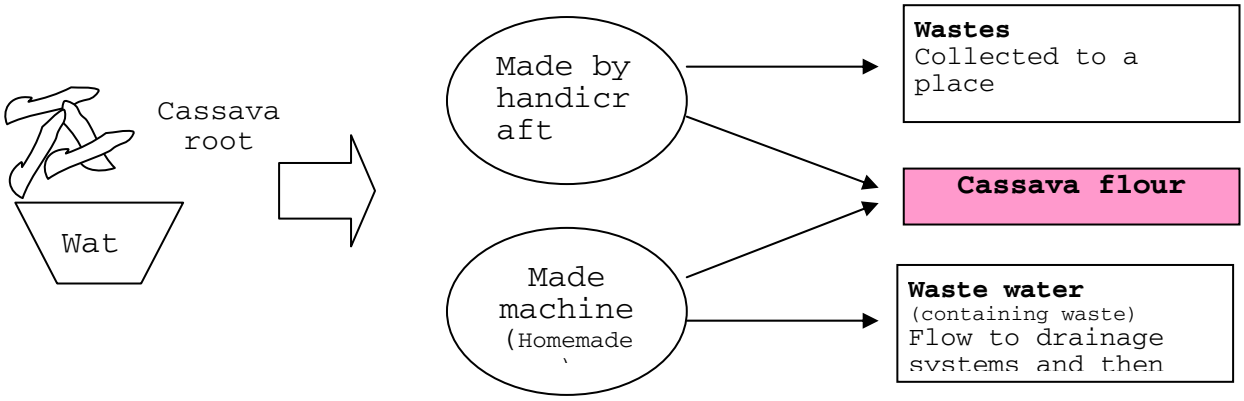


Figure 7. The small river was polluted 3 km from Cat Que commune

In the past, cassava flour was processed by hand; all waste was collected and carried to garbage dumps, benefiting the local environment. Recently, productivity has significantly increased through the use of improved machinery, negatively impacting on the environment.

Polluted waste was allowed to flow directly into water systems and accumulated in canals, ponds and lakes. The accumulation of pollutants emitted foul odors and caused other forms of environmental pollution.

4.6.2. Too much waste and waste water

- Volumes of waste water were too large and drainage systems were too small:

Duong Lieu and Minh Khai communes in Cat Que, created the greatest volumes of pollution in Hoai Duc district and also the greater Ha Tay province. This area processed between 100,000 and 120,000 ton of cana root and 150,000 to 200,000 ton of cassava root material for flour processing (approximately 300 to 350 ton of cana and 350 to 400 ton of cassava per day). The large volume of cana and cassava root processing required vast amounts of water. In 2002 the Department of Science Technologies and Environment of Ha Tay estimated that the food processing villages in Cat Que, Duong Lieu and Minh Khai commune produced about 15,000 m^3 of waste water, including 8,500 m^3 of waste water from food processing activities alone. It is estimated that other crafting activities in Cat Que produced about 3,500 m^3 liters of waste water (Table 8).

Figure 8. The drainage system flow to two communes of Cat Que and Duong Lieu

Table 8: Water demand for food processing activities in center of Cat Que, Duong Lieu and Minh Khai commune.

No	Kind of production	Unit	Cat Que	Duong Lieu	Minh Khai	Total
1	Rice vermicelli	m^3/day	-	-	1500	1500
2	Cana vermicelli	m^3/day	800	2550	1200	4550
3	Cassava flour production	m^3/day	2200	3800	2400	8400
4	Animal livestock	m^3/day	500	450	400	1350
5	***Total***	***m^3/day***	***3500***	***6800***	***5500***	***14.800***

Source: Department of Science Technology and Environment, 2002

- Large quantities of waste after processing combined with a lack of suitable dumping grounds:

An increase in flour processing has created more waste. Waste from food processing in Cat Que, Duong Lieu and Minh Khai was too great to be dealt with by previous means, not including grilled waste containing water (see Table 9).

Statistics complied by the Department of Technological Science and Environment indicate that Cat Que produced about 44.72 ton of waste per day, putting the annual waste output at 16,100 tons.

Figure 9. Food processing waste

It should be noted that waste in Cat Que was created mainly from the processing of cassava (accounting for 92.7% of the total). This waste could not be used to produce food for livestock feed or fertilizer for crop cultivation.

Table 9. Waste from food processing activities

No	Kind of waste	Unit	Cat Que	Duong Lieu	Minh Khai
1	Waste from cana processing	Ton/day	4,44	21,46	27,63
2	Cassava skin	Ton/day	9,0	12,56	3,6
3	Waste from cassava processing	Ton/day	32,4	45,00	12,9
4	Coal residues	Ton/day	2,64	8,58	2,15
5	***Total***	***Ton/day***	***48,72***	***88,60***	***46,28***

Source: Ha Tay Department of Technological Science of Environment

- Too much dung from livestock:

Of the 20 farmer household's in Tam Hop village interviewed, the average number of pigs per household was from 40 to 50 animals, with some households feeding up to and over 500 animals. Only about 20% of dung was collected, leaving 80% to flow into drainage canals and accumulate in ponds and lakes. This accumulation resulted in pollution of Tam Hop village.

4.6.3. The majority of waste and waste water remained untreated, creating further environmental problems:

Villagers who participated in assessment groups were asked to list the different kinds of waste and evaluate the relevant pollution level in the environment. The results are shown in Table 10.

Following assessment by the community it was agreed that the Cat Que environment was affected by eight main kinds of waste. Food processing and animal husbandry were identified as the two most serious categories when assessing environmental pollution. The majority of waste and waste water remained untreated, further damaging the environment. Water in the ponds and lakes was dark in color and emitted an odor. Dung and waste water from livestock initially accumulated in ponds, lakes and drainage systems and emitted a strong odor that caused the air to become stale and made breathing difficult. It affected the health of

villagers. It is vital to provide solutions to the current problems so that villagers are not forced to live with the adverse consequences of environmental pollution.

Table 10. The damaging effects of wastes to environment in Cat Que commune

No	Kind of waste	Polluted level	Waste status	Damaging effect level to environment
1	Waste from food processing activities	*****	Un-treated waste disposed of on roads, overflow to drainage canals	Waste deterioration. Foul odors.
2	Waste water from food processing	*****	Flour processing by hand, water used to clean roots, application of home-made machinery, cassava and cana was thrashed in water, flour was kept, waste water containing grilled waste flowed to drainage systems and accumulated	Waste water containing grilled waste deteriorated. Foul odors. Polluted water spread to neighboring locations
3	Exhaust fumes from charcoal, coal	***	Untreated coal smoke contaminated animal food and other activities in Cat Que. Polluted air	Coal smoke seriously damaged villagers' health, dust affected crop yields
4	Waste water from animal husbandry	*****	Waste water from breeding facilities flow directly to drainage canals then run to pond and lake	Water in ponds, lakes and drainage system left uncovered. Foul odor emitted
5	Dung from animal husbandry	*****	Dung disposed of directly into canals with waste water without treatment or dilution	Water in ponds and lakes was dark in color, thick with odor. The water surface bubbled. Unable to support aquatic life.
6	Garbage from human activities	***	Small amounts of waste disposed of directly into canals and road	Waste deterioration, odors, visual
8	Animal carcasses	**	Small numbers of animal carcasses disposed of into drainage systems	Spread of disease
7	Pesticide	***	Intensive cultivation, farmers used large quantities of pesticide	Pesticide directly affected those using it and indirectly affected many villagers
8	Veterinary medicine	***	Large quantities used in intensive animal husbandry. Antiseptic and detoxified medicines containing toxins flowed directly into drainage canals	Villagers did not recognize damage caused by veterinary medicine

*Note: * Brought about pollution in low level ***** Drought about pollution in high level*

4.7. PARTICIPATORY RURAL ENVIRONMENTAL MANAGEMENT

4.7.1. State management function of Ha Tay administrative offices in environmental field

The research team worked with local authorities to create the Venn diagram to express the functions of administrative offices in relation to environmental management. The Venn diagram is shown in Figure 10.

Figure 10 shows that the Department of Natural Resources and Environment office is under the Provincial People's Committee in regards to state management and under the Ministry of Natural Resources and Environment when referring to technical aspects. The Department of Natural Resources and Environment have responsibility for environmental management in respect to everyday functions. The Department of Industry have responsibility to plan rural industrial development, taking into account all environmental aspects. The Center of Fresh Water Supply comes under The Department of Agriculture and Rural Development and bears responsibility for the supply of fresh water for residential activities and to cooperate with other institutions to propagandize environmental protection activities.

The solid line in figure 10 illustrates the administrative role played by higher authorities when dealing with other departments under their control. Figure 20 shows that the Department of Economic and Infrastructure Development at the district level comes directly under Department of Natural Resources and Environment in environmental management. The Department of Economic and Infrastructure Development directly manage the Commune People's Committee on environmental management.

The Center of Spare Health, the Sub-department of Animal Health and the Department of Agriculture and Rural Development manage state matters relating to the environment through their sub-offices. This relationship is expressed by a solid line in Figure 10. Environmental management is not the main function of these institutions. These institutions need to collaborate with each other to carry out environmental management projects with the Department of Natural Resources and Environment. The Department of Agriculture and Rural Development act as a steering committee for the Center of Fresh Water Supply, and sub-department of Animal Health who are involved in fresh water supply, controlling animal disease and keep check on animal epidemics. Provincial administrative offices steer district response officers, and district response officers steer commune's to carry out environmental management. However at the commune level, the Board of Animal Health is only responsible

for the control of animal disease, it has no responsibility to monitor waste water and dung from animal husbandry, meaning that it is not responsible for environmental pollution.

Therefore it is unclear which agency actually bears responsibility for environmental pollution caused by waste, garbage and waste water from animal husbandry and food processing activities. According to current regulations, the Department of Natural Resource and Environment bear the main responsibility for the environment. This responsibility is regulated in its function and duties. The question of how to manage rural environmental management is currently unanswered.

At the provincial level the Department of Natural Resources and Environment bear responsibility for environment management. At the district and commune levels there has been no department primarily responsible for environmental management. Under these conditions it is difficult to see any satisfactory solution to environmental pollution being reached. We believe that offices with a primary goal of sustainable environmental management need to be established at the district and commune levels

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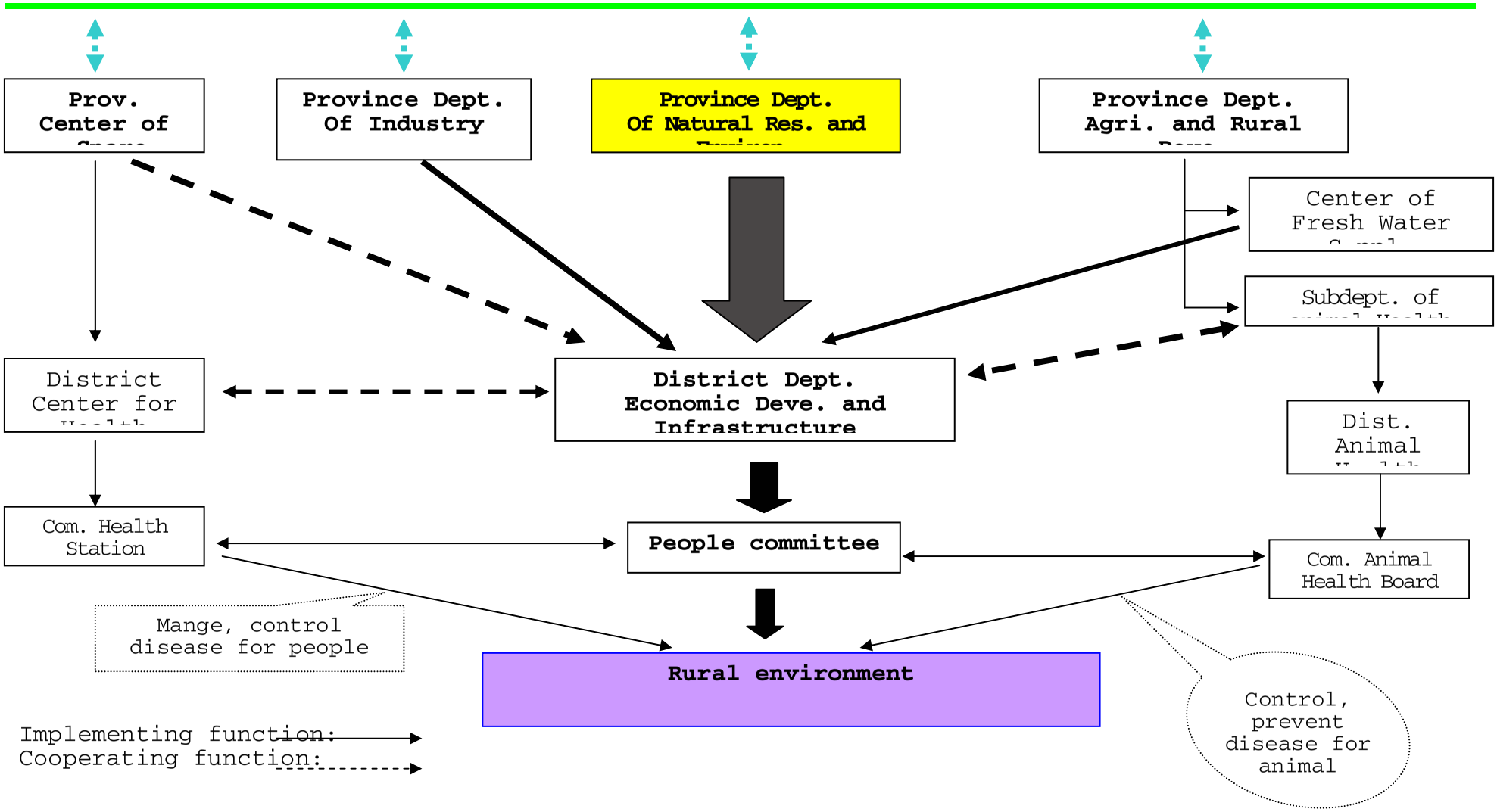
Figure 10. Administrative offices' responsibilities and their relationship in rural environmental management

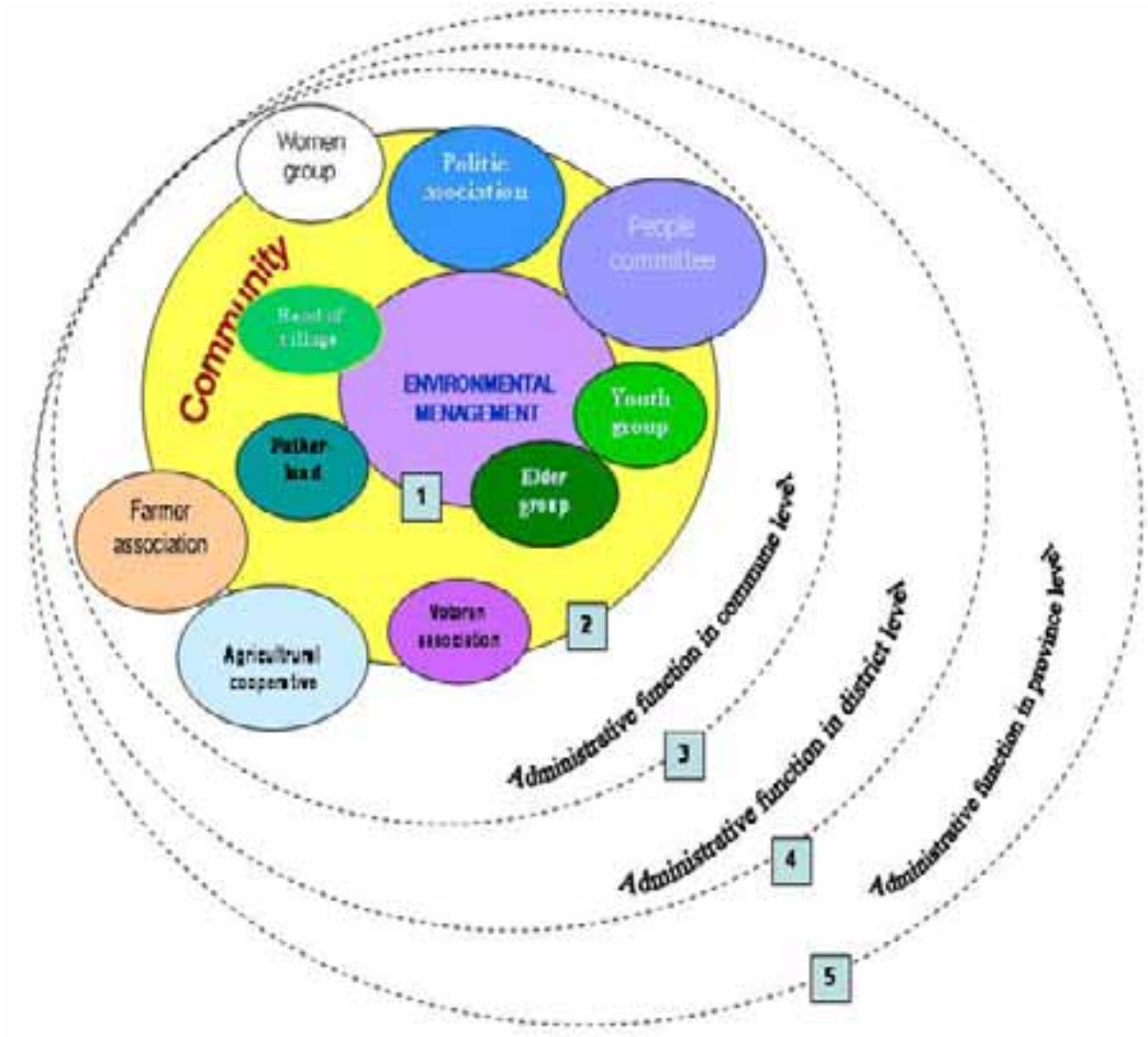


4.7.2. The different roles in environmental management:

The research team and villagers who participated in the assessment group drew a Venn diagram to illustrate the different roles each group played in environmental management. The small circles with solid colored line were discussed and added. The bigger circles with broken lines were drawn by the research team (see Figure 11).

In this diagram the assessment group illustrated that the environment was main concern (Circle 1). Villagers are both involved in the creation of pollution and they suffered from its consequences. For this reason, the villager community needs to bear primary responsibility for environmental protection. In this diagram, the community's role was expressed by circle No 2. This circle surrounds No 1.

Figure 11. Venn diagram expresses different roles in environmental management



The commune level is responsible for administrative functions relating to environmental management (Circle No3), the commune reports directly to the district level(circle 4), which in turn reports to the provincial level (circle 5). The purpose of this diagram is to illustrate that the environment is managed by all levels of government. We believe that the issue of environmental pollution exceeded the capacity of the commune level, and the district level should be responsible for finding a solution. If aspects of environmental pollution are over the district's capacity, the provincial level should assume responsibility. If environmental pollution continuously overloads the capacity of any level of government, the higher level will assume responsibility. Although the principles of environmental management are understood by villagers, they do not clearly understand their responsibility to help find and implement a solution.

The administrative performance illustrated in the diagram can also be used to evaluate villager's assessment of their roles in environmental management.

The size of the circles in the diagram express their relative importance in the state administrative pattern. The distance from the circle indicates its perceived importance of its role in environmental management. The area located in circle 1 (community circle) indicates that members within it come from this community, therefore members within the other circles come from other communities.

The Elder's Association, Youth Union and Head of Village hold the most important positions in environmental management. The assessment group believed that elders always take the lead to organize environmental sanitation, through doing this they also remind their descendants to maintain sanitation. The Youth Union is the most active in collecting waste, garbage and organizing events to protect the environment. The Head of Village supervises and encourages villagers to protect the environment.

The People's Committee, Father Land Association and local political organizations play the second most important role in environmental protection. The Commune People's Committee demonstrate administrative functions that include environmental management. However, the community evaluated that role of the People's Committee in environmental management did not match with its administrative function. Conflict resolution of environmental pollution is still a limitation. Father Land and other political associations actively participate in environmental sanitation, such as responding to environmental cleaning. Environmental pollution has regularly been mentioned in their handover meetings.

Environmental sanitation movements were weak amongst groups such as the Agricultural Cooperative, Women's and Farmer Associations (see Figure 10), these same groups caused extensive damage to the environment through their operations. These

organizations need to accept more responsibility for reducing pollution and helping to solve the current problems.

In part 4.5 it was shown that women were the group most affected by environmental pollution. The investigation of households also revealed that 65 percent of environmental sanitation works within the household was done by women. In this diagram, the role of the Women's Association in environmental management was very weak. Women are very active in cleaning their homes, leaving them with little or no time to participate in community activities of environmental sanitation. The level of work that is expected on women in their day to days lives puts them at a disadvantage compared with men in community activities.

The state administrative function role in environmental management is clearly defined in Diagram 10, however in reality it is very weak. During the assessment participants were unable to define their role in environmental management. Similarly, in part 4.4.1 it is shown that Ninh Con factory was the third highest factor to bring about pollution in the Cat Que environment, however as is shown in the diagram, they are not involved in any activities to protect the environment.

In short: This diagram shows that villagers, local mass organizations and the commune plays the most important role in environmental management.

4.7.3. Community activities in environmental management:

'Under mass organization' mobilization, villagers have participated in environmental protection. In 2003, Cat Que organized three events to clean sanitation systems in conjunction with active participations of the Youth Union and villagers. In many small hamlets, elders organized to clear drainage systems, communal roads and areas surrounding villager's houses. They also established groups to collect garbage, funded by donations from villagers.

In some hamlets, farmers contributed money to build drainage systems for their production activities, while in other hamlets villagers built and improved drainage systems in their housing areas.

The activities of villagers in rural environmental management were found to be very practical. However, the scale of the activities is too small compared to the increasing levels of pollution. They need support from higher levels of government to help solve environmental pollution.

4.7.4. Strengths, weakness, opportunities and threats associated with participatory environmental management in Cat Que Commune:

A SWOT approach was used to analyze the capacity of villagers to implement environmental management in craft villages in Cat Que. The results are shown in Table 11.

-Strengths:

- *Villagers started to recognize environment pollution:* The first strength is that the community began to attend to environmental pollution through discussion and action. The elders are particularly concerned about the increase in environmental pollution and have helped to establish action groups to solve the problems. Some hamlets organized construction of drainage systems and roads, many of which were concreted by money contribution from the village community. An average of 500,000 VND to 700,000 VND was contributed per household. In 1998 in Hamlet 1, Xuan Thang village, each household contributed 400,000 VND to 500,000VND to build drainage systems and roads. Each household contributed 2000 VND per month to pay for garbage collectors. Over the past several years villagers have organized themselves to collect garbage and clean drainage systems during the food processing season. These activities contributed an important role to the protection of the environment. Hamlet 1 in Xuan Thang village is a symbol in environmental management in Cat Que commune.

Table 11: Strengths, weakness, opportunities and threats of participatory environmental management in Cat Que commune

No	SWOT	Description	Causes	Meanings to environment management
1	Strength	1. Many villagers attended to environmental pollution and contributed money to pay for garbage collectors and the construction of drainage system	Deteriorating human health directly attributed to environmental pollution	Significant in mobilization of environmental protection activities
		2. Commune authorities paid attention to improve drainage system and communal road	Many conflicts were addressed by commune authorities, economic development contributed to increase in commune's capital wealth	Commune authorities expressed their administrative function to solve environmental pollution. Environmental management was attended by commune authorities
2	Weakness	1. Low villager awareness in environmental management (disposal of garbage and other wastes into drainage system	Poor promulgation and education of environmental management. Low awareness of environmental protection by villagers	Damage to environment will increase and making difficulties to environmental management
		2. Poor drainage systems and lack of planning	Lack of capital and general planning	Drainage of waste water was not sufficient, especially during wet season

		3. Until now, Cat Que has no waste water treatment solution at household level	Lack of solutions to waste water issues	Untreated waste water and waste brought about more serious pollution
		4. Poorly funded (main contributions by villagers) for environmental management in rural areas	Until now, no capital commitment by government to solve environmental pollution	Drainage system was not maintained, allowing pollution of the environment
		5. Local authority not strong enough to enforce environmental management	Difficult application of local sanction for environmental management	A measure of responsibility between expected behavior and not expected behavior in environmental management
		6. No environmental movement established within the village. Lack of cooperation between mass organization	The role of mass organizations in village still poorly implemented	Environmental protection was not individuals' responsibility. Mass organizations role is weak, resulting in weak villager participation
		7. Small scale craft production, decentralized within villages and minimal skills and antiquated technologies	Craft production in villages was spontaneous, small scale because of a lack of capital and access to stable markets	Dispersed production and low skill levels will create difficulties in securing capital investment in environmental management

No	SWOT	Description	Causes	Meanings to environmental management
3	**Opportunities**	1. Research institution began studying environmental pollution in rural areas, environmental pollution was urgent matter for authorities, commune and villagers	Increases in environmental pollution and its effects on craft producing activities.	Technologies to solve environmental pollution. Local authorities required to find solutions
		2. Economic development, villager living standard improved. Villagers experiencing better conditions to participate in activities of environmental protection	Crafting production has created benefits for villagers. They have money for everyday activities and savings	Improvements in living conditions and infrastructure
		3. Legal, institutional and policies promulgated completely by government.	Environmental pollution became urgent matter at all levels	Establishment of local sanctions to regulate responsibility for villagers in environmental protection
4	**Threatens and challenge**	1. Increase in disease caused environmental pollution increase	Environment pollution problems dire	Environmental pollution has damaged crafting production and the community's health
		2. Underground water resources for human activity and production is threaten to be polluted and exhausted	Long term accumulation of waste and waste water in drainage systems, ponds and lakes. Too much water consumption	Threatens food processing and animal husbandry

		3. Increases in waste and waste water while drainage systems, ponds and lakes become less able to cope	Waste water and waste overloaded drainage system capacity	Crisis of waste water and waste require immediate resolution
		4. Differential increases between producers in crafting villages and people in neighboring villages	Use of the same drainage system	Immediate resolutions required to avoid possible conflicts
		5. Differential increases between craft producing development and rural environmental degradation	Little or poor craft village planning	Continued environmental pollution will hold back craft producing development
		6. Increasing environmental pollution exceeding villager and commune capacity	Commune and villager's capacity limited	Environmental pollution effects will continue to increase. Government support is required.
		7. Ineffective investment in rural environmental protection	Decentralized distribution and located close to residential areas	Unattractive to potential investors

• *Investment by local authorities in environmental protection has recently increased:* In 2002 and 2003, Cat Que commune invested 300 million VND to build an important drainage canal in Tam Hop and Xuan Thang and 1 billion VND to construct a road. In addition to this, the Commune People's Committee encouraged villagers contribute money to help build drainage canals around hamlets and households. The Commune People's Committee also contributed money to pay for the constructions. This action by the Commune People's Committee was very symbolic in that it showed their awareness and acceptance of responsibility in regards to environmental management.

- Weakness

• *Awareness about environmental protection amongst villagers was low:* Assessment participants believed that only some of the environmental degradation could be attributed to villagers behavior. Low awareness levels has been a major barrier to solving environmental pollution in craft villages, particularly in rural areas. Disposal of garbage in drainage systems was a common occurrence in hamlets. While the Cat Que People's Committee regulated the disposal of garbage and waste, some people continued to litter the streets and drainage systems.

• *Organized waste collection had limitations: Despite the* Cat Que People's Committee providing a dust-cart and safe working clothes, hamlets did not organize garbage collection. The hamlets explained that there was too much garbage for the workers to collect and that the commune had not been supplied with enough equipment to adequately collect all of the garbage. This resulted in the hamlet remaining polluted and villager's awareness remaining low.

• *Poor promulgation of legal documents and regulations relating environmental management:* The research results showed that legal documents and regulations relating to environmental management did not reach the villagers. In 1999 the Convention of Building Cultural Village for Cat Que, Part C of Articles 17,18,19 clearly regulated environmental protection, however this information never reached the villagers. In a regional meeting it was claimed by leading government officials that policies relating to environmental protection were promulgated, however the leader of Duong Lieu said that they did not have these documents.

• Planning and management of *drainage systems has continued to exceeded commune's capacity:* Over several years authorities and people in Cat Que have attempted to improve conditions such as the sewerage system in Xuan Thang village being upgraded. However, based on the villager assessment, many of the main sewers are unable to cope with the large volume of sewage. Furthermore, ownership and responsibility to maintain sewer systems has been a problem, highlighted by the proposed sewer to be located between Duong Lieu and Cat

Que communes. To build this sewer, Duong Lieu and Cat Que need to seek the support of the Hoai Duc district People Committee.

- *State investment for improving Cat Que Commune environment has had a low impact:* In 1998 the Institute of Irrigation Science carried out an unsuccessful project of waste water treatment. The main reason given for the lack of success was an under estimation of the quantity of water that needed to be treated each day. Further more the time taken to treat the waste water was too high. At around the same time the Ha Tay People's Committee invested in a waste water treatment factory for the food processing center of Duong Lieu, Minh Khai and Cat Que located in Duong Lieu. However this factory could not operate for long periods of time because of the costs associated with power consumption, maintenance and repair.

- *Environmental protection regulations were hard to enforce:* Inappropriate garbage disposal both on the streets and directly into drains continued to occur. In these situations local authorities did not have enough power to sufficiently punish the offenders.

- *Poor co-operation between authorities and mass organizations in environmental management:* Participation of local authorities and mass organization in environmental management remains limited. To date, they have not established any movements that have attracted villagers' participation in rural environmental management. The activities of mass organizations mainly concentrate on economic development, environmental pollution is not a concern to these organizations.

- Opportunities for villagers and local authorities to participate in environmental management.

The living conditions of villagers has improved in instances where craft production has been developed. This is the time to canvass villagers to contribute money and labor within the formula of "State and people cooperate to do (*Nha nuoc va nhan dan cung lam)"* to build infrastructure and to achieve environmental protection. In this situation any new buildings could be fitted with biogas, sewers, drainage system, and roads.

The research team visited a biogas plant in Thap Thuong village operated by Mr. Nguyen Ba Toan. The area of the plant is approximately $24m^2$. Mr. Toan explained that dung and waste water from 100 pigs had previously been disposed of directly into the village drainage system, now it is collected and used in the biogas tank, improving the local environment. Mr Toan also said the biogas is used to cook for over 100 pigs and provides boiling water and lighting. The odorless waste from biogas production was used to irrigate crops.

- Threats and challenges to environmental management in rural areas:

While there are opportunities for villagers to improve their situation, the core threats and challenges of environmental pollution have not only remained, but also increased with time. The threatens and challenges are follows:

- *Increase in diseases related to environmental pollution:* Following the villager assessment, it has become apparent that present day diseases rarely occurred in the past. Results published by the Institute of Technological Science and Environment, University of General Technologies show that 13% – 38% of women living in food processing villages had contracted some form of gynecological disease. Although this study did not include Cat Que, we believe that as environment is similar, the results would also be similar. Following the villagers' assessment in Tam Hop and Hamlet 1 (in Xuan Thang village), in the ten years to now, 30% of deaths were attributed to cancer. These results warned of the implicit threats of currently occurring diseases.

- *Pollution and exhaustion of underground water resources:* 90% of households in the Cat Que commune currently use grilled wells, following the UNICEF standard. During the flour processing season, Cat Que used approximately 2,500 to 3,000m^3 liters of fresh water. If water continues to be consumed at this rate it is expected that underground water resources will be exhausted in the near future. Surface water in villages such as Xuan Thang, has been frequently polluted and leaching threatens to transfer this pollution to the underground water resources, creating a long term problem.

- *Conflict between communities:* Disunity between people involved in pollution creating activities and people that are forced to live with its adverse effects has steadily increased. Disunity and conflict occurs between households within villages and also between villages. This is threatening the traditional goodwill relationships that exist between villages.

- *The challenge is how to harmonize the development of craft production while actively reducing environmental pollution:* Craft village development in rural areas has created economic benefits, but has also lead to pollution. Villagers and local authorities are faced with the challenge of finding a balance between craft village development, improving living standards and the reduction of environmental pollution and minimization of adverse effects to health. If environmental pollution is not solved it will hold back the development of craft villages. The process of harmonizing economic benefits achieved through craft production developments and the resulting environmental pollution will not be easy, especially with the limited authority of local groups.

4.8. ACTION PLAN TO BE SET UP BY PARTICIPATORY VILLAGER ASSESSMENT IN ENVIRONMENTAL MANAGEMENT

An action plan for participatory environmental managements was devised by participants from local communities in consultation with the research team. The action plan is outlined in Table 12.

The research team asked participants to establish an action plan detailing the action, the associated level of importance, location to be implemented, planning time, people responsible, support required and the expected results.

The plan included four key actions (1) Organize garbage collection (very important); (2) Clean sewerages (very important); (3) Build biogas in household with many animals (important); (4) Mobilize villagers to participate in environmental protection (very important).

The actions set out in this plan are practical, included specific times when they should be implemented and all were considered important to very important. Based on the participatory assessment, almost all of these actions will initially be carried out by the community with

Table 12. Community's plan for actions in environmental management in Cat Que commune

(*This plan was be set up by villager community)*

Activities	Impor-tant level	Imple-menting location	People to bear responsibility	Capital source	Supporting require-ment	Proposed implementing time	Expected results
1. Waste and garbage collection	*****	Xuan Thang village (Hamlet 1,2,3,4,5,6)	Community	Villager's contribution		Beginning from 2/2004	- Cleaned roads - Cleaned drainage systems - Reduced flood in rainy season
2. Cleaned drainage system	*****	Whole commune	- Community - Youth Union	- Villagers' contribution - A little support from commune		- Before festival days - Before beginning rain season - In the beginning food processing season	- Cleaned sewerages - Reduced flood - Reduced fly and mosquito
3. Biogas building	****	In rich households with big animal feeding size	Community	3/4 of capital contributed by household	- Supported 1/4 of capital - Technique		- Reduced bad smell - Reduced fly and mosquito - Reduced pollution by dung and waste water - Gas for cooking
4. Mobilize villagers to participate in environmental protection	*****	Whole commune	- Commune radio - Youth Union - Mass Organization - Technical Institution	- Commune budget	- District People Committee - Organizations	Beginning 2004	- Strengthen villagers capacity in environmental protection - Establish helpful movement in Environmental protection

*Note: * Low important level ***** Very high important level*

support from donor institutions for activities such as the installation of a biogas plant. The plan does not rely on assistance from district or provincial authorities.

The actions outlined in this plan also show that the community understands their responsibilities towards environmental protection. That said, it also supported the argument that the community did not clearly understand the role that district and provincial authorities should be playing.

In our opinion, local authorities should capitalize on villagers' awareness and establish activities aimed at protecting the environment. Obviously, this will not solve the environmental pollution problem in rural areas; however it may help to minimize the effects.

4.9. COMMUNITY BASED SOLUTIONS TO PROTECT THE RURAL ENVIRONMENT

The local community has worked together to establish an action plan to help achieve environmental protection. The people involved in the establishment of the plan were both involved in creating pollution and people that were exposed to the pollution because of where they live. The research team asked the community rank the importance level of each action, the method of implementation and a proposed time frame. The results are expressed in Table 13.

Table 13 shows that 9 solutions were established by the community to achieve environmental protection.

First solution: "Always clean the flows in drainage system" (important). This is a practical solution and needs to be implement as soon as possible. Local mass organizations and leaders of villages will be responsible for the mobilization of villagers to participate in this form of environmental protection. We believe that this solution is very easily implemented.

Second solution: "General planning to improve drainage system" (very important). Villagers believe that this solution needs to be implemented as soon as possible. Local authorities will be responsible for implementing this solution. This solution will be funded by the government with contributions from villagers'.

Third solution: "Waste collection groups to be established"*(important).* This solution should be implemented as soon as possible. Villagers believe that commune level authorities and village leaders should be responsible for the establishment and action, while villagers will contribute money pay for collection.

Fourth solution: "Develop or adapt crafts that cause less or no pollution (important). The research team was surprised with this solution because of the large amounts of capital invested in food processing production in Cat Que, villagers are also experienced in these crafts. It is therefore possible to deduce that villagers place more importance on the reduction

of environmental pollution than on maintaining tradition skills. We do not believe that the implementation time suggested by villagers is achievable.

Fifth solution: "Research technologies for treating waste and waste water at the household level" *(very important)*.

Table 13. Proposed solutions to be established by the community for rural environmental protection in Cat Que Commune

No	Proposed solutions	Important level	Proposed implementing time	Implementing way	Easy or difficult levels	Implementing people
1	Frequently cleaning of drainage system	***	xxx	Local mass organization, Village leader mobilize villagers to participate in environmental management	RRR	Community
2	Macro and micro level planning and improved drainage system	****	xxx	Local authorities bear responsibility for planning and improving drainage system	KKK	Local authorities
3	Establishment of waste collection groups	***	xxx	Commune and village leader establish and organize waste collecting group	RRR	Local authorities and community
4	Development of craft production with less pollution or none	***	???	Depend on response from authorities	???	Unknown
5	Research of availalbe technologies for treating waste and waste water at the household level	***	xxx	Government supply budget for research institution	RRR	Research institution
6	Capital investment in treating waste and waste water	***	xxx	With support of money and technical from donor institutions	R	Household, commune
7	Educate and increase awareness for villagers in environmental protection	****	xxx	Villager community participation	RRR	Community, local authorities
8	Propagandize authoritive regulations with regard to environmental protection	****	xxx	Local authorities	RR	Commune authorities an village
9	Increase budget for environmental protection in each residential area	****	xxx	Community organize to collect contribution with commune and village leader support	RR	Villagers, commune and village leader

Note: * *Less important* ***** *High important* x *No need to solve soon* xxx *As soon as possible* KKK: *Very difficult to implement* RRR: *Very easy to implement*

We believe that this action is very important in the attempt to reduce environmental pollution. This will be the most difficult action plan to implement because of the decentralized nature of crafting production throughout the villages.

The other solutions illustrated in Table 13 are also considered important and should be implemented as soon as possible.

In short: These solutions have been developed by the village community and are designed to reduce environmental pollution at the local level. It should also be used as a reference by authorities who are directly responsible for environmental protection, at all levels.

Part V - Conclusion and Suggestions

5.1. CONCLUSIONS

1. Cat Que craft villages are seriously affected by environmental pollution. All aspects of the environment, including soil, air and water are polluted. Urgent solutions are required to amend the current situation. Villager health, everyday living activities and craft production are all adversely affected by environmental pollution.

2. Waste water, livestock dung, food processing and villagers activities have contributed to pollution of the rural environment in Cat Que. Poor drainage systems resulted in susceptible areas being exposed to high volumes of pollutants and therefore these areas are more polluted.

3. Village communities and local mass organizations (especially the Elder's Association) have made significant contributions to local environmental management. The role of Administrative Offices at the district and provincial levels has been limited and often not clearly understood.

4. Environmental management by the local community has strengths and limitations. There are excellent opportunities and incentives for villagers to participate in environmental management, especially in Cat Que where pollution is threatening living conditions and livelihoods.

5. The community established an action plan that included 4 key actions and 9 solutions aimed at overcoming environmental pollution. To implement this action plan the community requires the support of authorities and administrative departments at all levels.

5.2 . SUGGESTIONS

1. Cooperation is required between local mass organizations and authorities to carry out environmental protection activities, especially the mobilization of villager participation in rural environmental management.

2. Strengthen the role and authority of local mass organizations to mobilize the participation of villagers in rural environmental protection and management.

3. Strengthen education and mobilization of communities to raise awareness of environmental protection, including the addition of environmental protection studies in school curriculums.

4. Establishment of community regulations relating to environmental protection. This should include legal documents outlining the power of local authorities to punish people who willfully break the regulations under the guidelines of the Environmental Protection Law.

5. Local authorities need to be vigilant and to continue to seek further measures that will improve the current state of the environment. They should also be aware of possible pollution related conflicts between villagers.

6. Investment in research is required to source suitable technologies to treat waste water and waste in craft villages.

7. Establishment of stations to measure, inform and forecast environmental pollution levels in craft villages.

8. Strengthen power and training for staff responsible for environmental management at provincial, district, commune and village levels.

9. Secure more funding from the national budget for environmental management, with an emphasis on the resolution of current environmental pollution in craft villages located in rural areas.

10. Strengthen cooperation between the Health Department, Agricultural Organization, Women's Association, Youth Union, etc at provincial and district levels for the purpose of achieving environmental protection in rural areas.

11. Strengthen international cooperation in environmental management. Aim to get support from international governments and/or organizations with expertise in administration, waste and waste water treating technologies.

Part VI - Appendix

Appendix 1. Investigated household result

No	Description	Unit	Quantity	Percentage (%)
1	Total of investigated households	HH	20	100
2	Averaged age of household head	Year	49.1	-
3	Distribution household's head by gender			
	Male	Person	17	85
	Female	Person	3	15
4	Distribution of household' head by education			
	Bachelors Degree	Person	1	5
	Secondary school	Person	2	10
	Primary school	Person	6	30
	Pre-Primary school	Person	11	55
5	Averaged people per household	Per/HH	5	-
	- Averaged labor per household	Per/HH	2.9	-
6	Distribution of household by production kind			0
	- Participatory cultivation	HH	7	35
	- Participatory animal husbandry	HH	20	100
	- Participatory food processing	HH	13	65
	- Participatory service business	HH	4	20
7	Averaged income per household per annum	Mil. VND	9.6	-
8	Water resource utilization			
	- Grilled well	HH	20	100
	- Rained water	HH	5	25
	- Deep well	HH	0	0
	- Tap- water	HH	0	0

No	Description	Unit	Quantity	Percentage (%)
9	Hygiene building			
	- Number of household with standard toilet	HH	1	5
	- Number of household built biogas	HH	4	20
	- Number of household built grilled wells	HH	19	95
10	Averaged water consumption/HH/day		6.5	
	- Water for animal livestock	m3/day	1.83	28.2
	- Water for food processing	m3/day	4.2	65.1
	- Water for everyday consumption	m3/day	0.41	6.3
11	Averaged waste per household/day	Kg/HH/day	234.4	
	- Waste from food processing	Kg/HH/day	211.5	90.2
	- Dung from animal husbandry	Kg/HH/day	18.6	7.9
	- Coal residues	Kg/HH/day	3.8	1.6
	- Garbage	Kg/HH/day	0.6	0.2
12	Common diseases caused by environmental pollution			
	- Respiratory related disease	Time	14	70.0
	- Digestion related disease	Time	7	35.0
	- Sore eyes disease	Time	12	60.0
	- Gynecological disease	Time	13	65.0
13	Communicable Diseases			
	- Adults	Time	13	44.8
	In there: Male	Time	0	0.0
	Female	Time	13	100.0
	- Children	Time	16	55.2
14	Environmental status predict			
	-Number of interviewee's who believe that environmental pollution will increase in the next 5 to 10 years	Person	18	90
	- No of interviewee's who believe that environmental pollution will not change	Person	2	10

No	Description	Unit	Quantity	Percentage (%)
	in the next 5 to 10 years			
15	Which problem is the most urgent with environment in present (percent of interviewed)			
	- Waste water	Time	19	48.7
	- Waste	Time	10	25.6
	- Noise	Time	0	0.0
	- Smoke and dust (air pollution)	Time	0	0.0
	- Contradiction and conflict	Time	0	0.0
16	Gender of family member who participated in sanitizing environment			
	- Female	time	13	65
	- Male	Time	2	10
	- Both of them	Time	5	25
17	Total number of environmental sanitations per year	Time	1.8	-
18	Local mass organizations' participation in environmental management			
	- Participated	Time	17	85
	- None participation	Time	3	15
19	Monetary contributions for waste collection			
	- Agree to contribute money	Time	20	100
	- Do not agree to contribute money	Time	0	0

Appendix 2. List of local authorities interviewed for collection of database

Name	Address	Position	Kind of information to be collected
Le Duc Hung	Center of Spare Health in Ha Tay	Director	Information relating environmental protection and its pattern of organization
Ha Huu Thu	Department of Natural Resources and Environment in Ha Tay	Vice Head of Special Division	Activities conducted in relation to environmental management in Ha Tay province
Nguyen Duy Hong	Sub Deparment of Plant Protection in Ha Tay	Director	Sub-Department organizing pattern and its activities relating environmental management
Ha Dinh Chat	Center of Fresh Water Supply in Ha Tay	Head of General Division	Fresh water supply and environmental sanitation
Nguyen Van Tien	Center of Agricultural Extension	Deputy Director	Activities relating environmental protection in Ha Tay to be done by center
Nguyen Thi Thuy	Ha Tay Women Group	Vice Head of Propaganda and Training Division	Propagandizing activities relating to environmental protection
Le Van Ban	Cat Que Agricultural Cooperative	Vice Director	Agricultural development and activities relating environmental management from his organization
Nguyen Danh Ngo	Land survey, Cat Que Commune	Staff	Local environmental management
Nguyen Tai Yen	Cat Que People Committee	Chairman	Commune activities in environmental management
Tran Van	Cat Que Health Station	Director	Community Health
Nguyen Danh Tien	Commune information	Staff	Propagandizing activities of environmental management
Nguyen Ngoc Son	Station of Animal Health in Hoai Duc district	Director	Animal disease and environmental protection in animal livestock development
Dam Van Thong	Department of Economic and Infrastructure Development	Director	District policies and institutional relating environmental protection
Pham Tien Tan	Station of Health in Hoai Duc district	Director	Community Health and activities relating environmental protection

Appendix 3. List of Cat Que commune farmers interviewed

Name	Address	Code	Note
Tran Van Hong	KV1	I	Village area
Nguyen Danh Chat	KV1	II	
Le Hong Duong	KV1	III	
Nguyen Chi Phu	KV2	IV	
Nguyen Danh Hien	KV2	V	Village area
Nguyen Chi Vinh	KV2	VI	
Nguyen Khac Tien	KV1	VII	
Nguyen Thi Mao	KV2	VIII	Village area
Le Thi Bich	KV1	IX	
Le Duy Thu	KV2	X	
Pham Thi Con	KV2	XI	
Pham Van Tom	KV6	XII	
Nguyen Dinh Nhuong	KV6	XIII	Village area
Nguyen Dinh Loc	KV6	XIV	
Nguyen Ba Nhuong	KV6	XV	Village area
Nguyen Tai Nuoi	KV8	XVI	Plain area
Tran Hong	KV8	XVII	Plain area
Nguyen Van Dat	KV8	XVIII	
Nguyen Nhu Toan	KV8	XIX	
Le The Ly	KV8	XX	Plain area

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