Ecologizing Industrialization in Chinese Small Towns

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Preface

About five years ago, when I first touched upon the issue of environmental management towards Township & Village Enterprises (TVEs) in Small Towns and decided to do my MSc thesis on this topic, I was not really aware of the complexity of the problems. I was eager to apply what I had learned from the environmental management courses in Wageningen University in those TVEs, and I believed that the problems could be decisively solved with the appropriate attitude, management approaches and technologies. This belief was further confirmed during my two months fieldwork in three Small Towns in China in 1997. Those meetings, discussions, interviews and on-site visits left me with the impression that the idea of development first and environmental concerns second was firmly entrenched in the Small Towns visited. At that time, local leaders, entrepreneurs and town citizens were either reluctant to talk about environmental issues unless these efforts would be accompanied with other visible benefits or unaware of the environmental problems around them. Not surprisingly, I concluded my thesis with suggestions on environmental education, awareness raising, public participation and environmental management strategies based on multiple instruments. The more fundamental causes of TVEs environmental behaviors and management difficulties in Small Towns remained understudied in this small study.

Fortunately, during the first fieldwork in China, very useful contacts were made with some governmental authorities, technical experts and information resources in both Beijing and the towns visited. Cooperation with a major United Nation Development Program (UNDP) Project on capacity building for sustainable town development (CPR/96/507) started me on the path of learning about 'rural China'- that is, the local states. This, together with the contacts with the Administration Center for China Agenda 21 (ACCA21) and the Department of Systems Ecology of China's Academy of Sciences, laid the foundation for my Ph.D. research.

This dissertation presents my findings, thinking, interpretations and suggestions regarding the issue of TVEs environmental management in Small Towns. I offer it with the hope that it will contribute to the unveiling of the mysterious rural China and farmers' logic. The issues studied in this dissertation have been the interest of many researchers from both abroad and home. As observed by R. Kirkby et al., while the Western academics suffer from considerable problems in gathering of primary data of any kind in China, especially when it comes to the social sciences, the contextualization of primary data by the first generation of local Chinese social scientists remains problematic as well. This fact suggests to me the challenge of going deeper into this subject, from a new perspective; with advantages of being Chinese and a social researcher who has studied in a Western country, the Netherlands. There is only one way to build up this competence – to learn from both sides.

This doctoral research project involved four institutions, including the Department of Environmental Sociology in Wageningen University and Research Center (WUR), the

Dutch Academy of Sciences, the Center for Eco-Environmental Research in the Chinese Academy of Sciences and the Administration Center for China Agenda 21 (ACCA21) under the Ministry of Science and Technology (MOST). This dissertation would have never been made without their financial support and academic guidance.

The past four years for me has been a great learning process. Many people have helped me to continuously correct my directions before I got lost. To name all who have helped would be pretentious; to name only some is invidious. But I owe special thanks to Professor Dr. Arthur Mol of the Environmental Policy Group in Wageningen University of the Netherlands. It is he who showed interest in this research topic and has guided me from the beginning to the end of my work. Without his critical and detailed comments on the design, analysis and writing with his research expertise, there could have been no guarantee of the academic quality of this dissertation. I was surprised many times by his knowledge on and insight into environmental issues in my home country. I have also learned from him how to behave like a scientific researcher, which will benefit me for my entire lifetime.

I am also very grateful to my Chinese supervisor, Professor Dr. Wang Rusong in the Center for Environment and Ecological Research of the Chinese Academy of Sciences. As one of the leading figures in the field of human systems ecology, he inspired me with the Chinese theory of Socio-Economic Natural Complex Eco-system (SENCE), which lays the base of the established theoretical framework. But his influence on me goes beyond the discussions on this dissertation. I admire him for his knowledge on ancient Chinese philosophies and his devotion to his academic career.

Special thanks go to Shi Han, the director of the China Center for Environmentally Sound Technology Transfer (CESTT), for his willingness to cooperate for this research in China. I have benefited enormously from working with him and his group in Beijing and being involved in several international projects in environmental field. Through him, I have developed valuable contacts and carried out the case studies. His sharp comments and rich knowledge of Chinese environmental issues have contributed to the generation of some important ideas presented in this dissertation. He also set me an example of a professional consultant. I wish I had learned more from him.

I owe many thanks to Professor Yan Jianfu, who has been always helpful with his rich experience and knowledge on rural China. His encouragement and caring have protected me from getting depressed at the moments when things went wrong. I have learned from him how to stay firm and optimistic in difficult situations.

My life in China during 1998-2000 would have been unbearable without those friends I made there. Their friendship is the most precious thing I harvested during this period. Zhang Jichen, Xu Hesheng, Zhu Minjing, Lu Yi, Liu Chong, Shen Zhennin, Chen Dong, Tan Yajun, Yang Yuchen, Wang Yuxiang, Liu Yi, Feng Yecheng, Xie Wei, you all will remain the brightest stars in my sky.

Many friends in the Netherlands have helped me to discover and enjoy a life which is different from that at home. I am very grateful to Peter Hekstra, Dick Legger, Wenner Haas, Lajos Kovacs and their families who have shown great concern on my study here and have shortened the gap between the natives and the foreigners. Special thanks go to Dr. Kovacs for painting the cover picture of this dissertation. I also wish

to extend my thanks to all colleagues and fellow PhD candidates of the Environmental Policy Group of Wageningen University for showing strong interest in the Chinese people and China issues. I am very glad to see that our group has become more and more active in China and some of the lecturers got chances to work in China for cooperation projects. I wish they will know my homeland better and will promote China in a more positive way in Holland. My special thanks to several people for their either academic help or administrative support: Professor Dr. Gert Spaargagen, Dr. Peter Ho, Dr. Kris van Koppen and Ms. Corry Rothuizen. I owe many thanks to Anne Scheinberg for her great help on the English language of this dissertation.

During my seven years stay in Wageningen, many Chinese friends have shared with me my joys and sadness. Special thanks go to Weng Liping, Jiang Bo, Zhu Xueqin, Dang Jie, Han Beizhong, Chen Nan, Zhang Rong and Tian Dexue.

I am in great debt of my parents for their love, understanding and support over years. I would have never come to this academic point without their education and encouragement. Many thanks to my brother, Zhang Jing, and sister-in-low, Huo Fang, for their affection toward me and for taking care of our parents when I am far away from home.

At last, I would like to thank my beloved friend, Sun Zhongkui, for his love and companion in the past years and for all the sunny and dark moments we have shared.

Wageningen, 15 October 2002

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Summary

List of Boxes, Figures, Maps, Photographs and Tables

List of Abbreviations

ACCA21	Administration Center for China Agenda 21
CAC	Command-and-Control
CCCPC	Central Committee of Communist Party Congress
CCTRD	China Centre for Town Reform and Development
CCTV	China Central Television
CECSD	Comprehensive Experimental Community for Sustainable Development
CESTT	Center for Environmentally Sound Technology Transfer
CISSC	Central Institutional Setting and Staffing Commission
COD	Chemical Oxygen Demand load
CPP	Central Power Plant
CSSD	Chinese Society for Sustainable Development
EAO	Enterprises Administration Office
EIA	Environmental Impact Assessment
EMT	Ecological Modernization Theory
EPB	Environmental Protection Bureau
EPD	Environmental Protection Department
EPO	Environmental Protection Office
ETC	Economic and Trade Committee
FDI	Foreign Direct Investment
FYP	Five-Year Plan
GC	General Company for Agriculture, Industry and Commerce
GDP	Gross Domestic Production
GIS	Geographic Information System
HABITATII	United Nations second great Conference on Human Settlements
HEP	Human Exemptionalism Paradigm
HPRCS	Household Production Responsibility Contract System
HRS	Household Registration System
ICB	Industry & Commerce Bureau
ISO	International Standards Organization
JCCE	Jiangsu Certification Center for Environmental Management System
MOA	the Ministry of Agriculture
MOCA	Ministry of Civil Affairs
MOF	Ministry of Finance
MOLR	Ministry of Land and Resources
MOPS	Ministry of Public Security
MOST	Ministry of Science and Technology
NEP	New Ecological Paradigm
NEPA	National Environmental Protection Agency
NEPA	National Environmental Protection Agency
NEPP	National Environmental Policy Plan
NGO	Non-Governmental Organization
NIES	The Nanjing Institute for Environmental Science
OECD	Organization for Economic Cooperation and Development
POET	Population, Organization, natural Environment and Technology
PPP	Public-Private-Partnership
RCCPED	Research Center for China Population, Environment and Development
RCCSD	Research Center for China Sustainable Development

RCEES	Research Center for Eco-Environmental Science
RMAF	Ramon Magsaysay Award Foundation
SCERSR	The State Commission for Economic Restructuring and System Reform
SEC	State Economic Commission
SENCE	Social-Economic-Natural Complex Eco-System
SEPA	The State Environmental Protection Administration
SME	Small-and-Medium Enterprises
SOE	State-owned enterprises
SPC	State Planning Commission
SSB	State Statistic Bureau
TAB	TVEs Administration Bureau
TNC	Transnational Cooperations
TP	total phosphorous
TSP	total suspended particles
TVEs	Township & Village Enterprises
TVIEs	Township & Village Industrial Enterprises
UEQES	Urban Environmental Quality Examination System
UNDP	United Nation Development Program
UNPF	United Nation Population Foundation
WCED	The World Commission on Environment and Development
WTO	World Trade Organization
WWT	central wastewater treatment plant

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China's Environmental Dilemma: Township & Village Industrial Enterprises (TVIEs) in Small Towns

China is an extremely complex and diverse nation, underestimated and often misunderstood.
- China Environmental Review (1997, Vol.1, Issue 1)

"What is the biggest problem facing today's China? ...the severest problem is the fact that about 150 million farmers are not needed for crop production but can hardly be absorbed by other sectors."
– Dajun Zhong (2001)

1.1 Introduction

If the economic transformation of China over the last two decades is arguably one of the most significant developments of the last century (Kirkby et al., 2000), there are few arguments about the fact that it is the farmers who have changed China. The dynamism and energy of the Chinese reforms sprang from the farmers and profoundly transformed the economic and social realities of China. In order to survive, they ignored or broke the rules restraining their farming systems, and thereby initiated the rural reforms.

State policies on rural reform and rural change have, as Daniel Kelliher (1992) and Kate Xiao Zhou (1996) have pointed out, been reactive and/or of limited impact on the course of rural change. Zhou (1996: 12) is also correct in regarding farmer behavior as a "spontaneous, unorganized, leaderless, non-ideological, apolitical movement". Indeed, farmers are strong because they are spontaneous, unorganized, leaderless and so on, but they are weak for the same reason (Christiansen and Zhang, 1998:1). Likewise, Township & Village Enterprises (TVEs, or Xiangzhen Qiye) and Small Towns (Xiao Chengzhen), as 'great creation' of farmers, bear the same 'farmer hallmarks'. This bottom-up 'farmer power' has driven the whole transitional process in China, and now farmers and their 'creations' are challenged to survive and grow in an environment they themselves have created.

In simple words, the term TVEs refers to a variety of rural, farmer-owned enterprises within the boundaries of rural China. Small Towns are those 'small' urban centers at the root level of China's urban system which are the interfaces of the urban and the rural. TVEs evolved out of the commune and brigade enterprises of the late 1950s, which aimed to improve local, rural welfare. For this historic reason they fall under the administrative responsibility and support of the Ministry of Agriculture (MOA). Most of the initial

investments of TVEs were raised by farmers or diverted from the collective accumulated funds. Therefore, TVEs were born with – and still carry – the label of 'community enterprises'.

TVEs were officially defined in the *TVE Law*, which came into effect in 1997, as: "various enterprises that operate in towns, townships and villages and commit themselves to support agricultural production and rural communities" (paraphrased from the Chinese definition). In the *TVE law*, the major investors in a TVE were to have been classified as rural collective economic entities or farmers. This means that these investors should have held the majority of shares. Originally, when the former communal enterprises were renamed as TVEs in a *Circular*[1] issued by the State Council in March of 1984, TVEs included all enterprises located in rural areas, including: those owned by townships and villages; multiple cooperative enterprises; joint ventures; and other forms of collectively and privately owned enterprises. This is a much broader definition of TVEs than the one given in the 1997 *TVE Law*.

In fact, three models emerged in the 1980s and 1990s representing three typical ownership structures, namely, Sunan Model, Wenzhou Model and Zhujiang Model[2]. These models have drawn great interest among researchers and media since the middle of 1980s. In this study, the second, broader definition, is considered more relevant for two reasons. First, all the enterprises located in Small Towns have had impacts on the local social economic development and the environment, irrespective of what ownership structures they have had. Secondly, TVEs have been experiencing rapid internal reforms in relation to their ownership structures and sectoral composition in recent years. These reforms have aimed to better define property rights, establish modern enterprise institutions and make the TVE sector an integral part of the country's industrial system. Thus, it becomes less important to distinguish collective TVEs from private TVEs.

Small Towns in China, in a broad sense, refer to statutory towns (Jianzhi Zhen) and to the non-statutory towns and townships (Jizhen). The former are officially recognized by relevant government authorities according to certain criteria, and fall within the formal hierarchy of China's urban settlements. The latter evolved from certain administrative villages, and function as informal centers for local commercial activities.

Statutory towns are the grass-roots administrative units of China's urban system. Apart from their administrative function, many Jianzhi Zhen also function as commercial centers; collection and distribution centers for goods; industrial bases; transportation, communication and information centers of their regions. In the words of Kirkby (2000), the typical town morphology is a central urban core surrounded by a rural territory with a number of administrative villages and smaller settlements. With the rapid growth of TVEs, the number of the Jianzhi Zhen has increased dramatically, and so has environmental pollution. The conflict between development and environment in the Jianzhi Zhen is comparatively much bigger and more representative than that in the Jizhe*n.* Therefore, the

[1] In March of 1984, in a Circular entitled *The comments on the report about commune enterprises by the Ministry of Agriculture, Animal Husbandry and Fishery* (Policy paper No.4, 1984) the State Council agreed to rename the commune enterprises with TVEs.

[2] Sunan Model refers to TVEs which are collectively owned and run by community governments. These kind of TVEs were most developed in southern Jiangsu Province. Wenzhou Model represents household based and export-oriented processing TVEs in Wenzhou of Zhejiang province. Zhujiang Model is featured with joint-ventures based on foreign direct investment in Zhu River delta of southern China (Qiu, 1999).

term Small Towns in this study refers to Jianzhi Zhen. Towns are crowned with 'small' in Chinese language not because they are the smaller ones among the towns, but because they are smaller than cities.

Today when we say that TVEs are 'a glorious invention' of Chinese farmers, very few people realize that this was a no-choice choice of the farmers. In fact, both TVEs and Small Towns are the unanticipated results of the economic reforms that have been affecting rural China since the end of the 1970s. TVEs and Small Towns are widely regarded as unique features of the processes of industrialization and urbanization in China, not to be found in other countries.

The fundamental causes of these 'Chinese phenomena' are to be found both in the traditional division between 'urban/industrial – rural/agricultural' as operationalized in the Household Registration System (HRS or hu ji zhi)[3], and in the increasing surplus of rural laborers. It is now widely recognized that the collective system of the people's communes as it existed before the economic reforms concealed considerable rural underemployment (Kirkby et al., 2000). With the introduction of the Household Production Responsibility Contract System (HPRCS, or Jiating Lianchan Chenbao Zeren Zhi)[4], which replaced the communes of the 1978-1984 period, by the early 1980s it had become evident that one third of the rural workforce was not needed in crop and cattle production. Farmers had no alternative but to start up local industries to find a way to 'leave the soil but not to leave the land and to enter the factory without entering the city (litu bu lixiang, jingchang bu jingcheng)'. This was how the township and village model of rural industrialization started, and this is the development which is so 'uniquely Chinese'.

Since that time, China has witnessed an unprecedented rural-to-urban transition. During two decades of rapid development, Chinese farmers have been key players in reshaping the traditional 'urban/industrial – rural/agricultural' structural dichotomy into a 'urban/industrial – rural/industrial - rural/agricultural' structure. The development of TVEs and Small Towns are both the drive and outcome of that transformation process.

Over the last two decades, TVEs have created significant wealth as the most rapidly growing part of China's economy, with an average annual growth rate above 20% (NEPA, 1995). TVEs have raised the local level of industrialization and increased the income of the rural residents, and generated almost one third of the national Gross Domestic Production (GDP), and about half of the national industrial added value in 1997 (Zhu, 1998). Most important of all, TVEs have enabled the transfer of a large quantity of surplus rural laborers to industry without those laborers having to leave their villages. In doing so they have formed the driving force for Small Town development – a town model of rural urbanization. Not surprisingly, Small Towns have been adopted by the Central Government as a 'Grand Strategy' for increasing industrialization and urbanization in rural China.

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[3] China may be the only country who deployed a household registration system. This system was introduced after the liberation in 1949 as an important administration instrument under the centrally planned system to serve the economic and political strategies of that time. It strictly controls the number of rural population moving to live in the cities in order to have more industrial output accumulations (CCTRD, 1998).

[4]This system was first introduced during the 3rd Plenary Meeting of the 11th Party Congress in 1978. For the first time in the history, this system enabled the separation between the ownership and the use right over the land, and farmers were given the right to use the collectively owned land based on contracts. This reform on the land use is the prelude of the whole economic system reforms in China (Qu, et al., 1997).

A number of decisions and policies have been enacted by the Chinese Government to guide and facilitate the development of TVEs and Small Towns. Most notable is the document *Opinions on Speeding up the Sound Development of Towns*[5], which was issued nationwide as an official document of the Central Committee of Communist Party Congress (CCCPC) and the State Council on 13th June, 2000. This is the most comprehensive and latest policy addressing Small Town development. The strategy of combining Small Towns and TVEs for mutual benefit is also stressed in the Tenth Five-Year Plan (FYP, 2001-2005) of TVEs,[6] a strategy based mainly on better zoning and restructuring[7].

However, this unique model of industrialization and urbanization was created and has to operate under two separate social and economic systems, which separated the city from the countryside and industry from agriculture. The growth pattern of TVEs – straddling these two economic systems – has increasingly come to offer a challenge to the sustainable development of the locale, the region and the nation. The villages and towns are paying a great price for this, as are the state and the society at large. The development has been accompanied by significant costs to the nation's resources and environmental quality. TVEs have become the most polluting sector in the country and many Small Towns are now living with deteriorating environmental quality. China has reached the historical moment that environmental problems in rural areas can no longer be ignored and solutions call for concerted efforts.

Apart from agricultural pollution[8], industrial pollution of all kinds generated by numerous TVEs, especially Township & Village Industrial Enterprises (TVIEs), has reached intolerable levels. As noted by Kirkby, Bradbury and Shen (2000), media accounts and official studies of the impacts of rural industrialization upon the agricultural and living environments are by now almost too numerous to mention. As early as by the mid-1980s, TVIEs were responsible for one third of the nation's total industrial air emissions; almost one sixth of the industrial water pollution; and a similar proportion of the total industrial solid wastes (Qu and Li, 1994: 161). The environmental pollution and ecological destruction one can observe in many of TVIEs-dominated Small Towns have already hampered sustainable development of the local and regional economies.

However, while the economic, social, policy and demographic aspects of TVIEs have become the focus of attention of policy and academic efforts, their environmental dimensions have been neglected due to their geographically dispersed nature (Bradbury, Kirkby and Shen, 1996). The environmental consequences of the current development modes are deliberately put between brackets, in the hope that environmental problems will be automatically solved with increased income levels and technological advancements. The complexity of this issue has increased, given the fact that China, particularly rural China, is in the midst of many transitions: from a centrally planned economy to a market

[5] Policy Paper No.11 of 2000 by the State Council.
[6] "The Tenth Five-Year Plan and Long-tern Objectives for TVEs Restructuring (draft)", which was provided by TVEs Administration Bureau of the Ministry of Agriculture in July of 2000.
[7] The areas that need restructuring include the compositions of products, sectors, capitals, firm organizations, property rights and geographical distributions (Xu, 1998).
[8] In early 1990s, pollution from farming practices already became severe. According to *China's Agenda 21* (1994), 7 to 13 million hectares of farmland are directly affected by fertilizer or pesticide contamination each year, or about 1/5 of the total farmland have been contaminated to some extent.

economy; from a rural to an urban society; from an agricultural to an industrial society; from a traditional to a modern society.

Unfortunately, relevant studies on these two issues have in the past focused only on either TVIEs or Small Towns. The complementary effect and the potential to 'kill two birds with one stone' through systematic integration of these two issues have remained under-studied. The Nanjing Institute for Environmental Science (NIES) was given the task by the State Environmental Protection Administration (SEPA) to conduct research on the environmental aspects of TVIEs; to give detailed analysis on pollution levels; to identify their causes; and to propose feasible countermeasures. But its publications (e.g. Wang et al., 1993 and 1997; Zhao, 1998; Guo, 1995) pay little attention to the host localities of the TVIEs, or to their interrelationships with the surrounding environment. On the other hand, most of the studies on Small Town development focus on their key functions in absorbing the surplus rural labor force and accelerating urbanization of the rural areas; in stimulating policy reforms to increase autonomy in the towns so that they can react quickly to the changing environment; and on capacity building for town planning, etc[9]. But how these changes and reforms will affect the development of TVIEs and their environmental behavior in particular has been neglected.

Another important fact, which is often neglected in environmental studies on TVIEs, is that the town governments (or, in a broader sense, the local community governments) and TVIEs maintain inseparable alliances in playing local environmental regulatory games (see further elaboration in chapter 4). Despite the frequent in-depth social and economic study and analysis of this feature of the economic behaviors of these alliances, surprisingly few environmental analysts have attempted to problematize or utilize the general nature of these local alliances for the benefit of local environmental protection. This fact explains the past failures in which TVIEs were dealt with by the formal environmental regulatory authorities on individual basis, and the dual roles of the town/township government in this game was not fully recognized. At the same time, this fact provides a breakthrough perspective towards solutions.

Thus for historical reasons, any policies that attempt to address issues of Chinese farmers, agriculture and rural society, without taking these interactions into account, face difficult dilemmas. One typical example is the question of how to protect the rural environment during the ongoing rapid industrialization and urbanization processes in rural China, a process driven by Township & Village Enterprises (TVEs) and Small Towns. The economic and social achievements of TVEs and Small Towns are widely celebrated and are regarded as secret weapons to alleviate rural poverty, mitigate population pressure on limited arable land, and narrow gaps between the urban and rural societies -- all without causing social unrest (Jiang, 1998). Unfortunately, China has reached the moment that environmental problems in rural areas, related to these processes, can no longer be ignored and solutions call for concerted efforts.

This dissertation places these two issues within a single framework for purposes of analyzing the intricate relations between the (f)actors involved in local environmental management.

[9] For example, 36 papers presented during a conference on *China: Small Towns Development* in Beijing in 1995, and two major books by the former State Commission for Economic Restructuring and System Reform (SCERSR) published in 1996.

1.2 Framing research questions

As we have seen in the preceding section, China has to cope with environmental degradation and the demand for rapid economic growth[10] at a time when its economy is in a transition both from a centrally planned towards 'a socialist market economy with Chinese characteristics[11]' (as it is called in China), and its society is in transition from a traditional rural economy towards a modern industrial society. The notion of 'double-risk' societies (Rinkevicius, 2000), which refers to the developing countries and the ones in transition, who have to face the global ecological risks and a more complex social anxiety over the distribution of goods and 'bads', is especially true in the case of Small Towns (Zhang, 1997).

Since publication of the Brundtland report (WCED, 1987), it has become widely known that the essence of sustainable development is to combine economic growth with environmental protection on the long term. Given the fact that TVEs and Small Towns are both economically and environmentally significant for the nation, their progress will be decisive in the national effort towards sustainable development. The dilemma facing Small Towns is that industrial development and environmental pollution tend to grow in parallel; the fact that both of them should be priorities challenges existing institutions and requires a profound ecological switch in existing social organizations.

Environmental protection in Small Towns can be seen from many viewpoints. It can be addressed from the technical, managerial, institutional or behavioral aspects at the firm level, town level, or even regional level. This research focuses at the 'software' dimension of TVIE environmental protection in Small Towns, that is, the social causes of environmental problems in Small Towns, including the internal relationship of the TVIEs-Town Government alliances; the current institutional set-up and policy environment pertaining to environmental regulation at town level; and the relations between different actors. I would argue that the adjustment of the existing management strategies and institutional arrangements is rather important -- even fundamental -- for enabling an ecological shift in Small Towns given the current social, economic and technological conditions. Therefore, the ultimate objective of this research is **to develop strategies for environmental reform of contemporary TVIEs-Town Government alliances.**

To this end, this study aims to answer the central question: **How can TVIEs-based Small Towns combine sustained TVIE economic development with safeguarding the sustenance base?**

[10] As soon as the annual growth rate of the national economy is below 7-6%, or the industrial growth rate is below 9-8%, it will cause severe social problems (Ji, 1998).

[11] 'Socialist economy can also be market economy' is a historical and revolutionary breakthrough of the traditional Marxism theory on socialism society. Learned from her past experience and lessons, China finally determined that 'establishing socialist market economy' is the goal of her economic reform. Market competition mechanism has been introduced into China's economy. This change has its far-reaching impact on Chinese society. Although it is still too early to say what China will become, it is clear that China would have lost her 'global identity' if she did not take the path to market economy. However, China should not and can not develop her economy after the manner of the West (see what happened in Russia), China need a model which is suitable and can function in her existing situation, that is the so-called 'socialist market economy with Chinese characteristics'.

To be more specific:

- ⌘ What are the characteristics of the TVIEs-Town Government alliances?
- ⌘ What kinds of environmental strategies have been adopted by the alliances? How are different environmental strategies associated with different types of alliances?
- ⌘ What are the necessary institutional conditions for the success of different environmental strategies? How to introduce these institutional changes into Small Towns and TVIEs?

1.3 The organization of this dissertation

The argumentation in this dissertation is organized in 9 chapters.

Chapter 2 lays out the theoretical foundation for subsequent chapters by reviewing and analyzing relevant environmental sociological theories: Social Economic Natural Complex Eco-system (SENCE) theory, which has been developed by a group of Chinese scientists since early 1980s, and Ecological Modernization Theory (EMT), which is rooted in the Western European settings and is one of the dominant theories addressing environmental problems from a sociological perspective. This theoretical thinking leads to the formulation of a theoretical framework called the 'environmental regulatory triangle', which guides the empirical studies. This framework combines the holistic view of SENCE with the analytical power of EMT for purposes of analyzing environmentally-induced institutional changes. Apart from the state, this green triangle also brings market agents and the community into the game. The uniqueness of this triangle is that the Small Town Governments and TVIEs are regarded as alliances that react to state policies, markets and public pressure.

This theoretical framework is translated into an analytical framework in chapter 3. To understand the processes, dynamics and development trends in Small Towns, case study research is adopted as the most suitable research strategy to look at the complex situation. To generate empirical data, qualitative methods, namely, profiles, literature studies, observations and open-ended interviews, are used.

Chapter 4 and 5 are meant to give more background information on institutional factors behind Small Town and TVEs phenomena and industrial environmental management in China. Apart from giving more concrete figures on both economic achievements and environmental pollution by TVIEs and Small Towns, chapter 4 analyses how the old institutions have driven the growth of Small Towns and TVEs, and why these institutions have now become constraints for sustainable development in towns and in the nation. Chapter 5 comments on the existing industrial environmental policies and regulatory approaches. It concludes that, other than forced closure campaigns, current policies and regulations do not greatly affect TVIEs. This justifies the adoption of more system- and region-based approaches instead of a focus on the individual TVIEs.

Chapter 6 and 7 are devoted to analyzing case studies in five Small Towns from Jiangsu and Anhui provinces. Information on the economic level, environmental situation and environmental management capacity are analyzed and compared at provincial level, municipal/county level and town level to illustrate the embedded environment of Small

Towns and TVIEs and why Small Town governments and TVIEs become alliances in the environmental regulation game.

Chapter 8 uses a comparison of the case studies in further analyzing the role of the state policy, market agents and the community in ecologizing industrialization in Small Towns. From this in depth analysis, five possible environmental strategies are presented: political modernization; aid-oriented strategy; technology-based solutions; export-driven models; and a shift-to-service industry strategy.

Chapter 9 draws conclusions and gives recommendations on the institutional innovations that are required for triggering ecologizing industrialization process in Small Towns.

2

Environmental sociology: Analyzing social roots of environmental problems

Environmental problems are problems for society… Environmental problems are as well problems of society.
- M. M. Bell (1998)

In order to investigate the ways TVIEs and Small Towns deal with environmental challenges and to understand the reasons behind their behavior, we are in need of theoretical perspectives. Environmental sociology, an emerging discipline of sociology, provides us with new perspectives that allow us to think beyond the border of our social realm. This chapter brings environmental sociology into focus, and presents two theories that attempt to bridge ecology and sociology from different viewpoints. The first theory is Socio-Economic Natural Complex Ecosystem theory (SENCE), which is widely acknowledged as a theoretical basis for sustainable development studies in China. The second is called Ecological Modernization Theory (EMT), a framework that originated in Western European countries and has been quickly developed into one of the most prominent theories in contemporary social sciences for analyzing society-environment interactions (Mol and Sonnenfeld, 2000:4).

SENCE theory, which roots in human ecology traditions, broadens our view by elaborating the position of human society within a comprehensive framework, and placing its relationship with other sub-systems in a complex eco-system. EMT, which is one of the dominant theories under the label of environmental sociology, provides a useful framework and tools to analyze environment-induced social changes. With the help of these theories, it will be possible to establish a theoretical model for analyzing the relations, processes and mechanisms of the environmental management in Small Towns.

2.1 The emergence of environmental sociology

Michael Bell was not alone in often having to field the question: "What does sociology have to do with the environment?" (Bell, 1998: 1-2). And he is right to start his two-minute answer with explaining the ecosystem in its broadest sense: a system in which people, other animals, plants, land, water, and air are closely interconnected. He continues by pointing out that environmental problems are social problems because they not only threaten our existing patterns of social organization, but also challenge us to change those patterns of organization. Thus, people are the problem-makers and at the same time the problem-solvers. We need sociology, together with other disciplines, to be able to

understand the origins of, and to propose solutions to these all-too-real social and biophysical conflicts, situated as they are in the midst of inter-connected ecosystems.

Supplementing this two-minute answer, this chapter gives a more complete answer to the same question by presenting two perspectives which claim to stand in the middle between ecological and sociological perspectives: SENCE and EMT. The reason for exploring these two theories is not only the fact that they represent two academic tendencies and that they originate from two different geographical locales, but also because both of them can generate inspiring ideas and principles for the construction of the theoretical framework for this study.

Although environmental problems have accompanied human societies from their inception, the field of environmental sociology developed largely in response to the emergence of widespread societal attention to environmental problems in some industrialized countries in the early 1970s (Buttel, 1987; Dunlap and Catton, 1979; Freudenburg and Gramling, 1989; Humphrey and Buttel, 1982; Mol, 1995). Therefore, a brief review of the upsurges of environmental concerns in Western industrialized countries and the situation in China will help us to better understand the social background of the emerging discipline of environmental sociology and explain why similar academic efforts in China have different features.

2.1.1 Upsurges of environmental concerns in the West

Environmental problems caused by industrialization were first experienced in Western industrialized societies after the Second World War. The history of modern environmental concerns has not been a process of linear growth. Instead, some major upsurges that responded to visible increasing environmental accidents and some timely books on the issue can be observed. Modern environmental concerns refer to an awareness of environmental problems in a structured manner: the ad-hoc concerns of earlier times did not evolve into a permanent, structural concern (Spaargaren, 2002).

The first upsurge took place in the late 1960s to early 1970s. During this period, increasing environmental degradation led to broad social concern and to the organized activism of civilians. The early 1970s was regarded the birth-period of the 'new environmentalism,' a period which was marked by the publication of the Report to the Club of Rome *The Limits to Growth* (Meadows, 1972) and the first world-wide conference on environment and development in Stockholm in 1972. Of course, some other books like Rachel Carson's *Silent Spring* (1962), Barry Commoners' *The Closing Circle* (1972), Paul Ehrlich's *Population Bomb* (1971) and also *The Blueprint for Survival*, a special edition of the environmental journal *Ecology* (Goldsmith, 1972), made important contributions and usually are regarded as 'classics' in environmental studies (Nelissen, Straaten and Klinkers, 1997). This period also saw the emergence of 'new' environmental organizations (e.g. Friend of the Earth) and an 'activated' public opinion (Spaargaren, 2002). Environmental issues started gaining access to most of the official political agendas around the world, especially in the developed world.

However, the real political institutionalization of environmental concerns did not take place until the mid-80s. During the period 1970 until the mid-80s (the second

environmental wave), environmental activists began to question the foundations of industrial societies (Mol, 1995; Spaargaren and Mol, 1992). De-modernization or counter-productivity was the dominant ideology in the 1970s within the environmental movement, which advocated a partial or total revision or dismantling of modern industrial, capitalist society.

In the same period, government bureaucracies started to elaborate their environmental ideas and futures. Instruments and strategies of environmental policy-making were developed. The main result was integrated policy planning, illustrated in the Netherlands by the so-called NEPPs - National Environmental Policy Plans – which appeared from the late 1980s onwards. However, many state governments emphasis on physical or direct regulation, and the top-down, command-and-control (CAC) approach current at the time, led to very modest support for environmental policy in business circles. Not surprisingly, the implementation of the vast body of environmental laws and regulations became a major worry. This situation called for changes in environmental regulation approaches (Spaargaren, 2002).

The Brundtland report *Our Common Future* (WCED, 1987) catalyzed the debate within the environmental discourse of the 1980s and marked the third wave of modern environmental concern (mid-80s to early 90s). As Mol (2000) pointed out, the deindustrialization, counter-productivity and neo-Marxist undertones of the ideologies of the early environmental movement started to fade during the eighties. The concept of sustainable development sought to exit the classical scheme of 'environmental issues' and 'economic growth' as two irreconcilable entities. This new environmental ideology attracted not only politicians, but also many responsible policy makers in business and industry. The involvement of economic sectors in environmental policy-making processes made it possible for environmental institution building in the economic realm. At the same time, without the entire withdrawal from the process, the role of the state was re-defined as organizer or facilitator of consultative processes of environmental policy-making, which is carried out by horizontal networks of both state and civil society actors, especially economic actors, at different levels of society (Spaargaren, 2002). More decentralized, flexible and consensual styles of national governance with less top-down hierarchic command-and-control regulation emerged (often referred to as political modernization; cf. Jänicke, 1993; Mol, 2000). The important feature of this period was the commencement of actual, environmentally-induced institutional transformations (Mol, 1995).

From the 1990s onwards we witness the final upsurge to date. Environmental concerns of this period bear the label 'global environmental changes', and include the greenhouse effect, ozone depletion, and loss of biodiversity. The fact that these environmental problems become increasingly trans-national, makes also the demands on environmental policy-making global. On the one hand, global environmental problems function as an important drive towards the process of globalization. On the other hand, globalization processes also affect the construction and solution of environmental problems in both a negative and positive way (Mol, 2001). The Rio World Summit on Environment and Development in 1992 was seen as "global consensus and political commitment at the highest level", an illustration of the ways in which governments, enterprises and non-governmental organizations can co-operate to solve the crucial environmental problems of our time which threaten human life and society (World Bank, 1997).

As Mol (1995: 2-3) pointed out, it was from the 1980s onwards that "the environment is moving from the periphery to the center of the social development of industrial societies". Environment has become increasingly important in institutional transformation processes in industrial societies. It was against the historical background of this second modern environmental wave that, Ecological Modernization Theory emerged, based on empirical observations from several Western European countries. Since the central subject of this present study is to seek necessary institutional arrangements and management approaches in favor of environmental improvement in Small Towns, the experience from industrial societies might be valuable for industrializing China.

2.1.2 Environmental concerns in China

Although plenty of evidence can be found in the ancient Chinese philosophy (e.g. Yin-Yang, Taoism, Confucianism, Legalism, Mohism, Logicianism etc. from Chun Qiu to Warring States, 720-221 BC) and people's practices (e.g. ecological farming approaches) about how the ancient Chinese perceived the relationship between man and nature and how they made use of certain ecological principles to coordinate man-nature and man-man relationships, so-called modern environmental concerns comparable to those in the Western world are obviously absent in China. Peter Ho (2001) noted that, while "the green movement in the former East-bloc countries such as Poland, Bulgaria, Hungary, the German Democratic Republic and Czechoslovakia played a significant role in bringing down the communist regime", such protest demonstrations are unheard-of in contemporary China.

The political and societal context in China is, of course, the main reason why China forms such an exception. As early as in 1950, the first regulations by the Chinese communist government on social organizations introduced strict control over voluntary civil society organizations. Although the central government is aware that it can not avoid strengthening civil society and allowing the rise of grassroots organizations, the latest 1998 regulations on social organizations do not relax this control. To deal with this dilemma, the central government is currently following an unofficial policy of toleration. Thus, "it is this mix of official strict control and unofficial toleration that yielded environmentalism in China its specific configuration" (ibid.).

This specific configuration of Chinese environmentalism is characterized by the participation of individuals, student groups, social groups and semi-governmental organizations[12] in environmental protection. Public participation is especially important for a country like China, which is challenged by a huge population, severe environmental problems and rapid economic growth. When its economic strength and science and technology still remained at a low level, active public participation in environmental protection could be more effective at a lower cost. However, due to the above mentioned political and societal context in China, although it was adopted as early as 1973 during the first National Environmental Protection Conference that environmental protection must rely on broad participation of the people, this principle was neither transmitted into right

[12] These environmental organizations, including semi-governmental organizations, social groups and student groups, can be considered as environmental NGOs in China, according to Zhao (1999).

signals to the civil society nor institutionalized (Zhao, 1999)[13]. Thus, the social environmental movement remained underdeveloped in China while the trend of environmental deterioration continued. Direct environmental damage in China has been estimated to exceed 200 billion RMB[14] each year, and a similar amount of money is being lost each year due to waste of energy and resources in industrial production processes (Guo, 1996).

It is only in recent years, that reports in various public media about actions by individuals and social organizations have been increasing. For instance, Xin Yang, an ordinary employee of a company in Shengzhen city, volunteered to work for 'Protect the Origin of Yangtze River, Love Nature' campaign for several years. Zhongming Chang, a resident in Beijing, invested all his savings to a piece of waste land of 30 *mu*[15] outside of the city and turned it into a natural reserve; Jinggui Yang, a farmer in Shangxi Province, has since 1995 initiated a bicycle tour of thousands miles for environmental awareness (Zhao, 1999). And this list can be extended.

While domestic environmental NGOs play a limited role in advancing environmental awareness, the mass media have increasingly addressed environmentally related issues with the tacit approval of the central government. Newspapers are publishing a growing number of environmentally related articles. In addition, radio and television programs dealing with the environment often include call-in shows and exposure of environmental accidents (Schwartz, 2000). Many regular and occasional television programs have been initiated to disseminate environmental knowledge to audiences with different backgrounds and age ranges. The most noted one, a program called 'Century Tour of China Environment (Zhonghua Huanbao Shiji Xing)', started in 1993. Every year, this program focuses on a different theme and more than 3,000 reporters have been sent across the country. This program helps to increase environmental awareness, to bring the polluters into focus and to solve some environmental problems. In the 'clean-up action'[16] of the Huai River in 1997 and the 'clean-up action' of the Tai Lake in 1998, China Central Television (CCTV) and many major newspapers, journal and magazines devoted efforts to reporting, and environmental awareness surged as a consequence (SEPA, 1998). Other organizations, such as China Women's Federation, and Youth Leagues, have carried out various activities to contribute to a better environment through their nation-wide networks. For instance, a series of projects on the theme of 'Women, Home and Environment' have been initiated by the Women's Federation since 1997. On the Environment Day of 1995, Youth Leagues called for volunteers for a 'White Waste Clean-up Action' along four major railway lines in China and this Action attracted about 210,000 young railway workers (Zhao, 1999).

However, officially registered environmental groups remain underdeveloped in China, and environmentalism has not (yet) become a mainstream social force. Zhao (1999) divided Chinese environmental mass organizations into three categories: student groups, social groups and semi-governmental organizations. Most of these environmental organizations emerged around 1996 because of several factors. One is that environmental problems

[13] It should be recognized that although state-imposed mass mobilization campaigns, such as that for tree planting, may have been very effective, modern society requires public participation based on adequate information, open exchange of views, transparency of the decision-making process and early involvement of the interested parties (Vermeer, 1998).
[14] In 1995, 1 US$ = 8.37 RMB.
[15] 1 mu=0.1644 acre=0.0667 hectare; ha
[16] See chapter 5.

became intolerable in China. Secondly, the 1992 UN Conference on Environment and Development, the start of China Agenda 21 in 1994, the Forth National Conference on Environmental Protection in 1996 and a series of environmental regulations released afterwards all contributed to a favorable political opportunity structure. The third is the mounting environmental awareness among the public. A survey by Friends of Nature, a Chinese environmental NGO, on "environmental awareness of Chinese newspapers in 1996 shows that reports on environmental issues of 51 comparable newspapers increased by 92.5% in 1996 compared to 1995 (Friends of Nature, 1996). In Beijing, the number of social groups and student groups doubled from 9 in 1995 to 18 in 1996 (Zhao, 1999). Professor Liang Congjie, director of the Green Culture Branch of China Institute of Culture, China's first non-governmental environmental protection organization, won the 2000 Philippine Ramon Magsaysay Award[17] for his extraordinary work on environmental protection. Yet, Ho (2001) is prudent by stating that, given the current political and societal context in China, it is still premature to say, to what extent these tender sprouts of environmentalism today might grow into a significant social force in the future.

Although a sample survey jointly conducted by China Environmental Protection Foundation and China People's University in 1995 concluded that the overall level of environmental awareness in China is still low (Hong, 1997) and that the public is generally under-informed despite some shifts in public perception (Agence France Press, 1999), this situation has been improving rapidly. Dasgupta and Wheeler (1996) show evidence by pointing out that China's provincial and local regulators respond annually to more than 100,000 citizen complaints. Plaintiffs visited provincial and local regulators over 79,000 times per year and sent more than 53,000 letters.

The so-called modern environmental concerns in China appeared about three decades after parallel developments in the environmental waves in the Western Europe. Not surprisingly, theoretical development that addresses increasing environmental problems in China as timely response to organized social environmental movements within China is still in its infancy. Instead, the Central Government has been the one that drives and supports this kind of research activities. It is also the Central Government that makes the determination to adopt a sustainable development strategy and initiates the political and economic institutionalization of environmental concerns. The consequences are reflected in the differences one can find in the objectives, scope, content and methods of environmental studies in the West and China.

2.1.3 'Human exemptionalism paradigm (HEP)' and 'new ecological paradigm (NEP)'

As defined by Catton and Dunlap (1978), environmental sociology is "the study of interaction between environment and society". They pointed out in an article on *Environmental Sociology*: *A New Paradigm* (ibid.) that the Durkheimian tradition of explaining social phenomena only in terms of other 'social facts', plus an aversion to

[17] Named after former Philippine president Ramon Magsaysay (1907- 1957), the Ramon Magsaysay Award, Asia's equivalent of the Nobel Prize, is given every year by the Ramon Magsaysay Award Foundation (RMAF) to outstanding persons or institutions in social activities. The Award started in 1958. Fei Xiaotong, a renowned ethnologist and sociologist, received the Community Leadership Award in 1994. He was the first Chinese to win the Magsaysay Award (*China Daily*, August 8, 2000).

earlier excesses of biological and geographical 'determinism', had led sociologists to ignore the physical world in which humans live. They claimed that this 'human exemptionalism paradigm (HEP)', which denies the constraints of nature, should give way to an ecological paradigm or worldview that acknowledges the ecosystem-dependence of all human societies. Their 'new ecological paradigm (NEP)' stressed the environmental factor and challenged the tradition of *Sociology.* Spaargaren (2002) summarizes the major assumptions in HEP and the proposed NEP as shown in Table 2.1.

Table 2.1 A comparison of major assumptions in sociology's human exemptionalism paradigm (HEP) and the new ecological paradigm (NEP)

	HEP	NEP
Assumptions about the nature of human beings	Humans have cultural heritage in addition to (and distinct from) their genetic inheritance, and thus are quite unlike all other animal species.	While humans have exceptional characteristics (culture, technology, etc.), they remain one among many species that are interdependently involved in the global ecosystem.
Assumption about social causation	Social and cultural factors (including technology) are the major determinants of human affairs.	Human affairs are influenced not only by social and cultural factors, but also by intricate linkages of cause, effect, and feedback in the web of nature; thus purposive human actions have many unintended consequences.
Assumptions bout the context of human society	Social and cultural environments are the crucial context for human affairs, and the biophysical environment is largely irrelevant.	Humans live in and are dependent upon a finite biophysical environment which imposes potent physical and biological restraints on human affairs.
Assumptions about constraints on human society	Culture is cumulative; thus technological and social progress can continue indefinitely, making all social problems ultimately soluble.	Although the inventiveness of humans and the powers derived therefrom may seem for a while to extend carrying capacity limits, ecological laws can not be repealed.

Source: adapted by Spaargaren (2002) from Catton and Dunlap (1980: 34).

It seems obvious now that the increasing environmental problems and awareness during the first environmental wave more or less triggered the combination or 'hybrid' of biology or ecology on the one hand and sociology on the other. The paradigmatic turn from HEP to NEP introduced ecology into the social sciences in the late 1970s and prepared the emergence of environmental sociology. Ecology is often described as the study of natural communities. Sociology is often described as the study of human communities. Environmental sociology is the study of both (Bell, 1998).

Following this new paradigm, many researchers have attempted to answer questions like: What kinds of relationships exist between the natural world and human societies? What are the dynamics and logic of each system? How do they react to each other? What are 'environmental problems' indeed? What are the solutions? To answer these questions, two theories have attempted to bridge ecology and sociology, but from different sides of the spectrum using different research methods (Figure 2.1). The Chinese Social-Economic Natural Complex Ecosystem (SENCE) theory differs from Chicago school of human

ecology[18] and contemporary human ecology by emphasizing culture, values, institutions and technologies as driving forces of SENCE. The western Ecological Modernization Theory (EMT) focuses on environment-induced social changes and believes in the ability of human society to coordinate between economic and environmental objectives by economizing ecology and ecologizing economy.

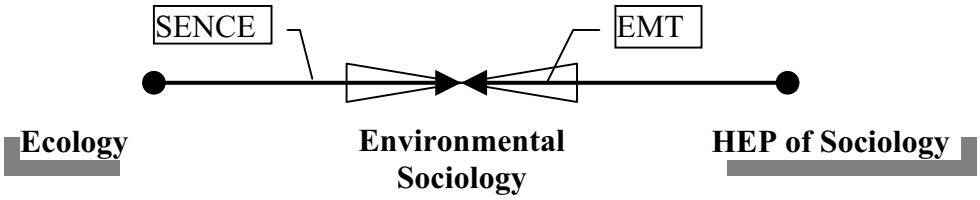

Figure 2.1 The positions of SENCE and EMT

2.2 Ecology-inspired perspective: the core of SENCE

The ecology-inspired perspective is considered more ecological because the scholars in this group focus more on ecological principles and attempt to apply these principles to human society. They use some methods or analytic frameworks from natural sciences (e.g. the methods of ecology and system science). They criticize the traditional sociological paradigm, as what Dunlap and Catton started in late 1970s (Dunlap and Catton, 1978 and 1979).

The ecology-inspired analytic framework posed by Dunlap and Catton can find its origin in earlier contributions by Park (Park, 1936) and Duncan (Duncan, 1959 and 1961). By transplanting ecological points of view to human ecology, Duncan introduced the concept of ecological complex. This so-called ecological complex refers to a system comprising human **P**opulation, **O**rganization, natural **E**nvironment and **T**echnology (or in short: POET Model), in which each of the four elements relates to the other three and the change of any of the four elements will lead to changes in the others (Figure 2.2). Dunlap and Catton modified this model by putting more emphasis on the central position of the environmental element and the natural substance attribute of the environment (Figure 2.3).

[18] A group of sociologists and biologists, notably Robert Park and Ernest Burgess, developed the field of human ecology at the University of Chicago in the 1920s (Faris, 1967; Matthews, 1977). While they studied the similarities between the organization of human and nonhuman life, the culture, values and symbolic qualities of the physical environment were traditionally either deemphasized or explicitly not discussed (Humphrey and Buttel, 1982). This fact limits the usefulness of human ecology for environmental sociology (Dunlap and Catton, 1979).

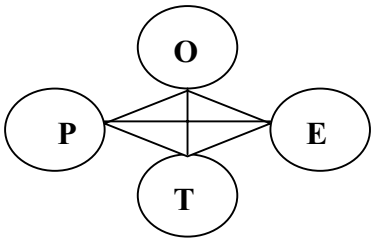

Figure 2.2 The POET Model

Source: Duncan, 1959.

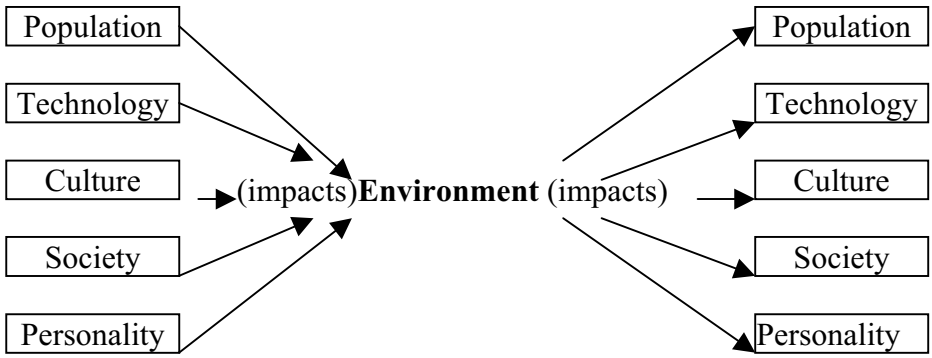

Figure 2.3 An ecological framework analyzing environment-society relationship

Source: adapted by Hong (1999) from Dunlap and Catton (1979 and 1983).

In their later studies, Dunlap and Catton introduced the concept of 'three competing functions of the environment' based on the framework described above (Hannigan, 1995). They analyzed three service functions (provides living space, supplies resource, stocks and converts wastes) the environment provides to human beings, the conflicting relationship between these three and the evolution of these functions and their intricate relationships with an attempt to explain the ecological root of the modern environmental problems. This eco-centric perspective developed in the sixties, seventies and early eighties and supported what Mol (1995:8) calls the 'take-off' or first phase of environmental sociology.

A Chinese theory called Social-Economic-Natural Complex Ecosystem (SENCE) further developed the idea of the complexity of human-environment interactions by identifying three layers of relationships (namely, eco-core, eco-base and eco-pool) in complex ecosystems, defining their boundaries and functions and focusing on regulatory mechanisms (Wang, Lu and Zhao, 1991). SENCE was jointly proposed by Ma and Wang in the early 1980's (Ma and Wang, 1984; Wang et al., 1989) and has been further developed by a group of scientists in the Department of Systems Ecology in the Chinese Academy of Sciences. This department is the leading one in China where interdisciplinary

studies on sustainability of human society have been carried out since its establishment in 1986 (Wang et al., 1995)[19]. SENCE is used to study various kinds of complex ecosystems which are dominated by human activities, as well as to analyze the dynamics, cybernetics, driving forces and regulatory mechanisms of these systems (Ma and Wang, 1990: 1-12). The major difference between SENCE and other versions of human ecology lays in its emphasis on technology, institutions and behaviors as the determinants of sustainable development of these complex eco-systems (Wang et al., 1995), while other versions of human ecology put more emphasis on applying ecological principles to human society.

The thought of SENCE originates from ancient Chinese philosophy in *Yi Jing* (*Book of Change*, negative and positive forces play upon and within any ecological relationships), which emphasizes the concept of system and the ever-changing relationship among its different elements. This holistic systems view on man-nature relationships may date back as much as 3,000 years. As Wang (1990: i - ix) explained, the *Tian* (heaven or nature), *Di* (earth or resource), and *Ren* (people or society) and their relationships have been investigated for thousands of years and formed the basis of today's Chinese human systems ecology studies.

The ancient Chinese believed that man is nourished by the nutrients of nature, and grows up as the change of seasons and exchanges energy and materials with the environment. Therefore, man is part of nature and is affected by changes in the natural system. They also believed that man is able to adapt to and deliberately bring changes to the environment for his own benefit. This is called *Dao Li,* the natural laws of the universe, geography, climate, etc. that govern man-nature relationships. The Chinese also developed a series of principles for human activities. Xun Tsu, a philosopher of the Period of Warring States (- 221 BC), pointed out that human responsibility is to create its culture in the process of exploiting nature. Different schools of philosophers at that time proposed different ways of governing a country, with emphasis on power, law, tactics, or other aspects. This is known as *Shi Li*, or planning and management of human activities, such as farming, warfare and others. There are also rules governing the relationships among people, or *Qing Li* (personal feelings, motives, and psychology). The Chinese emphasized the social attribute of man. Man should meet the collective requirement and be constrained by social responsibilities, such as tenderness, justice, kindness, harmony, and so on. The value of an individual is determined by his or her morality and contribution to the whole community. All these thoughts have contributed to the shaping of the social, economic, political and cultural structures of ancient China and are still influencing the Chinese people and the Chinese society of today.

SENCE theory is deeply rooted in the ancient thoughts mentioned above. As its name tells, SENCE is a complex system that consists of human society (institutions, technology and culture/behavior) as the eco-core, its direct environment (geographical, artificial and

[19] Responding partly to the emerging environmental concerns among the society and partly to the adoption of sustainable development strategy of the Government around mid 90s, many research institutes have been established in China to address the theoretical and practical issues during the course of pursuing sustainable development. Among many others at local levels, only in 1994, we saw the establishment of Administration Center for China's Agenda 21 (ACCA21) and Chinese Society for Sustainable Development (CSSD) under the State Planning Commission (SPC) and the State Commission for Science and Technology (Ministry of Science and Technology or MOST after the institutional reform in 1998), Research Center for China Sustainable Development (RCCSD) in Beijing University, Research Center for China Population, Environment and Development (RCCPED) in Chinese People's University, etc. In any respect, the Department of Systems Ecology of the Research Center for Eco-Environmental Sciences of Chinese Academy of Sciences takes the lead.

biological environments) as the eco-base and the surrounding as the eco-pool (source, sink, store, which is the external supporting system). Every SENCE has social, economic and natural functions and these functions are interdependent. The ultimate goal of SENCE is to realize wealth, health and faith of a given human ecological complex (Wang et al., 1995). Wealth includes monetary asserts, natural asserts (mineral, water, timber, soil, air), and human and social resources (institutions, arts, etc.). Health refers to human health and ecosystem health. Faith is reflected in attitudes, traditions, perceptions, ideas, concepts, values, believes, ethics and life-styles (Figure 2.4).

The lens of SENCE attributes many environmental problems in developing countries, in addition to their natural, historical and external roots, to the improper coupling of the institutional lay-out, technology and culture/behavior and their relationship with the environment within the eco-core of SENCE. This explains, on the one hand, the scarcity of resources and deteriorated environment, and the alarmingly wasteful use of resources, manpower, capital and time on the other. Recognizing that energy, capital, power and spirit are the driving forces of SENCE and acknowledging the fact that technology, institutions and culture/behavior play decisive roles in shaping man-nature relationship, SENCE studies aim to find the crucial causes of these problems, and to suggest suitable technological, institutional and cultural interventions to enhance the self-regulation of the system. It is the complicated systematic feedback between different elements of the SENCE, an 'invisible hand' or cybernetic mechanism, that drives the flows of material, energy, information, capital and population and thereby maintains system vitality (Figure 2.4) (Wang et al., 1995).

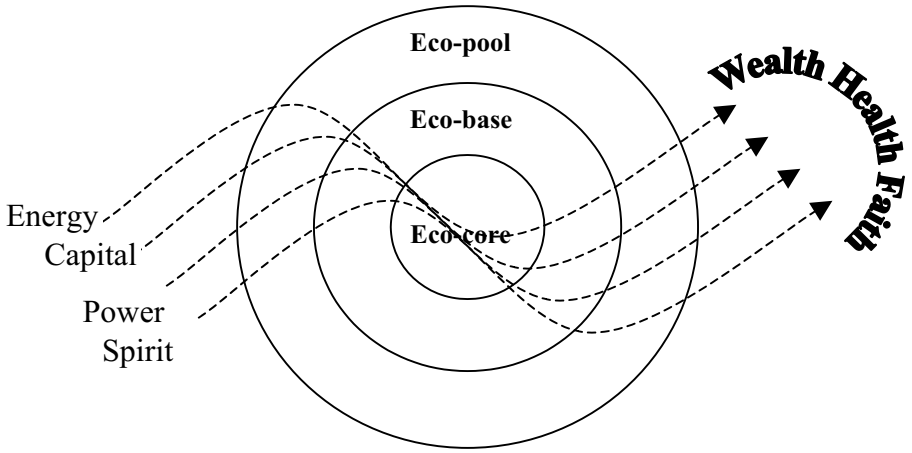

Figure 2.4 The composition, driving forces and goals of SENCE

The concept of SENCE has been widely adopted in sustainability studies in China. The sustainable development of an urban ecosystem, for instance, depends on the vitality of its

life-support system, including the levels of its carrying capacity and ecological service functions, the material metabolism chain between the rural and urban, etc. Ma and Wang (1984) defined a city/town as a SENCE that is dominated by human activities, connected through ecological metabolic processes, and supported by natural life systems (Figure 2.5).

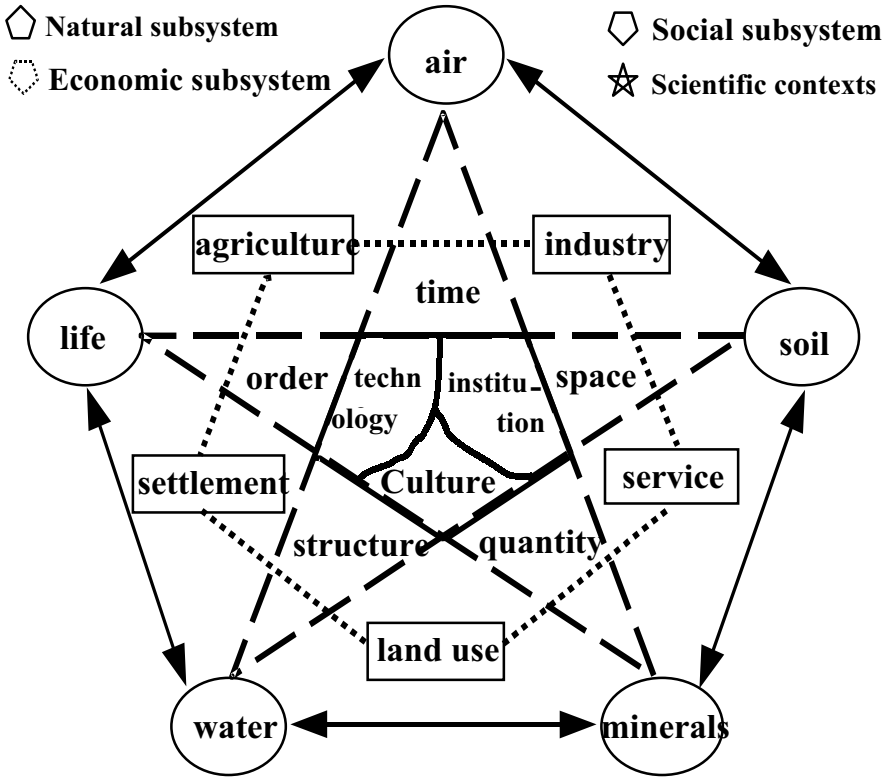

Figure 2.5 A Social-Economic-Natural-Complex Ecosystem

Source: Wang, 2000: 836.

Scientists and practitioners seeking to develop and test tools for eco-planning and management have made major efforts to translate these ideas and principles into practice. For example, comprehensive studies on Beijing-Tianjin Urban and Regional Ecosystem and Urbanization and Environment in the Tai lake basin were listed as key national research projects in early 1980s (Wang et al*.,* 1991: 42-49). In its broadest sense, the concept of SENCE is also applied in government-initiated programs. To give an example: in order to promote the sustainable development bottom up, the Ministry of Science and Technology (MOST) together with 27 other State Commission and Ministries initiated a program immediately after the Rio Conference in 1992 to urge governments at central and local level to make efforts in building Comprehensive Experimental Community for Sustainable Development (CECSD). Since then, more than 60 provincial and 18 national CECSD have been set up. Significant progress has been achieved in the social-economic and environmental development of these communities. The ongoing ecological construction (including *hardware, software* and *mindware*) in the whole province of

Hainan, with support from the scientists on SENCE, is to ecologize its economy, institutions and culture by applying the principles and methods of SENCE.

Experiences from the applications of SENCE show that: " ...sustainability can only be assured with a human-ecological understanding of the complex interactions among environmental, economic and social/cultural factors and with careful planning and management grounded in ecological principles...the central objectives [sic] is to promote highly efficient resource use rather than high speed development, harmonious system's relationship rather than inflexible compartmentalization, and robust and vital self-regulation rather than bureaucratic control...This ecological order is to be achieved through *technological innovation*, *institutional reform*, *and behavioral incentives* that promote positive economic development while mitigating negative environmental impacts (Wang, 1995)." This means that technologies (*hardware*) should be environmentally sound, economically profitable, behaviorally acceptable; institutions (*software*) should be based on system thinking so that they can enhance the symbiosis and coevolution function; incentives should be in place to raise ecological awareness (*mindware*) of people, to build up decision-making capacity and to encourage collaboration between different interest groups, interdisciplinary efforts, combination of various information, knowledge, experiences, methods and means. In other words, the health of SENCE requires proper couplings of *hardware, software* and *mindware*.

An interesting conclusion drawn from these practices is that man can neither fully understand nor optimally control the whole man-nature interaction ecosystem. In reality, decisions are made not through optimization but based on simple trial and error. Tracing the process and developing locally satisfactory and system-oriented solutions through broad participation is critically important in human ecosystems. Methodologically, system analytical techniques have been applied to rethink and rearrange the development process by local policy makers together with scientists. The core of these techniques is to guide the local people to identify the key factors, key dynamics and key opportunities for local development; to keep adjusting the system to maintain its efficiencies, its interconnections and vitality; and to make interactive trade-off among different objectives (Wang, 1995: 9). Wang (1995: 3) also summarizes several important points critical for the success of ecological construction projects in China. He pointed out that the proposed ecological solutions must be able to bring economic benefits to the local community, that the interest and support of local governments are crucial for successful implementation, that *hardware* can not work without the support of *software* and *mindware*, and that the optimal technical packages do not have to be modern advanced technologies but an appropriate combination of traditional eco-technologies and modern technologies which suit the local environmental, social and economic contexts.

In spite of what they offer, SENCE-based studies in China represent a relatively new and evolving framework, and as such suffer from: 1) the limited technical means which constrain its theoretical development. 2) the lack of a clear niche in the existing formal education system, which leads to 3) the lack of professionals with multidisciplinary knowledge.

Although SENCE recognizes the creativity of human beings who are not only able to adapt to environment but also able to introduce change into the man-nature relation, it lacks the scientific methodological base with which to study the society-environment interactions

from a sociological perspective. The suppression of the social sciences in China for several decades has made it difficult to incorporate scientific understanding of society into policy-making (Wu and Robbins, 2000). Not surprisingly, SENCE remains a comprehensive framework which is difficult to operate in real situations. And last but not the least, due to the absence of specific authorities for ecological construction in the existing institutional setting of the cities and towns, consistent funding for researches and development activities is often a no body's business (Wang, 2000:838). These weaknesses of SENCE explain why its success remains limited at an operational level.

Nevertheless, SENCE provides us a holistic view of the studied object, TVIEs in Small Towns. The TVIE-based industrialization and urbanization model in China is best considered as a social process. As happens in other countries, the process of industrialization leads to a number of social problems, such as urban squalor and environmental degradation. It is equally important to understand that it is the very process of industrialization that is ultimately socially determined (Kiely, 1998:17). Technological development is an intrinsic part of any industrial revolution, but the decision to innovate through the introduction of new technology is made within a specific social and political context. Therefore, to kick off the process of ecologizing industrialization in Small Towns, we have to understand the agents involved in determining the directions of industrialization processes. Given the fact that, currently, the overall technological level in TVIEs is rather low, public participation remains very limited in decision making, and governmental agents dominate in local affairs, innovation in the functions, structures and governing styles of the governmental institutions represents the most fundamental solution to local environmental problems. Therefore, departing from the SENCE framework, this study focuses on the institutional arrangements that are necessary to catalyze ecologizing industrialization processes in Small Towns (Figure 2.6). To this end, Ecological Modernization Theory (EMT) can guide the analysis from an environmental sociological perspective.

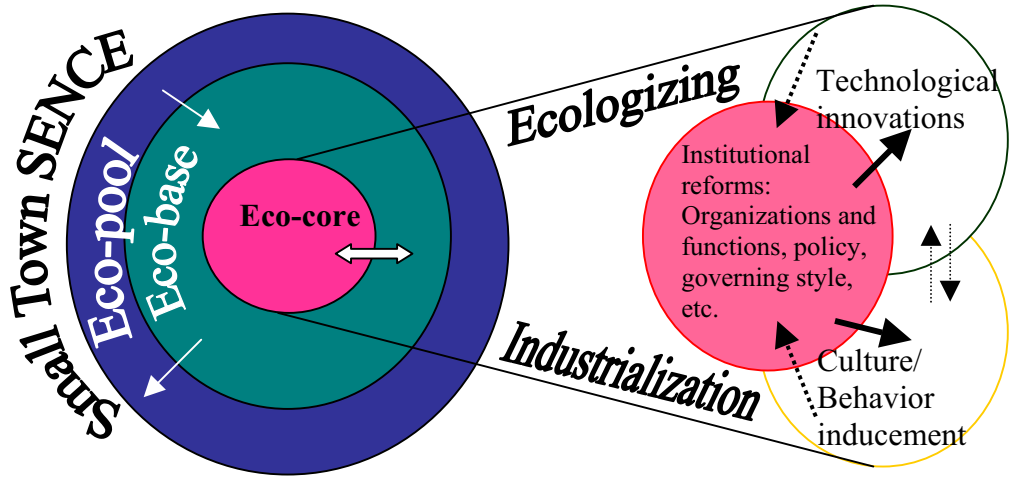

Figure 2.6 Theoretical framework for ecologizing industrialization in Small Towns

2.3 EMT as a theory for analyzing environment-induced social changes

2.3.1 Three schools of thought in environmental sociology

From the sociological perspective, we use environmental sociology to complement the weaknesses in various versions of human ecology and SENCE, since environmental sociologists focus more on the social impacts and the social backgrounds of environmental problems. The scholars in this group mainly use analytical tools provided by traditional sociology, such as social conflicts analysis and social constructionism. With regard to the analysis of the relationship between modern society and the environmental crisis, three schools of thoughts are presented here insofar as they are helpful to understand the position of Ecological Modernization Theory (EMT), which is elaborated at length.

According to Mol (1995:10-16), the 1970s and early 1980s saw 'the neo-Marxist approach, various versions of the (post)-industrial society theory and the adherents of what can be called the counter-productivity-thesis'. All three schools address the *structural factors* of the modern society that cause environmental degradation. The term of *structure* refers to the 'institutional make-up' of social systems, the way they are designed and constructed (Spaargaren, 2002). Each school has emphasized different aspects of modernity and sought to promote different remedies for the disturbed relation between modern society and nature (Mol, 1995: 11). The core features of these three schools are explained below.

Allan Schnaiberg's environmental sociology (Schnaiberg, 1980; Schnaiberg and Gould, 1994) can be regarded as the 'political economy' of environmental issues, based on neo-Marxism and neo-Weberianism. Compared with the 'ecological' explanation by Dunlap and Catton, Schnaiberg attempts to conceptualize the very powerful social momentum behind environmental destruction (Buttel, 2000). He asserted that the 'treadmill of production' is what causes the continuing disruption of the sustenance base (Schnaiberg, 1980; Mol, 1995; Buttel, 2000). 'Treadmill of production' is a process of mutual economic pinching that gets everyone running faster while advancing only a little, and always tending to increase production and to sideline the environment (Bell, 1998). Schnaiberg points out that some basic characteristics of capitalist societies discussed by Karl Marx, such as the private appropriation of surplus by the owners of the instruments or 'forces of production', the competitive character, and the lack of direct control of politics over the economy/markets must be held responsible for environmental destruction. Although Marx did criticize capitalist production organization, he did not at that time focus on the environmental side-effects of this organization. Schnaiberg appears to reduce the different aspects of the environmental crisis to the monopoly-capitalist character of contemporary society (Mol, 1995).

In contrast to the rather straightforward Marxist analysis by Schnaiberg, the other two schools share "the belief that it is the industrial rather than the capitalist character of modern society which is the more important factor (or: an equally important but under-theorized factor) in the environmental crisis" (Mol, 1995: 11). The scholars in the third school – counter-productivity - criticized Marxist analyses from a 'radical perspective'. They are sometimes labeled de-modernization/counter-productivity or de-industrialization theorists, or eco-anarchists (cf. Eckersley, 1992). The counter-productivity or de-modernization theorists, like Ivan Illich (1973), Hans Achterhuis (1986), Otto Ullrich

(1979) and André Gorz (1989), worked within the same neo-Marxist tradition as Schnaiberg, and looked for the causes of environmental degradation in the capitalist organization of production and consumption. But they did not leave the industrial traits of capitalist production untouched or undertheorized. They concluded that there is a need to focus the analysis and critique on the growth machinery itself, and not only the class inequalities that it helps to sustain. They regarded the forces of production, the growth machinery, the industrial mode of production as major factors behind environmental degradation.

Spaargaren (2002) summarized their reasoning as follows. Up to a certain level, the development of production forces is a positive thing in the sense that it means an increase in 'welfare' as well as in 'well-being'. However, there will be a moment in the development of the productive forces, which represents the optimum. When development is pushed too far, some of the benefits of ongoing rationalization will turn into social/environmental costs. This optimum point is called the social critical point. In line with this reasoning, counter-productivity theorists share the belief that the solution of minimizing the negative impacts of the industrial mode of production can only be found by (partially) dismantling the existing systems of production (Mol, 1995: 12).

Located in between the schools of (neo)marxist and counter-productivity, the scholars in the second school – (post-)industrial society - unite under the central assumption that 'the development of industry and its impact on society are the central features of modern states' (Badham, 1984:2). Their positive evaluation of the 'all-embracing logic of industrialism' distinguishes them from the counter-productivity theorists. These so-called post-industrial society theories share the basic tenets of the first-generation theories of industrial society. Post-industrial society is the latest phase in the development of industrial society and is characterized by a shift towards a service-sector-based economy; the displacement of blue-collar labor by white-collar labor; and the substitution of non-material values for material growth-oriented conceptions (Inglehart, 1982). According to these theorists, the changes that have taken place within the production structure considerably lessen the burden (of production) on the sustenance base. Mol (1995) compares these three schools of thought in Table 2.2 below:

Table 2.2 General characteristics of three schools of thought in environmental sociology

Schools of thought	(Neo-)marxist	(Post-)industrial society	Counter-productivity
Kind of theory	Conflict theory	Consensus theory	Conflict theory
Institutional trait	Capitalism	Industrialism	Triangle of capitalism, industrialism and surveillance
Prime cause of environmental crisis	Relations of production	Unadapted industrial development	Forces and relations of production
Solutions	Socialization of production	Ecological adapted industry and post-materialism	Decentralized organization and convivial technology

Source: Mol, 1995: 16.

2.3.2 Ecological Modernization Theory

Ecological Modernization Theory (EMT) emerged in the early 1980s primarily in a small group of West-European countries, notably Germany, the Netherlands and the United Kingdom. As its name suggests, EMT addresses the modernization issue from an ecology-inspired perspective. Ecological Modernization theorists believe that we do not have to abandon modernity in order to have environmental improvement. We can continue with the modernization process, in which, however, it is no longer the traditional society that has to be modernized, but modern society itself. Modern society has to move into more ecologically sound directions. Joseph Huber (1991), who is arguably seen as the founder of EMT, distinguished a wide number of dimensions in which the modernization of modernity should take place:

1. The operative dimension, which is the realm of technology, of natural sciences and of human work;
2. The allocative dimension, which forms the realm of market and finance;
3. The ordinative dimension, which contains particularly politics;
4. The normative dimension, the realm of law and ethics;
5. The Semiotic-symbolic dimension, which is the realm of culture in the very narrow sense, of belief, of languages and of notions.

All these dimensions or systems are of equal importance in determining the evolution of society, and they evolve in a complex processes of co-evolution. In this regard, EMT shares some similarities with SENCE framework. Huber uses Figure 2.7 to discuss the way in which the industrial mode of production and consumption (referred to by him as the 'techno-sphere') relates to environmental problems.

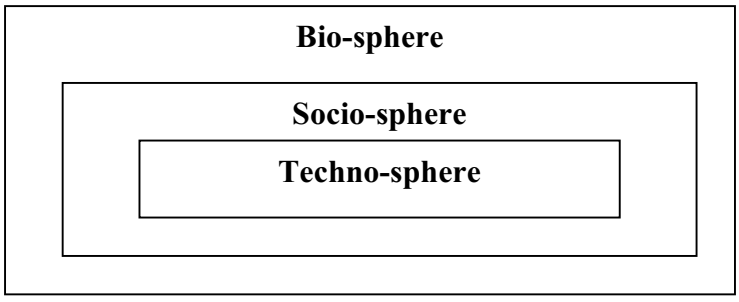

Figure 2.7 Bio-sphere, Socio-sphere, Techno-sphere

Source: Huber (1985).

In its early stages, EMT was characterized by a heavy emphasis on the role of technological innovations; favorable attitudes towards market actors and market dynamics in environmental reforms; and a relatively under-developed notion of human agency. Its second period of development, from the late 1980's onwards, showed less emphasis on technological innovations as the motor behind ecological modernization; more attention to

the institutional and cultural dynamics (cf. Hajer, 1995; Spaargaren and Mol, 1992; Cohen, 1997); and a more balanced view of the respective roles of states and 'the market' in ecological transformation (cf. Weale, 1992; Jänicke, 1991, 1993). As in the first period, later EMT studies continued to focus on national and comparative studies of industrial production in the Organization for Economic Co-operation and Development (OECD) countries. The third period, since the mid-1990's, the frontier of EMT has broadened theoretically and geographically to include studies on the ecological transformation of consumption; ecological modernization in non-European countries; and global processes. (Mol and Sonnenfeld, 2000: 4-5). In that sense, this study is a typical product of, and contributes to, this latest phase of the Ecological Modernization discourse.

EMT studies focus on environment-informed social and institutional changes at the eco-core part of SENCE, specifically, changes in technology, institutions, culture, and behavior . Empirical studies have shown the emergence of a process of de-coupling or de-linking of material flows from economic flows from the mid 1980's onwards, in ecological front-runner nations such as Germany, Japan, the Netherlands, the USA, Sweden, and Denmark.Such studies evoked lively debate on whether these environmental improvements in society's metabolism actually take place, as well as to what extent and whether these improvements are structural or incidental. These social transformations are grouped by Mol and Sonnenfeld (2000: 5-7) into five clusters as listed below.

1. *Changing role of science and technology in environmental deterioration and reform:* science and technology are not only causes of environmental problems but also valuable and potential sources of solutions despite an apparent growing uncertainty of expert knowledge.
2. *Increasing importance of economic and market dynamics and economic agents*: economic agents, such as producers, customers, consumers, credit institutions, insurance companies, etc., are not just the disruptive force of ecological degradation, but are the social carriers of ecological restructuring and reform.
3. *Changing role of the nation-state in environmental reform:* from top-down, centralized command-and-control (CAC) environmental regulation to more decentralized, flexible and consensual styles of governance. Nation-states' traditional role in environmental reform has been undermined with the emergence of sub-political arrangements (cf. Beck, 1994; Hogenboom et al., 2000) and supranational institutions.
4. *Modifications in the position, role and ideology of social movements:* social movements are no more on the periphery nor outside of environmental decision-making and its institutions as they were during 1970s and 1980s. Instead, social movements are increasingly directly involved in such processes and institutions.
5. *Changing discursive practices and emerging new ideologies in political and societal arenas:* sustainable development becomes common sense. Complete neglect of the environment and the fundamental counterpositioning of economic and environmental interests are no longer accepted as legitimate positions (cf. Spaargaren and Mol, 1992; Hajer, 1995).

These changes and the economic and environmental achievements associated with them have been increasingly used as the basis for analyzing the social dynamics of present-day processes of environmental reform (cf. Weale, 1992; Mol, 1995; Spaargaren, 1997). Other scholars, Boons (1997) and Phung (2002) for example, even claim that these premises have

not only analytical value but also normative merit in outlining desirable and feasible paths for environmental reform.

According to EMT, these premises are the basis of social changes and dynamics. Mol (1995:58) summarizes the institutional characteristics that are considered essential for the ecological restructuring processes. Among them are: a democratic and open political system; a legitimate and interventionist state with an advanced and differentiated socio-environmental infrastructure; widespread environmental consciousness; well organized environmental NGOs; intermediate or business organizations; a state-regulated market economy; negotiated policy; sufficient and reliable environmental data; and advanced technological decision-making. Not surprisingly, all these institutional characteristics can be found in countries such as The Netherlands, Germany and Denmark, which are often cited as pioneering countries in such ecological transformations (see Box 2.1 for the case of The Netherlands).

Box 2.1 Case of the environmental policy in The Netherlands

The Netherlands has been known as a front runner in environmental policy among OECD countries (cf. Andersen and Liefferink, 1997). It was often used as a successful example to support EMT (Weale, 1992). Its National Environmental Policy Plans (NEPP) function as national strategy for the environment which aims to achieve sustainable development in the Netherlands within one generation. It establishes key environmental quality objectives and sets out a long-term program of actions to ensure that objectives are achieved. NEPP is characterized by a management approach to environmental problems, involving:

- the adoption of quantified (measurable) targets and timeframes;
- the integration of environment into decision making by all sectors of society;
- clear identification of responsibility for actions;
- creativity in the design and use of policy instruments;
- a commitment to long-term reshaping of social and economic structures;
- recognition of the Netherlands' dependence on international cooperation and action.

The NEPP recognizes that a high quality environment cannot be achieved through conventional pollution control measures alone. A mixture of new, clean technologies and structural changes in production and consumption patterns will also be required. Therefore, NEPP focuses on the source of environmental problem, not the effects. In the mid of 1980s, Dutch environmental policy adopted an integrated cross-media approach to managing environmental problems, instead of the traditional sectoral environmental approach based on controlling emissions to air, water and soil. The key instruments in the implementation of Dutch Environmental Policy includes: Direct Regulation, Voluntary Agreements, Environmental Reporting, Environmental Technology, Financial instruments and Social Instruments.

Source: *Towards a sustainable Netherlands: Environmental policy development and implementation*, 1997, by the Ministry of Housing, Spatial Planning and the Environment.

Due to its West-European origin, the postulates, hypotheses and empirical references of EMT are especially relevant for these geographical contexts. Simply by checking against the list by Mol, the value and relevance of EMT in non-European countries may not appear to be directly evident. Studies regarding the generalization and the relevance of EMT in other countries range from less developed and newly industrializing countries (cf. Sarkar, 1990; Frijns et al., 1997 and 2000; Sonnenfeld, 2000; Zhang, 1998) to transitional economies in Central and Eastern Europe (cf. Rinkevicius, 2000; Gille, 2000). These studies conclude that the analytical power of EMT is limited in non-West-European contexts due to differences in socio-political, economic and cultural conditions.

However, cases of Lithuania (Rinkevicius, 2000), Vietnam (Frijns, Phuong and Mol, 2000) and China (Zhang, 1997) showed that EMT is a powerful analytic tool, that can be useful in the analysis of ongoing environmental reforms and as a normative guide to the ecological restructuring process. This usefulness is enhanced when the theory is adapted to the specific situations found in these societies which face both severe environmental and economic risks.

2.4 A conceptual framework for analysing industrialization in Small Towns

The theoretical thinking in previous sections contributes to the formulation of a conceptual framework for analyzing *Ecologizing Industrialization* in Small Towns. I use the term *Ecologizing Industrialization* to refer to a kind of environmental reform process which aims to adjust and manage a rapid, ill-planned industrialization process in a fast-changing social, economic and political environment. *Ecologizing Industrialization* works through institutional, technological and social innovations, which trigger or induce technological and social changes given the current social, economic and technological conditions in Small Towns and TVIEs.

Through the theoretical lens of SENCE, *Ecologizing Industrialization* of TVIEs is considered as an embedded process within of Small Towns, mainly driven by government-initiated and -promoted institutional innovations. Within this framework, environmental management of TVIEs should become an integral part of the overall development planning of Small Towns. The SENCE framework focuses on the structure of the complex eco-system and the interrelationships between its different elements. SENCE also stresses the central role of institutional reform within this framework in triggering changes in other fields. However, to answer the research questions of this study on the internal relationship of the TVIEs-Town Government alliances; the rationality behind their current environmental strategies and the institutional conditions for successful environmental reforms, SENCE is not refined enough to analyze the social dynamics and mechanisms for environment-induced social and institutional transformation. SENCE also lacks a theory that can analyze the roles social actors can and do play in bringing about social changes. Thus, SENCE is less successful in using a set of institutional arrangements as the basis for translating ecological principles into business language and rationality.

To complement the shortcomings of SENCE, EMT is especially useful for analyzing environment-induced social changes within the broader framework of SENCE. Empirical experience of EMT shows that, apart from the state, successful environmental management

should also involve economic agents and the public. Each of these agents plays its own role in environmental management. In line with this argument, a so-called *green triangle* for environmental regulation was posed by Afsah (1996) and advocated by many others (cf. Mol, 1995; Afsah et al., 1996; Dasgupta and Wheeler, 1996; Schwartz, 2000; Wu, and Robbins, 2000; Duan et al., 2000; World Bank, 1999; OECD, 1992; O'Connor, 1994; Hamilton et al., 1997).

This *green triangle* is based on a consensus on three points. First, it is clear that the basic assumptions which support the model of 'optimal regulation' – full information and zero transactions costs – are not met in practice. Second, the regulator proves to be no longer the sole source of pressure on plants to improve their environmental performance. Local communities and market agents also play important roles. Therefore, the new model focuses on the interactions linking four distinct kinds of agents: plant, state, community and economic actors. Third, the *green triangle* implies that regulators lose their role as sole enforcers, but at the same time they gain a potential for greater policy and enforcement effectiveness through new policies which leverage the power of communities and markets (Afsah et al., 1996). This *green triangle* is also in line with the hypothesis of EMT regarding the changing roles of the nation state, market, technology and social movements in environmental reform. Thus, the relevance of EMT in China can be tested as well by using this *green triangle* approach.

The conceptual framework that is used in this dissertation is a version of this green triangle modified by taking into consideration the interdependent relations between TVIEs and Small Town Governments and their interactions with other agents (Figure 2.8). In this modified model, TVIEs and Small Town Governments are regarded as an alliance, a point that their interwoven nature supports. As the lowest government authority in China's formal bureaucratic hierarchy, it is important to note that Small Town Governments always play a dual role in environmental regulation. The town leaders have long been pictured as 'dual agents' of state and community (see further elaboration in Chapter 4). They serve simultaneously as agents of the Central Government and representatives of local residents and their collective industries (Pan, 1996; Whiting, 1995).

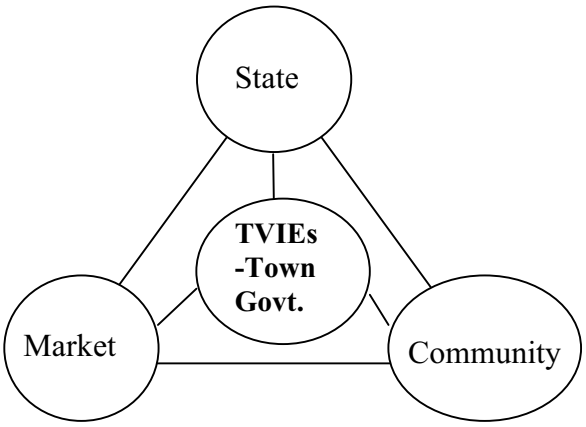

Figure 2.8 Environmental regulatory model of Small Town Government-TVIEs alliance

Source: adapted from S. Afsah (1996).

The relationship between the TVIEs-Town Government alliances, state, market and community in this modified model has partly different features from the commonly known relationship in other *green triangles* for environmental regulation. The fact that both Small Towns and TVIEs are at the front of the ongoing socio-economic transitions in China adds complexity to the relationship. The consequences are felt in increased difficulties in analyzing these relationships, and larger challenge in proposing universal strategies for solutions.

3

Operationalizing 'Ecologizing Industrialization': analytical framework and case study strategy

In general, case studies are the preferred strategy when 'how' or 'why' questions are being posed, ... and when the focus is on a contemporary phenomenon within some real-life context.
- R.K. Yin (1984)

In chapter 2, ecologizing industrialization in the context of Small Towns has been framed as an embedded process that involves the state, market, the TVIEs-Town Government alliances, and the community/public. The roles of these actors and the interrelations between them are decisive for the outcomes of the environmental triangle games. To guide the analysis in this intricate network of relations, we are in need of an analytical framework. In developing such an analytical framework this chapter bridges the gap between an abstract theoretical notions of chapter 2 and the concrete analysis of industrial environmental reform in Small Towns. Furthermore, a research methodology and strategy are designed to develop empirical case studies.

3.1 Analyzing the rules of environmental games

The heart of the Small Town environmental regulatory model (Figure 2.8) is formed by the TVIEs-Town Government alliance. Therefore, any analysis of environmental reform in Small-Town-based TVIEs starts with investigating the internal relations of the alliance, and proceeds with analyzing the ways in which the alliance responds to state policies[20], market signals and public pressure. Or, to say it in another way, we need to analyze and map networks in which these actors engage in more or less permanent, institutionalized interactions. Following this line of reasoning we investigate four types of relations or networks (Figure 3.1): TVIEs-Town Government relations, (county/municipal, provincial and national) state-alliance relations, market-alliance relations and community-alliance relations. These relations will be introduced shortly.

[20] With state policies I refer to the (environmental) policies of governmental authorities above the level of the Small Town government, especially policies from county/municipal, provincial and national authorities.

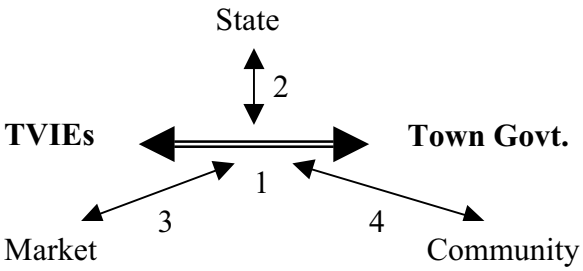

Figure 3.1 Four types of relations in the environmental regulatory model in Small Towns

The typical nature and mutual dependence of these alliances are core features in understanding opportunities, barriers, successes and stagnation in environmental reforms. The specific characteristics of each alliance are based on the power distribution in terms of ownership arrangements, distribution of authoritative and economic resources, profit distribution, personnel administration, access to and flow of information and knowledge. It goes without saying that local social, political, economic and environmental conditions, leadership characteristics of both industrial and government managers, and governing styles are relevant factors in determining, the pace, depth and processes of environmental reforms within TVIEs. This first set of relations serves as the core of the analysis and forms the dependent variable that explains the successes and failures of environmental improvements and reforms in Small Town-based TVIEs. Chapter 4 will analyze in depth the specific nature and typical interdependence of Small Town governments and TVIEs.

Very few state policies have been designed and introduced to protect the rural environment against the booming TVIEs in Small Towns. In analyzing how national (and county/municipal, provincial) state authorities (try to) influence the development and environmental impacts of Small Town-based TVIEs, we focus first on the unified, countrywide policies, but also on the interpretation, implementation and/or modification of these policies at local levels by town government officials. National and provincial policies and measures affect development at the municipal and county levels, but not in an automatic or homogeneous way. The focus in the analysis of state-alliance networks will be on ways in which this external policy environment affects the environmental strategies of the alliances in terms of constraints on regulatory styles at the local level; enforcement of environmental regulations; financial support; enabling conditions for technological change and innovation; information monopolization and exchange; institutionalized evaluation of the local environmental officials and entrepreneurs; possibilities to raise additional financial resources above those supplied by the state; and the like. It is these kinds of relations between the alliance of Small Town governments and TVIEs on the one hand and state authorities on the other that determine the processes, successes and stagnations in environmental reforms of the TVIEs themselves.

The relations between TVIEs and the market are changing, especially in relation to the transition of the Chinese economy towards a market-oriented growth model. These

changing relations affect both TVIE ownership and TVIE relations to consumers and customers. During the early stage of TVIE development, when the market was imperfect and state-owned enterprises were neither flexible nor efficient enough to meet market demand, public ownership of collective TVIEs with Small Town governments as the *de facto* owners, (a situation which receives further elaboration in Chapter 4) had a comparative advantage over state ownership in terms of the performance of the enterprises (Chen, 2000). Because of the dual role that town governments have been playing in rural social organization -- both as state regulator and economic manager - they could more effectively ensure the firms' property rights, mobilize resources, and manage economic and political risks. This model of public ownership (via local town governments) of firms can be viewed as a rational response of local economic entities to the imperfection of both market and government institutions in a transitional economy (Che and Qian, 1998), rather than as a solution enforced by the Central Government as part of its economic reform process (Chang and Wang, 1994).

However, these advantages are fading away now that market competition is increasing, and a stronger separation is taking place between the political and economic domains, especially after China's entry to the World Trade Organization (WTO). Since the end of 1990s, reforms in the ownership arrangements of TVIEs, and the restructuring within the TVIE sector, have become critical for the survival and further development of TVIEs . Anticipated additional separation of economic institutions and political/governmental institutions will continue to affect environmental governance and reforms, but it is not evident beforehand precisely how. Such changes may provide town governmental officials more freedom in enforcing environmental policies and regulations towards TVIEs, but they could also limit the influence of environmental authorities on the TVIEs. In addition to these ownership characteristics, the growing market orientation will make TVIEs more dependent on consumers, customers and investors, which in turn will increase the importance of environmental considerations in those cases where production is also for an export market or foreign investors are needed for expansion.

TVIEs have strong ties with the local communities and community residents, since these are the *de jure* owners of the collective TVIEs, as well as the resource base from which they draw necessary human resources and capital investments (as further elaborated in chapter 4). Yet these same community residents are often absent in environmental decision-making within the alliances. This corresponds to the overall situation in environmental regulation in China, where environmental social groups are just emerging and play limited roles in constructing public and political agendas and pushing for environmental reform. Lack of access to environmental information and low environmental awareness of the residents are, of course, a few of the causes, in addition to the fact that the dominant political systems allow few spaces for environmental NGOs to blossom. At the same time there is growing evidence of a successful system of local complaints to town governments on the environmental performance of industries. This analysis of the community-alliance relations aims to understand the nature and extent to which communities concern and try to influence environmental performance of TVIEs and regulatory activities of Small Town governments. What are the interaction patterns, do these differ among communities and what are explanatory variables for these differences? What are the strategies and resources applied by community members in influencing the environmental performance of the Small Town-TVIE alliance and has this changed during

the last decade? It is these kinds of questions that take central stage in analyzing the network relations between community and alliance.

This analytical framework enables us to investigate the most important (f)actors and their relations in environmental regulatory games in Small Towns.

3.2 Research design

3.2.1 Case study research

If we want to carry out empirical research on how - in the context of Small Towns - environmental regulatory games are played, and what factors and contextual circumstances contribute to their environmental success, case study research is the most obvious research methodology. Case study research, or qualitative field research (Nooij, 1990: 51), is especially relevant if: “a ‘how’ and ‘why’ question is being asked about a contemporary set of events, over which the investigator has little or no control” (Yin, 1984:20). Yin defines case study as an empirical inquiry that investigates events with unsharp boundaries between the event and the context, and for which multiple sources of evidence are used. Verschuren’s (2002) definition further justifies the use of qualitative methods for this study: "A case study is a research strategy that can be qualified as holistic in nature, following an interactive-parallel way of preceding, looking at only a few strategically selected cases, observed in their natural context in an open-ended way, making use of analytical comparison of cases of sub-cases, and aimed at description and explanation of complex and entangled group attributes, patterns, structures or processes."

Environmental regulation in Small Towns relates to networks that have no clearly defined boundaries. This research aims to understand how environmental regulation operates in a situation of close interdependence of Small Town Governments and TVIE management, and to identify those (f)actors, which are relevant for explaining the successes and failures in environmental improvement between towns and industries. These kinds of questions cannot be dealt with via quantitative surveys based on large samples of towns and industries. It is only possible to answer such questions by carrying out in-depth case studies, which -- due to the fact that these are time consuming -- will necessarily be limited in number. Given the fact that Small Towns are heterogeneous in terms of scales, economic and social conditions, environmental circumstances and development history, the generalization of the results of any single case will be limited. Multiple cases allow comparative analysis and improve the generalization of the findings, be it not to the extent of a large-scale survey.

Another reason for adopting a case study methodology in this research is that towns are small, but they are at the same time complex and diverse societies. Although this research focuses on TVIE environmental protection issues, our theoretical elaboration and analytical framework have already indicated that we cannot study these in isolation; rather, the research needs to look at them in their social, economic and natural environment. This is what Yin (1989) calls an "embedded design". In fact, a Small Town is an embedded part of a larger system or constellation of networks.

Analyzing environmental regulations affecting TVIEs must therefore involve, the county, provincial and state level environmental authorities; the financial conditions of the town, but also the specific locational and economic factors; technology transfer which may involve research institutes hundreds of kilometers away; foreign investors; relevant market demand, and environmental interests related to the host community (local) and the market (global). The boundaries of the research are thus not easily defined in spatial terms, but are rather a product of the problems, processes and networks that form the focus of this study (see also Wang, 1994: 9).

3.2.2 Selecting the cases

We use several criteria in order to select Small Towns and the alliances between Small Town governments and TVIEs for case study research. Following the research questions it was decided to include both 'good or best practices' Small Town – TVIE alliances (as far as environmental performance is considered) and more 'average' ones. The average ones will provides clues to the state-of-the-art in TVIE environmental performance, the main structural factors that hinder rapid improvements, and the way the social environment and their networks enable and constrain environmental transformation processes by Small Town – TVIE alliances. The 'good practices' are important to provide insight in the options for successful environmental protection in TVIEs-based Small Towns, the favorable conditions for successful environmental strategies and the institutional reforms that go along with that.

Based on this consideration, a preliminary study has been done to prioritize the provinces for selecting case studies. This preliminary study suggested that the Yangtze River delta, including Shanghai municipality and Jiangsu and Zhejiang provinces would be a region providing both the most advanced TVIE economy and the pressures caused by severe environmental pollution due to rapid TVIE-driven industrialization and urbanization. In this region, Jiangsu province was further selected as a province where Small Towns would be selected, for several reasons.

- Jiangsu province is known as the 'home of TVEs', where Sunan Model (see footnote 2) and Small Towns have been highly developed.
- This Sunan Model has been confronted with the improvement of a rule-based market system since the late 1990s, forcing it to modify the TVIEs.
- TVIEs have caused severe environmental pollution in Jiangsu and face the most stringent environmental regulations.
- Jiangsu province is located in the Taihu lake basin, which is one of the priority lakes in China for urgent clean-up action.
- Initiatives have been made at different government levels in Jiangsu province to protect environment without jeopardizing the growth of TVIEs.

These reasons together make that it will be very likely to find interesting, successful incidences of Small Town environmental protection in relation to TVIEs in Jiangsu province, that is, cases which deserve and can support in-depth analysis.

We also include Anhui province, which borders Jiangsu province to the West, in the study, both to ensure that we include average Small Town environmental protection efforts towards TVIEs and to compare Small Towns at different economic development stages. Economically, Anhui lags quite far behind its neighbor Jiangsu, but is nevertheless in a stage of rapid development. In addition, similar to Lake Tai in Jiangsu, the Huai river basin where Anhui is located is one of the prioritized areas in China for environmental clean-up actions. TVIEs in Anhui confront and have to cope with increasingly stringent environmental regulations, in a situation of strong demand for economic growth.

Within these two provinces the selection of the Small Towns is based on the following criteria. Each case should focus on

1. a TVIEs-based statutory Small Town, and excluding county towns;
2. a Small Town with a population ranges from 10,000 to 50,000[21];
3. a Small Town where TVIEs represent an important part of the local economy, and contribute at least half of the town's GDP.

In addition, for practical considerations:

4. the studied Small Towns should be geographically concentrated to make travelling distances reasonable, and
5. Each studied Small Town should be willing to cooperate with the study, as a pre-condition to being included, since it is extremely difficult to access the data of towns without the support of the town government.

Based on these selection criteria, we selected two Small Towns, Hengshanqiao town and Luzhi town, in Jiangsu province, and three Small Towns, Digang town, Guandou town and Daxing town, in Anhui province.

3.2.3 Focus of the study

This research aims to bring light to the interrelations between the institutional arrangements and the successes/failures of certain environmental practices so that the alliances are able to come up with creative environmental management options that cater to their local situations. It is not the intention here to offer concrete solutions to specific industries.

Consistent with these research objectives, first areas of study in each Small Town were the more general environmental reform processes, strategies and dynamics. Then we made specific in-depth studies of a limited number of TVIEs in each Small Town. The selection of the specific TVIE for each case was based on their actual or potential environmental impact, and on the improvements in environmental performance in recent years. The selection was not based on specific types of pollution, nor did we limit ourselves to TVIEs belonging to any single sector.

[21] According to the 1997 survey of Small Towns, Small Towns with a population ranging from 10,000 to 50,000 form the bulk of the statutory towns: 33.29% in number and 60.82% in real population (Yu, 2001).

3.2.4 Research methods: profiles and networks

Qualitative methods form the basis of the investigation of these Small Towns and their TVIEs, embedded in broader systems, and are used to generate adequate data and information. Qualitative profiles of each Small Towns and TVIEs are made using literature, field observations and interviews. Where available, these are supplemented by quantitative data on location, population, economic performance, environmental investments, pollution loads, number of TVIEs, number of environmental staff, etc.

The main methodological tool used in the analysis of networks and relations that are involved in successes and failures of environmental reforms in Small-Town – TVIEs alliances is the profile of the province, the Small Towns and the TVIEs in it. Profiles are based on data and information gathered from various English and Chinese-language sources, including official and unofficial documents ('grey literature'); face-to-face interviews semi-structured interviews with key informants from different organizations and networks; relevant conferences and workshops; statistical yearbooks and publications; journals and periodicals; and internet web sites.

Local profiles have to rely on the data obtained from the field observations, local reports and interviews, since Chinese national statistics seldom provide data at town level[22]. In order to follow the changes in Small Towns over time, three field investigations have been made. The first field mission took place in the framework of United Nation Development Program funded project on *Capacity building for Small Town Development* in three Small Towns in 1997. Subsequently, two extensive field visits have been made, one was done in May and June 1999 and one in March/April 2001.

Profiles are drawn for each of the selected provinces, Small Towns and TVIEs to provide background information about the geographical, socio-economic and environmental facts of the province where the Small Town locates, the specific situations in the town and the selected TVIEs. These profiles are important references for mapping the actors involved and their relations. Each profile includes the following information, with some variation.

For the selected provinces:
- the location, area, population
- economic level and its position in the national economy
- industrialization and urbanization modes
- environmental situation
- local environmental management features

For the selected Small Towns:
- the location, area, population of the whole town and the population in the built-up area
- its economic position in the province
- its industrial composition
- organizational structure of the town government and their functions
- major environmental problems

[22] At present, statistics reports and statistics yearbooks are only available at county and upper levels. The lack of information on social, economic development and environmental quality has become an important constraint for sustainable development of Small Towns. According to Renpu Bai, China Agricultural University, March 2001.

- local environmental management strategies and measures taken
- local leadership and entrepreneurship

For the selected TVIEs:
- the location in the town, production activities and scale, number of employees
- its economic importance in the town (annual output value and profit)
- its technological level (compared with the sectoral benchmark in China)
- its ownership structure
- environmental performance
- internal environmental management strategy

It should be noted that although physiographical data are very important for eco-planning and design, this part is usually kept as brief as possible because the focus of this study is on institutional aspects.

In analyzing the social relations, institutional performance and networks as outlined in section 3.1, primary sources, especially interviews, proved to be the most important source, due to the limited availability and relevance of any previous sociological studies. The most relevant relations for environmental reform served as the basis for the selection and focus on the case studies on Small Towns and TVIEs. That means that it was not possible to include each of the four relations of Figure 3.1in every case study, as often not all four relations proved important or interesting with respect to our research questions. The case studies together, however, do provide a complete analysis of the social dynamics of environmental reform in Small Town government – TVIE alliances, embedded in a wider social environment.

4

Reshaping Rural Landscapes: TVIEs-Town Government Alliances

While the western world has about 200 years to experience and deal with similar social problems occurred during social transition, institutional transition and environmental risks, all these problems took place in China within a short period of about 50 years.
- Tong (1995:12)

This chapter explains further (1) the uniqueness of TVEs-Small Towns-based industrialization and urbanization models in rural China; (2) the social and economic significance of Small Towns and TVEs; and (3) how TVEs and Small Towns have been changing the social and natural landscapes of rural China. It also analyses the institutional factors that have been driving the transition in China. Only with this background is it possible to understand the interdependencies between Small Towns and TVIEs. It is the rationality of TVIEs-Town Government alliances, I assert, which calls for dramatic changes of the traditional environmental management approaches towards TVIEs.

4.1 A unique path for industrialization and urbanization

The phenomenal growth of TVEs and Small Towns has been one of the most remarkable features of industrialization and urbanization in rural China since the Open Door Policy around 1980 (Bradbury et al., 1996). What makes this development so 'uniquely Chinese' is the existence of a man-made, dichotomized socio-economic structure, in which the urban and the rural, agriculture and industry, the traditional and the modern are separated by the Government by imposing a so-called Household Registration System (HRS). Although a similar urban-rural dichotomy exists at certain development stages in almost every country, it is especially evident in China because it has been solidified by administrative means (Zhong, 2001). This section is devoted to explaining why and how TVE-Town government alliances have featured the industrialization and urbanization of rural China within the fences of HRS.

The rapid development of both TVEs and Small Towns represents one of the unplanned outcomes of the economic reforms introduced from the late 1970s onward; at the same time these alliances have been the driving force behind the deepening of rural reforms and the sustained growth of the national economy.

Why did it happen like this? To better understand this, we need go back to the root of

the whole process: the Household Registration System (HRS) and the dichotomized social and economic structures. China may be the only country which has ever deployed a HRS. This system was introduced after the liberation of China in 1949 as an important administrative instrument of the central planners, and was designed to serve economic and political priorities during the Cold War time. It strictly controls the movement of rural population to live in the cities, in order to accumulate more industrial outputs.

This system played an important role in the rapid formation of an independent industrial system, but it also caused inertia in urbanization and an ever-widening gap between cities and the countryside in terms of infrastructure, education and public welfare (CCTRD, 1998). The impact of this system on Chinese farmers and rural areas has been profound, and has become even more evident after the economic reforms.

HRS and dichotomized social and economic structures are children of the Cold War. HRS has served as an institutional guarantee for the centrally planned economy and its strategic priority in favour of heavy industries. The result is, however, that it has left more than 70% of the total population to cope with traditional backward production modes and living styles. For example, the output value of the Chinese agricultural sector shrank to about 17% of the total gross domestic production value (GDP) of the nation in the last years of the 20th century, at the same time that more than 900 million people were identified by HRS as agricultural producers (Zhong, 2001). Since this huge population has been blocked in a limited space, the overload of land and over-exploitation of natural resources is unavoidable.

It is now widely recognized that the collective regime of the people's communes before the economic reforms concealed considerable rural under- and unemployment. With the introduction of the Household Production Responsibility Contract System (HPRCS), which replaced the commune system as it existed in the 1979 – 1984 period, it became evident that a large proportion of the rural population was not needed in crop production. According to estimates, by the early 1980s, almost one third of the rural workforce was basically surplus to production requirements (Kirkby et al., 2000). Since that time, China has witnessed an unprecedented rural-to-urban transition. As China's Action Plan for Human Settlements 1996 – 2010 acknowledges "…at the heart [of the urbanization question] is how to handle surplus labourers while appropriately distributing the country's non-agricultural population" (Ministry of Construction, 1996:18). As Kirkby and his colleagues wrote on the establishment of this small town strategy for urbanization (Kirkby et al., 2000: 5):

> "The post-Cultural Revolution government's determination to pursue a small town policy was first formally expressed in 1978 at the National conference on Urban Work, and later confirmed at the 1980 National Conference on Urban Planning. The objectives were, simply put:
>
> - Strictly control the development of the large cities;
> - Rationally develop medium-sized cities;
> - Vigorously promote the development of small cities and towns."

This policy was incorporated in the first comprehensive set of laws on urban planning in 1989 and was reaffirmed during the United Nations second great Conference on Human Settlements (HABITAT II) in 1996 (Ministry of Construction, 1996: 14). An

even more glorious period for Small Town development is expected after the 5th Plenary Session of the 15th Central Committee of Communist Party Congress (CCCPC) and the release of the document *Opinions on Speeding up the Sound Development of Towns* by the State council in June, 2000. Shao (2000) also pointed out quite clearly that developing towns and speeding up the urbanization processes is a strategic priority in the *Suggestions on Making the 10th Five-Year Plan (FYP) by CCCPC*.

However, this Small Town strategy is not without its detractors. Some (e.g. Fang and Yan, 1998) have suggested that further urbanization should rely on the expansion of the existing medium and large sized cities; others, especially certain policy-makers, continue to believe that to develop Small Towns is a more realistic strategy (Sun, 2001; *People's Daily*, 1998[23]). The first group has based their arguments on the fact that the existing medium- and large-sized cities still have potential to absorb surplus rural labourers. The waves of farmer migrants to cities in the past were in parallel with the fast growing periods of the cities.

The second group argued that although a separation parallel to China's separation between the agricultural and industrial sectors is common in developing countries, it is rather unusual in China. The agriculture-industry dichotomy in Chinese society has arisen partly because the flows of production elements (land, labor and capital) between these two sectors are restricted, but also because the rural and the urban territories are geographically isolated from each other. This is due to a series of policies and laws released since the 1950s, which forced a separation between rural and urban populations through the vigorous enforcement of HRS and the associated food supply system, employment system, social welfare system and control policy on towns in rural areas.

Even in the present, there remain barriers to the free movement of production elements, and we should not expect that these barriers will be removed overnight. Further more, it is psychologically easier for farmers to adapt to life in Small Towns which are not too far from their previous homes and social networks than it is for them to move to the cities. Small Towns can quickly connect the markets in villages and cities, and provide fertile ground for the growth of service industries. In fact, long before the Central Government realized what was happening, Small Towns quietly became the outlets for rural surplus labor pools, thus reducing the pressure on the poor infrastructure, living environment and management capacity of the cities, and easing the growing tension between the laid-off workers from the state-owned enterprises and the job-hunting farmers as it has happened since the mid of 1990s. By the end of the 20th century, more than 200 million surplus rural labourers need to be relocated. To give an example: it means constructing 200 cities with a population of one million, which is obviously unrealistic. However, there are 2,600 counties in China. If each county can develop 10 Small Towns and each Small Town can absorb 30,000 people, then the problem has solved itself[24].

[23] *People's Daily* (*Renmin RibBao*), September 18, 1998.
[24] *China Township Enterprises Daily* (*Zhongguo Xiangzhen Qiye Bao*), No. 3157.

4.2 Social and economic significance of TVEs and Small Towns

4.2.1 TVEs

Looking back at the rural economic reforms in China over the last two decades, we can identify three quite distinct developmental leaps. The HPRCS that was launched in the late 1970s encouraged farmers to farm and enabled them to 'have a full belly' (Li, 1999). This first leap increased agricultural productivity tremendously. This contract system officially decentralized collective industrial management and directly linked investment and labor input with personal gain (Qi, 1995). To accommodate increased under- and unemployment due to the increased productivity and limited arable land, farmers were encouraged 'to leave the soil but not the village' by setting up rural industries. Since the early 1980s, TVEs have emerged/evolved from the community enterprises in the centrally planned economy, and have survived in the market. Within a rather short period, TVEs succeeded becoming 'half of the sky' of the national industrial economy. This second leap was regarded an economic miracle and drew great attention both at home and abroad. With the third leap, beginning in the mid of 1980s[25], featured the development of TVEs, creating booming Small Towns in rural China. As Courtney (1995) stated, "this is the era of the town in China's development."

Both TVEs and Small Towns have experienced similar ups and downs with the changes of political climate. As summarized by Jiang (1999), communal enterprises, the institutional parents of the TVEs, germinated in the 1950s driven by the desire to industrialize the rural area. Many rural laborers were transferred to industrial activities at that time. All kinds of small-scale operations were set up using all possible local resources with a purpose to serve the agricultural production, to meet the local demands and to complement the large state-owned enterprises (SOEs). After a sharp decrease in the 1960s during the restructuring of the national economy, the number of commune enterprises reached 1.52 million in 1978, employing 28.26 million surplus rural laborers and realizing a total output value of 51.5 billion RMB.

TVEs took off in the period from 1979 to 1983. After the 3rd Plenary Meeting of the 11th Chinese Communist Party Congress in December 1978, the focus of the party's work shifted to economic development, including the well-known economic reforms. A series of policies, regulations and incentives were released to promote and support the development of TVEs. In 1983, the number of employees and the output value of commune enterprises increased by 14.4% and 98%, respectively, compared to 1978.

The 1984 *Circular* released by the State Council marked the high-speed growth period of TVEs. This *Circular* invented the name TVEs and broadened its definition from communally-owned enterprises to a more diversified ownership structure. TVEs

[25] The new Constitution, which was adopted in 1982 and came into force in 1983, changed the system of the people's communes, the production brigades and the production teams, which had all been levels of collective economy and authority, into a structure of townships and towns, which became the lowest level of state authority, and of administrative villages, which according to the Constitution represented 'Popular self-organization'in the form of villager's committees. The original people's communes had governed both production and public administration, but the new townships and towns were intended as organs of public – i.e. state administration". (Christiansen and Zhang, 1998)

were also permitted to enter more industrial sectors with increased access to the market. TVEs enjoyed a golden age within this very favorable policy environment. Between 1978 and 1988, the total number of employees and output value increased by 238% and 1263%, respectively. Apart from this quantitative increase, this period also saw the rapid expansion of private and cooperative enterprises; the emergence of various cooperation projects between the East and West of China and between SOEs and TVEs; the opening of the industrial sector to foreign investors; and an increasing tendency towards specialization of production.

From 1989 till 1991, the Government cut down on construction projects and initiated the restructuring of industries, sectors and products. Bank loans had by this time largely been reduced, stagnating the growth of TVEs. Many TVEs were closed and millions of farmer workers went back to their fields. One unexpected result of these policies was the emergence of export-oriented TVEs which were forced to attract foreign investment on the one hand, and to introduce foreign technologies, equipment and management skills on the other. In 1991, the export volumes handled by TVEs increased by about 200% compared to 1988, and their share of the national total export volume increased from 15.2% in 1988 to about 30% in 1991 (MOA, 2000; Jiang, 1999).

From 1992 to 1996, TVEs achieved their full development. The speech made by the former President, Deng Xiaoping, after his 1992 'southern tour', greatly encouraged the farmers and TVE workers (Kirkby et al, 2000). Shortly thereafter in the same year, during the 14th Party Congress, the bias against TVEs in terms of attitude, theories and policy was corrected and removed, affirming the status of TVEs as a key sector of the national economy. In 1996, the number of TVE employees was 4.8 times higher than that in 1978.

A new stage of restructuring and innovation began in 1997. While the implementation of *the TVEs Law* after 1997 and other signals from the Central Government continued to consolidate and support TVEs, the changes in the domestic market and the impact of the south-east Asian financial crisis in 1997 put TVEs into difficulties, which have persisted during the current general economic decline. The good side of this coin is that the inherent weaknesses of TVEs were exposed under pressure, bringing into focus poor management, obsolete technologies and poor quality of products. Rethinking the root causes of the problems is necessary for the next surge of TVE development.

The most recent statistics[26] show that, in 1999, TVEs numbered up to 20.71 million and achieved a total added value of 2488.3 billion RMB, which was an increase by 3.3% and 12.2% compared to the number and added value of 1998, respectively. The growth rate of TVE GDP was 5.1 percent higher than that of the national GDP, and formed 30.3% of the national GDP. About 34% of farmers' income came from TVEs. In the same year, TVEs owned fixed assets equaling to 2,397.8 billion RMB, realized a total net profit of 539.2 billion RMB and turned over to the state 179 billion RMB in taxes, which were respectively 11.2%, 13% and 13% higher than in 1998. Due to industrial restructuring and severe market competition, the number of collectively owned TVEs had dropped to 940,000 in 1999 (36,000 enterprises were shut down),

[26] *China Township Enterprises Daily* (*Zhongguo Xiangzhen Qiye Bao*), 2000, No. 3215, Beijing.

which was 11.6% fewer than in 1998. On the other hand, the number of privately owned TVEs increased to 19.77 million, accounted for 95.5% of the total TVEs, 800,000 more than in 1998. These private TVEs contributed 60.2% to the total TVE value-added. There were 67.4 million TVIEs, of which only 61,000 were collectively owned. Within the collectively owned enterprises, non-collective capital accounted for about 50%. We can say with confidence that privately owned TVEs have become increasingly important for the growth of the rural economy and have brought about a big change in the ownership structure of TVEs.

In fact, after two decades of development, TVEs have come to constitute a significant share of China's economy. TVEs contributed almost one third of the national GDP, and about half of the national industrial added value in 1997 (Zhu, 1998). Up until the early 1990s, it took the state-owned enterprises more than 40 years to build up a total fixed asset of 1,700 billion RMB and absorbed more than 100 million labourers, while it took TVEs only 10 years to own a total fixed asset of 530 billion RMB and absorb the same number of labourers. One should be aware that TVEs have achieved this without similar capital investments by the state as the government did in the state-owned enterprises. TVEs have been the most rapidly growing part of China's economy in the past two decades. Based on a rough calculation, every 3 -5 percentage increase or decline in TVE industrial added value will lead to one percentage change in Chinese national GDP. That means that the growth rate of TVEs needs to be maintained above 18% if China wants to remain a economic growth rate above 8% as it was set in its 'Ninth FYP' (ibid).

4.2.2 Small Towns

Small Towns have been growing in parallel to TVEs (Figure 4.1). After the liberation and before 1954, there were no official definitions or criteria for towns. At that time, "town" referred both to county towns and to towns with more commercial and industrial activities. According to the first national census in 1953, there were 5,402 recognized towns. The administrative status of the town was specified in the *1954 Constitution of People's Republic of China*. The criteria for designating the town as the root level administrative unit were made. According to these criteria, some towns merged with others, and others were revoked. The number was reduced to 3,621 by the year 1958. From 1958 to 1961, due to the nation wide *'great leaps forward'* campaign, which aimed to realize unrealistic industrialization and urbanization levels, the number of towns quickly increased to 4,429. The expanded urban population went beyond the supporting capacity of agricultural sector. Not surprisingly, the period of 1962 to 1983 witnessed a historical reversion of Small Towns. Apart from this policy mistake, three-year natural disaster during the same period made the situation much worse. The Government had to lift the town criteria to reduce the number of towns. As a result, only 2,173 statutory towns were left by the end of 1978. It was after 1983 when the new *Constitution* came into force, that towns and townships regained their legal status and started to take off as a consequence of the booming of TVEs (CCTRD, 1998).

The years since 1984 have seen a quantum leap in the designation of towns due to the easing of official criteria for establishing towns (Kirkby et al., 2000). By 1996, there

were 18,200 statutory towns, and this number would approach 55,000 if the non-statutory towns and townships were to be included (Li, 1996). By the end of the 20th century, the total number of statutory towns had risen to around 20,000, from a mere few thousand in the mid-1970s (Kirkby et al, 2000; Du, 1999). According to the statistics of 1997, a population of 190 million lives in these statutory towns (Li, 1998). Adding the non-statutory towns, about one third of the total rural population lives in small towns. Therefore, improving the living environment and quality of life for these town dwellers has become an important policy target for the relevant government departments, who aim to push additional rural reforms and development initiatives.

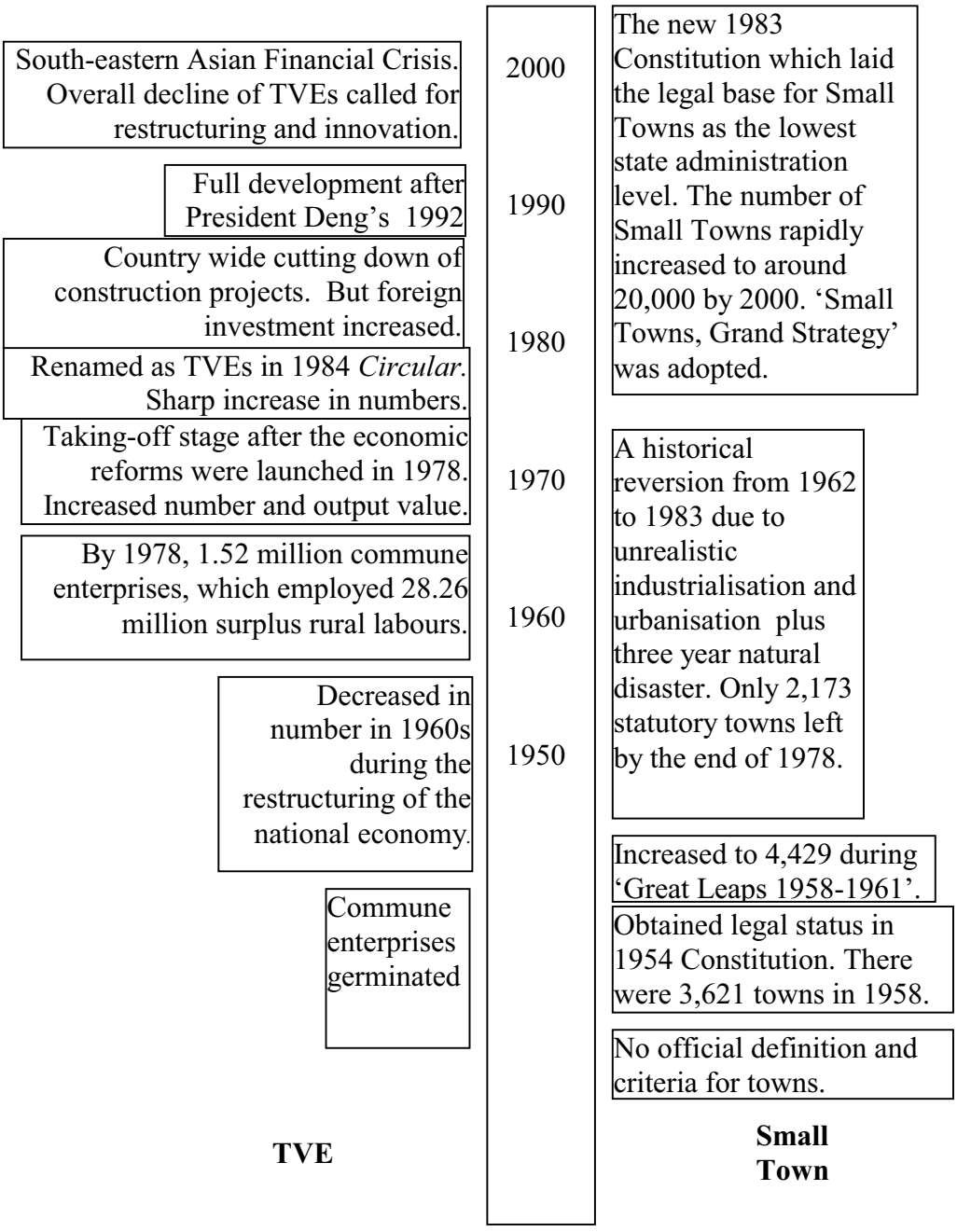

Figure 4.1 Major development stages of TVEs and Small Towns

4.3 Reshaping rural landscapes

It is interesting to look back at how TVEs and Small Towns have reshaped the rural socio-economic landscapes during the reform era. Of the long list of changes related to this transition, only the mainstream changes related to rural industrialization and urbanization are discussed here: the changes related to rural industrial composition; to employment composition; to institutional arrangements; and to farmers' income. Certain other aspects, like education, gender, fertility control and so forth, are beyond the scope of this dissertation.

First, it is TVEs who have turned the traditional *urban/industrial – rural/agricultural* dichotomy economy into an *urban/industrial – rural industrial - rural/agricultural* structure (Fang, 1999). This is what is unique compared with other developing countries. Between 1978 to 1998, the dominant position of the primary industrial[27] sector was replaced by the secondary industrial sector on the one hand, and modest increases in the service sector in rural areas (Figure 4.2 and 4.3) on the other.

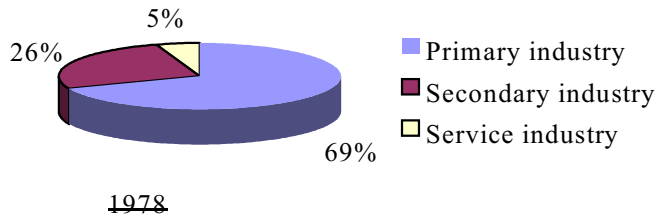

Figure 4.2 Composition of the rural economy in 1978
Source: MOA, 2000.

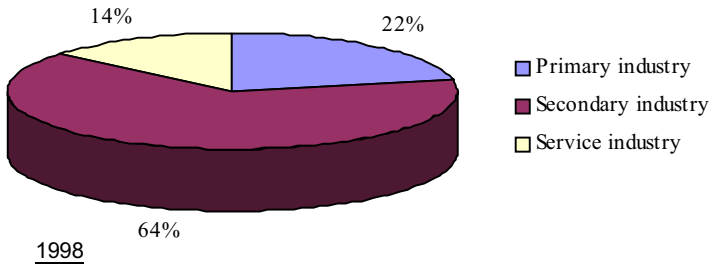

Figure 4.3 Composition of the rural economy in 1998
Source: MOA, 2000.

[27] Primary industry in China refers to farming, forestry, animal husbandry, fishery, gathering and hunting (Source: China Statistical Yearbooks, 1999).

The percentage of rural laborers involved in agricultural production has been declining, and the percentage involved in non-agricultural activities has been increasing continuously. This trend was more obvious in the 1990s. The percentage of rural laborers who engaged in the primary industrial sector dropped from over 80% in 1985 to 70% in 1998 (MOA, 1999).

With more income sources, farmers' per capita income has increased dramatically, from 133.6 RMB in 1978 to 2,162 RMB in 1998 in absolute terms (Figure 4.4). The average annual growth rate reached 7.9% in 1998, and about one third of farmers' net per capita income came from TVEs. TVEs have accumulated about 80% of rural collective assets. This gave the farmers certain possibilities to improve all aspects of their living conditions, enabling improvements in education, health care, transportation, communication, irrigation & drainage systems and other infrastructure (Jiang, 1999).

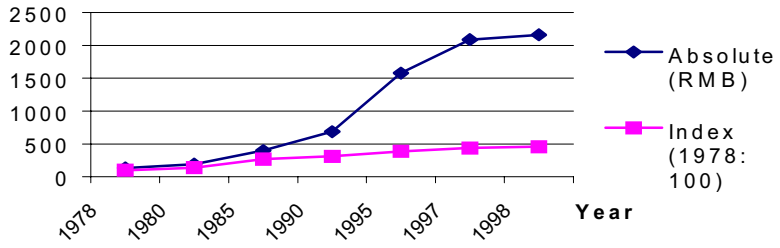

Figure 4.4 Farmers incomes per capita 1978-1998
Source: MOA, 2000.

However, the most important reform was related to the economic institutions, symbolized by the 18 households in Xiaogang Village in Anhui province who dared take the risk to sign a responsibility contract in 1978. The long time depressed productivity under commune system was quickly replaced with HPRCS. This, in turn, stimulated the rise of TVEs. The decentralized decision-making process and the increased autonomy of the micro-units (farmer households) resulted in changes in managerial organization of the TVEs. Development of the market system, meanwhile, enhanced the organizational changes, which evolved cumulatively into a fundamental reform of the property rights structure (Chen, 2000).

Over the past two decades, TVEs have contributed 150 billion RMB to support agricultural production and have greatly improved the mechanization level of farming. In some villages, certain TVIEs turned themselves into the "dragons' heads" that brought large-scale intensive planting and animal raising activities. The formation of *planting-raising-processing* chains and *production-supply-sale* chains increased the production efficiency and economic effect greatly (MOA, 2000).

Both the visible and invisible changes resulted in a mixed picture of today's rural China, especially in the coastal provinces. In these regions, it is common to see factories standing right in the fields, sometimes with different national flags dancing in air. There are newly built town centers with colorful shops and public leisure squares. Some industrial parks are growing and achieving international standards. New roads tie towns and villages together. The traditional shabby farmhouses are giving way to brand new villas with foreign architecture. It is no longer easy (or in some cases even impossible) to distinguish farmers from city dwellers based on the way they dress. Being part of the market economy, many villages are not remote any more. The exchange of goods, technologies, and information have not only filled the wallets of farmers, but have also introduced new life styles, values and mentality.

Vigorous development of Small Towns and TVEs has been instrumental in speeding up China's urbanization and industrialization processes, in realizing the modernization of the national economy, and in narrowing the rural and urban disparities. TVEs in Small Towns are functioning as the income generators and job creators for the local governments and the farmers. Small towns absorb surplus rural laborers on the spot (by the year 1996, TVEs had absorbed 135 million rural surplus laborers, according to Li, 1998), which in turn can mitigate the social pressure brought about by the waves of immigrant workers from the countryside who might otherwise flood to the big cities.

These significant functions of Small Towns and TVEs have drawn considerable attention from the Central Government, and national policies have favored their development. Policy experiments carried out in selected towns were designed to remove policy and institutional barriers and to improve the environment for Small Town development. These include: reform of HRS, which gives more possibilities to rural residents to move to towns; reform of the tax system, which gives more incentives and delegates more responsibilities to Small Towns; and reform of the land use system, which allows for more rational planning and use of the land.

4.4 Driving forces of further development of TVEs and Small Towns

Urbanization is a global trend. Often, the level of urbanization serves as a major indicator of the modernization level of a country. According to the United Nations Population Fund (UNPF) report, in the year 2006 more than half of the world's projected 6.6 billion people will be living in urban areas (Baslago, 1999). In China, the level of urbanization is measured based on the proportion of the urban population according to its HRS. After two decades of economic reforms and development, the registered urban population increased by 12.5% from 1978 to 1998. The number of cities increased from 191 in 1978 to 668 in 1998. The number of Small Towns increased from 2,173 to 19,216 during the same period (Shao, 2000). However, the urbanization level of China remained below the world average, according to which, in 1995, about 80% of the population of developed countries and 43% of the less developed countries are living in urban settings (Li, 1996).

Analysis of international data suggests that there is a positive linear relationship between income per capita and levels of urbanization and industrialization. And, in most cases, urbanization is ahead of industrialization (Yu, 2001: 230-231). However,

this relationship does not appear to hold for China, where the urbanization progress does not match with the achievements of industrialization. For instance, while industrial added value accounted for 42.1% of the national GDP in 1998, the urbanization level at that time was only 30.4%, or about 15 percent lower than those countries with similar economic levels (Shao, 2000; Yu, 2001; World Bank, 2000). The negative impact of this situation was the increasing tension between the huge rural population and limited arable land, the slow development of the service industry sector and the stagnation of domestic consumption. The decline of farmers' income since 1997 indicates that rural economic structures are in need of restructuring to create the conditions for the transfer of surplus rural labour to non-agricultural sectors. In many industrialized countries, non-agricultural production accounts for 60-70% of the total, and the non-agricultural employment rate can be 70-80%, while the real farmers are less than 10%. In China, non-agricultural production value is about 80% of the total, but the non-agricultural employment rate is only 50%, while urban population is about 30% (Wang, 1999). Therefore, the urbanization of rural areas is seen as inevitable. And, for the reasons we discussed in chapter 1, China must follow the path of developing Small Towns within the boundaries of the rural, instead of expanding existing big cities (Zhen, 1998; Yu, 2001).

Effective aggregation of people and economic elements is the pre-condition for urbanization process. Small Town development is actually an aggregation process bringing together the rural labour supply and capital. TVEs are the catalyst of Small Town development. Chinese researchers (e.g. CCTDR, 1998; Chen, 2000; Wei, 1998; Yu, 2001) conclude that the driving forces behind TVEs' initial take-off are:

~ The need to relocate surplus rural laborers. While the rural economic reforms triggered the explosion of rural unemployment, the market mechanism offered a perfect institutional space for the growth of TVEs.
~ The existence of large market demand. The shortage of commodity supply was a basic feature of the economic life under the old system, which failed to allocate resources effectively according to market signals. Compared with SOEs, TVEs were more flexible and quicker to meet market demand.
~ Low market entrance cost increased the profit. Most TVEs directly employed local low-cost laborers without considering their educational input, social insurance or welfare funds. They created the initial market using social relationship resources, thus reduced the marketing cost. They themselves rarely developed technologies. Instead, they developed using second-hand SOEs technologies or "borrowing" technologies from research institutes. Another factor was the availability of cheap, or in some case, free land for occupation.
~ 'Spill over' effect of the investment in SOEs. With the fading discrimination on the ownership, TVEs could be chosen by SOEs as suppliers through market competition. This was how many TVEs survived.
~ Strong desire of the community leaders to accumulate wealth. TVEs became the major income sources of the local community. The economic benefits from TVEs were obvious. Not surprisingly, the community leaders considered TVEs the main instruments for wealth accumulation.

Driven by these forces, TVEs became the direct force for town development. When this was put together with the mounting desire of farmers to enjoy city life, Small Towns became a proxy for urbanization. Due to the HRS, moving to nearby towns

became a realistic choice for many farmers who were no longer directly involved in farming. Millions of farmers bought residence permits in Small Towns during the upsurge of 'selling permits (mai hukou)' in 1992. Although this illegal practice was banned shortly thereafter, the real number of farmers living in statutory towns ran to about 200 million (CCTRD, 1998). It was (and remains) also a strong desire of the communities to improve their living environment. With the financial support of TVEs, Small Towns finally became able to invest in public facilities.

On the other hand, TVEs are the direct beneficiaries of town development. As the local centers for goods distribution, transportation, communication and information, towns offer better production and market services than the industries could mobilize on their own. As farmers became workers through TVEs, they also changed from rural dwellers to residents of Small Towns, where they can enjoy many of the benefits of urban civilization. The combination of TVEs and Small Towns thus lead to the integration of economic growth and social advancement. The construction of towns also created more market demand for some TVEs. The altered consumption patterns of farmers has further pushed national economic development.

This is basically how the old institutional constraints were turned into driving forces for Small Towns during the rural economic reform. Because farmers were only allowed to develop within a very limited space, TVEs and Small Towns were created as farmers' own way to pursue industrialization and urbanization. The designers of the urban-rural dichotomy structure might not have expected this result.

4.5 Interwoven nature of TVEs and Small Towns

Obviously, synchronism exists in the development of Small Towns and TVEs, in terms of time and spatial location. Figure 4.5 shows the development trends of Small Towns and TVEs; the unbalanced distribution of Small Towns and TVEs over three economic regions are expressed in Figure 4.6, 4.7 and 4.8. About half of the TVE employees worked in Small Towns, and 57% of the total TVE production value came from those located in Small Towns (Zhang, 1996).

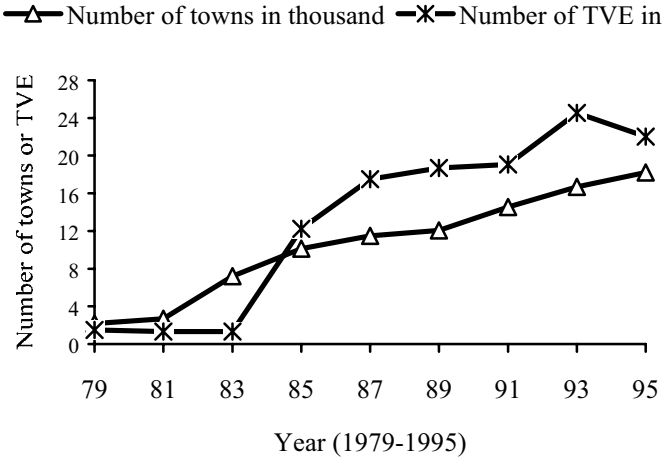

Figure 4.5 Small Towns and TVEs in numbers during 1979 – 1995
Source: *Project document of UNDP-China project (CPR/96/507),* 1999.

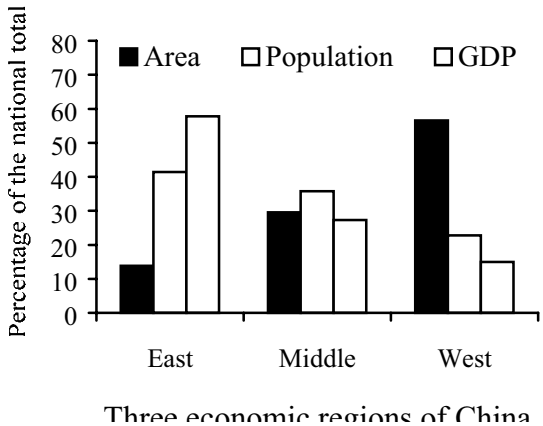

Figure 4.6 **Area, population and GDP in three economic regions of China**
Source: *Project document of UNDP-China project (CPR/96/507),* 1999.

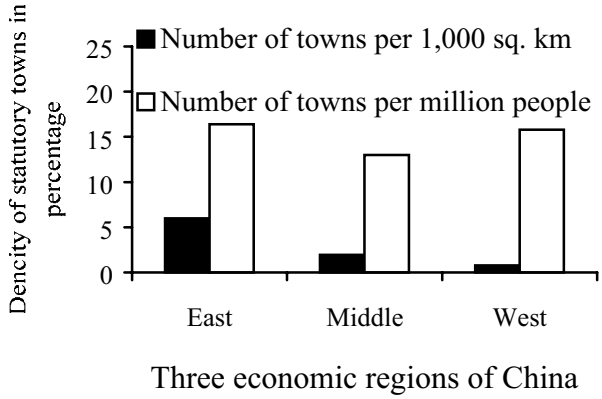

Figure 4.7 **Density of statutory small towns in three economic regions of China**
Source: *Project document of UNDP-China project (CPR/96/507),* 1999.

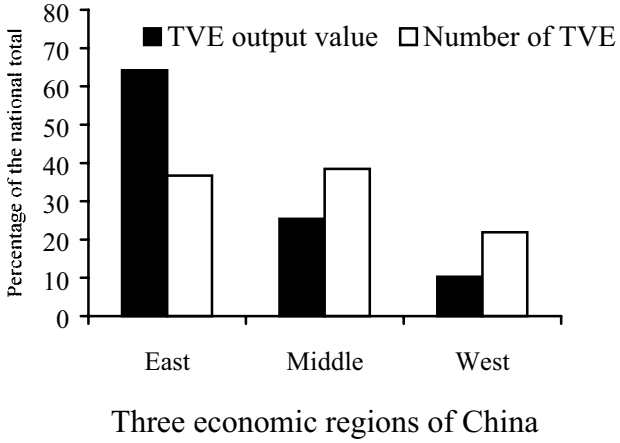

Figure 4.8 **Density of TVE in three economic regions of China**
Source: *Project document of UNDP-China project (CPR/96/507),* 1999.

Another unique feature of the phenomenon of TVEs & Small Towns consists of the interdependent relations between Small Town governments and TVEs, which have been shaped from the very beginning by a number of endogenous factors. Generally speaking, TVEs originated as rural community enterprises, particularly in southern Jiangsu province where the Sunan Model[28] has been developed. The replacement in 1983[29] of the former commune regime by town/township arrangements as the lowest-level local authorities in China's bureaucratic hierarchy did not fully change the dual roles of the town/township governments. In most cases, town/township governments do not only govern public administration, but also production. Since the first batch of collective TVEs evolved from the former communes or production brigade enterprises, they were taken over by the new town/township governments or villages. In addition, at an early stage of the rural reform, individual farmers could not afford investing in private industries or purchasing collective enterprises. Therefore, the so-called two-tier principal-agent -proxy relations (Chen, 2000: 22-24) were integrated into the governance structures of collective TVEs. As shown by Figure 4.9, the community residents, as the nominal, or *de jure*, owners of a collective TVE, delegate the control rights (including the residual distribution rights) in the firm to the community government, who serves as the *de facto* owner of the firm. In return, the community government assumes responsibility for the provision of public goods and services, agricultural production support, local welfare, and capital re-investment for the community residents. This is the first-tier of principle-agent relations.

According to Chen (ibid.), the second-tier of principle-agent relations in collective TVEs' organization operates between the community government and firm manager when the former re-delegates at least part of the control rights in the firm to the latter. In return, the firm manager receives certain economic compensation through an operational contractual arrangement. The firm manager thus has the obligation to remit profit, pay rents and fees to the community government. The community government, through the fiscal system, will share the taxes paid by the firm to the state as well.

[28] See footnote 2.
[29] See footnote 25.

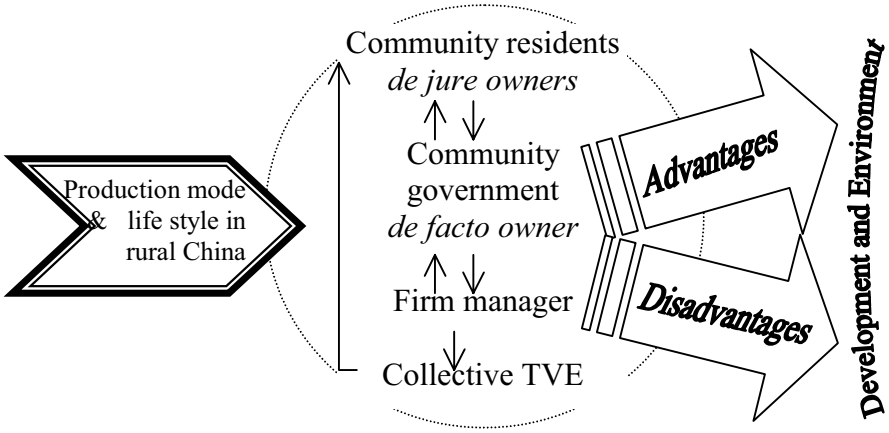

Figure 4.9 The Two-tier Principle-agent Relations in Collective TVEs
Source: Adapted from the figure by Chen (2000:22).

To a large extent, these two-tier relations explain both the economic miracle of collective TVEs in the last two decades and their decline since 1996. The fact of being community enterprises was always a big advantage at the early stage of TVE development. Compared with state-owned enterprises or private enterprises, these TVEs were more flexible in making decisions and responding to market demands in an unfettered market economy. TVEs could draw strong political and financial support and protection from the community leaders and residents. To set up enterprises on their collectively owned land also reduced the cost for land occupation and resources utilization. Moderate-cost local labour and the existence of strong kinship in rural communities also contributed to the lowered entrance cost for TVEs. In addition to pursuing profit maximization as all other enterprises did, TVEs were also supposed to serve other development objectives of communities. Therefore, their social effects should not be neglected in any analysis of TVEs' roles in town development. Not surprisingly, many Small Towns have been emerging and developed through the growth of TVEs.

However, the disadvantages of these two-tier relations have been becoming more and more obvious since the early 1990s. First, the failure to separate party, government administration, and economic management (dangzheng bufen, zhengqi bufen) is seen as a major disadvantage. Excessive intervention of the community leaders in business decision making, personnel management, production arrangement and profits distribution have been effective barriers for the healthy economic development of TVEs. Even in the 1990s, when private enterprises increased rapidly and former collective TVEs have been being gradually reformed into various share-holding companies or share cooperative system[30] in which property rights are better defined,

[30] Various contractual forms have been implemented in collective TVEs: work-point system, wage/salary system, collective contractual responsibility system (Jiti Chengbao Zeren Zhi), personal contractual responsibility system (Geren Chengbao Zeren Zhi), personal mortgage contractual responsibility system (Geren Diya Chengbao Zeren Zhi), leasing (Zulin), auction, and share cooperative system (Gufen Hezuo Zhi). The last system was introduced as

similar interference of community leaders still exists, to varying degrees in various places.

Secondly, the community character of TVEs has blocked the flow of production elements between different communities. This fact explains the fragmented distribution of TVEs in rural areas and the redundancy of investments in similar resources-based industries. Third, being enterprises belonging to a local community, the kinship or pan-kinship relations have prevented TVEs absorbing outside qualified management personnel, while it has also reduced the incentives of their employees for continuous self-improvement.

Both positive and negative impacts of the community character of TVEs have been evolving continuously during the course of their development. Both are the consequences of the production modes and life styles of a given group of people in a given environment during a given time period. To maintain and expand the positive elements of this characteristic structure and to minimize the negative effects, rural production modes needs to be improved and adaptive to the new social environment. This means, for instance, removing the 'iron curtains' between the urban and rural population, allowing the transfer of land use rights that are contracted to farmers but owned by the community, and overcoming 'city centrism' both in policy making and practice. Fortunately, the ongoing reforms targeting Small Towns and TVEs are partly going in this direction.

4.6 The Dark horizon of China: Small Towns, big pollution

4.6.1 General introduction

This economic prosperity brings with it a lurking problem and growing disadvantage. Environmental pollution and degradation caused by TVEs, and by Township & Village Industrial Enterprises (TVIEs) in particular, is increasingly threatening the health, stability and sustainable development of the Small Towns themselves. The existing growth patterns of Small Towns and TVEs have been widely recognized as unsustainable. Many Small Towns are living with ongoing environmental degradation at the same time that they are striving for a fatter wallets. The 98 small paper mills operated in Fangshang village of Hebei Province form an example. In 1997, these mills generated 80,000 tons of untreated wastewater every day (UNDP, 1997). Social conflicts caused by TVIE pollution are not uncommon. For instance, to suppress the complaints of the villagers about the pollution from a non-ferrous metal processing plant, the plant manager hired thugs to beat up the villagers. One was killed and 13

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an institutional innovation in the reform experiments to attempt to 'clarify the property rights' of the collective TVEs, and 'to separate governments's administrative intervention from firm's daily operation' so as to improve firm's efficiency (Chen, 2000: 82-106). The concept of a rural share cooperative system arose in the context of controversy over reforms to improve enterprise efficiency and to alleviate the tensions brought about by rapid rural industrialization. The Ministry of Agriculture's Provisional Regulations (1990) stipulate that a shareholding cooperative is an independent entity with powers of decision-making vested in the annual general meeting of shareholders, or their representatives, which elects a Board of Directors. There are clear differences with a shareholding system. It also diverges significantly from cooperative principles since it allows outside investment (Clegg, 1998).

injured in this incident (Li et al., 1999). Increasing environmental problems caused by TVEs and disorganized town planning and management in their host communities has been offsetting their economic achievements. For instance, in Zhejiang Province, the 'environmental damage' caused by TVIEs increased from 6% of the total 'environmental damage' in 1978 to 20% in 1988, and exceeded 50% of the total 'environmental damage' in 2000 (Sun, 2001).

The environmental situation in rural China can be summarized as continuous degradation in general, with severe pollution in some specific areas. Examples include environmental hazards in the Huai river, the eutrophication of the Tai lake in the eastern part of China, and ecological degradation in the vast western China (Wang, 1997). Although over 95% of TVIEs were located in villages in the early 90s, TVIEs in towns and townships contributed to 40% of the total output value and 60-70% of the waste emissions of all TVIEs. TVIEs in eastern coastal regions are more often concentrated in Small Towns. For instance, in the early 1990s in Jiangsu Province, TVIEs located in Small Towns generated over 60% of the total TVIE's output value and about 80% of total air and water pollution by (Wang et al., 1993). All kinds of pollution can be found in Small Towns and the potential harm for those living and working there is increasing. In some densely populated Small Towns with a high concentration of industries, the environmental pollution load is as heavy as that in big cities or industrialized areas. With the rapid growth of Small Towns and TVIEs, new pollution sources are emerging. However, insufficient attention has been given up till now to pollution control in towns' planning and TVIEs' management.

4.6.2 Trends and geographical distribution of TVIE pollution

Trends of TVIE pollution

Two national surveys on TVIE pollution sources give an idea of the level and types of pollution caused by TVIEs. One was conducted in 1989 jointly by the State Environmental Protection Administration (SEPA), the Ministry of Agriculture (MOA) and the State Statistic Bureau (SSB). However, the rapid development of TVIEs has made the data and information from this survey obsolete and no longer adequate.

In order to ensure the realization of the environmental protection targets, which were proposed during the 5th plenary meeting of the 14th CCCPC in 1995 for the 'Ninth FYP'[31], another country-wide survey to provide a baseline of TVIE pollution sources in 1995 was urgently required. Therefore, SEPA, MOA, (SSB) and the Ministry of Finance (MOF) jointly started a second national survey on TVIE pollution sources in early 1996. The final results were published in December 1997 (China TVE Year Book, 1998). Although there were some doubts about the accuracy of the data due to the financial and technical constraints and the complexity of TVE sector, it was believed that this would not change the general picture on TVIE pollution levels and future trends, and it was comparable to the 1989 survey (Table 4.1)[32]. Unfortunately, the 1995 national survey of pollution by TVIEs came too late to be incorporated in the

[31] The main target is that, by the year 2000, the pollution discharges of the major pollutants should be maintained at the levels of 1995.
[32] According to the interviews with Mr. Wang Jianming from NIES November 2000 and the director of Statistics Division of TVE Administration Bureau in MOA in August 2000.

'Ninth FYP' (Vermeer, 1998). Thus, the base-year figures in the Plan may have been seriously underestimated.

Table 4.1 Major TVIEs Polluting sources in 1989 and 1995

	1989	1995
Major polluting sources (in million)	0.5715	1.216
Its percentage in the total number of TVEs (%)	3.10	5.50
Its percentage in the total number of TVIEs (%)	7.80	16.90
Industrial output value of polluting TVIEs (in billion RMB)	100.4	1926
Percentage of the total output value of TVIEs (%)	35.5	37.6

Sources: *TVIE Environmental Statement*, 1997; Li et al., 1999.

This second survey shows that strong economic development of TVIEs up to at least 1995 resulted in a considerable increase of industrial pollution loads[33], and TVIEs have potentials for continuous high environmental pollution in the future. To be more specific, in 1995, 1.216 million TVIEs were identified as major pollution sources, which accounted for 16.9% of the total number of TVIEs in that year. These polluting TVIEs shared 37.6% of the total output value of all TVIEs, and the major part was generated by those collectively owned by the towns, townships and villages (about 300,000 in number). About 65% of the TVIE polluters were found in sectors of non-metal mineral products, textiles, food processing, metal products, chemical industry and machinery manufacturing. Together they shared 53.1% of the total industrial output value (Figure 4.10).

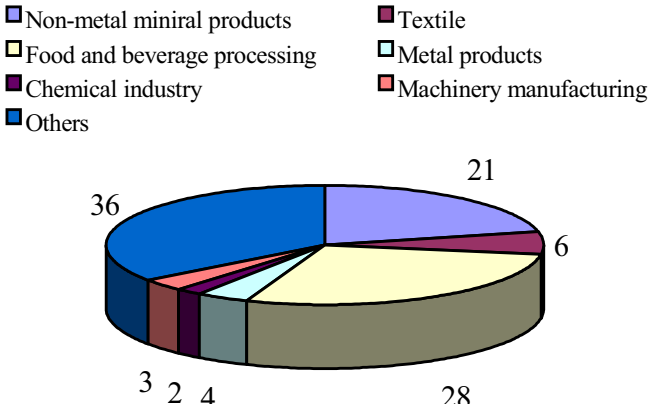

Figure 4.10 The percentages of six major polluting TVIE sectors by the number of enterprises in 1995

Sources: *TVIE Environmental Statement*, 1997; Li et al., 1999.

[33] See also a review on *Environmental Pollution Patterns of TVIEs* in *Environmental Management Of Chinese Township And Village Industrial Enterprises* by Jostein Nygard and Guo Xiaomin (included in the document *China: Air, Land and Water*, by the World Bank and SEPA, June 2001).

According to the same survey, in 1995, TVIEs generated 21% of the total industrial waste water in the country, 44.3% of the total industrial Chemical Oxygen Demand load (COD), 23.9% of the total industrial SO_2 emissions, 50.3% of the total industrial soot emissions, 67.5% of the total industrial dust emissions and 88.7% of the total industrial solid waste. All of these figures – both in absolute and relative terms - were much higher in 1995 than in previous measurements from 1989, and this upward trend has continued (Table 4.2). In addition, the rate of waste treatment in TVIEs was much lower than their counterparts at county or higher levels. Only 40.1% of the industrial wastewater from TVIEs received treatment before discharge; only 26% of the gas emissions from fuel combustion were treated to reduce soot and dust; and only 30.9% of industrial solid waste was reused. The surveys show that only 10% of the total pollution discharge fees owed were collected from TVIEs, much lower than their share of the total pollution load. The implementation rate of 'Environmental Impact Assessment (EIA, or Huanjing Yingxiang Pingjia)[34]' in TVEs was only 22.7% and only 14.5% of TVEs complied with 'three simultaneous practices (san tongshi)[35]'.

Table 4.2 Surveys on TVIE pollution load in 1989 and 1995

Items	1995		1995/ 1989 *
	Quantity (ton)/year	Percentage of the national total (%)	
Industrial waste water	5.91 billion	21	2.3
COD	6.11 million	44	3.9
SO_2	4.44 million	23	2
Smog & dust	8.49 million	50	2.8
Industrial solid waste	180 million	88.7	11

* In absolute terms.

Source: *China TVE Environmental Statement*, 1997.

Geographical distribution of TVIE pollution

Looking at the geographical distributions of these TVIE polluters, 39.7% are in the eastern part, 32.7% are in the middle part and 27.6% are from the western part of the country (Figure 4.11)[36]. The proportions of their output values are 77.6%, 14.7% and 7.7%, respectively. Obviously, the eastern region has a bigger share both in terms of economic contribution and pollution load by TVIEs. Jiangsu province, which is

[34] Environmental Impact Assessment (EIA) serves as safeguards against unchecked environmental impacts of any new construction or expansion projects.

[35] The 'three simultaneous practices' is a typical Chinese measure. It requires that pollution control facilities be included in the designing, construction and operation phases.

[36] China is divided into three economic regions based on economic development levels and economic geographical locations, etc. This tripartite regionalization is of course a surrogate for 'developed', 'intermediate-developed'and 'less developed'. The East Region refers to the coastal provinces and cities (Beijing, Tianjin, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan) , and represents the most developed economy in China. The Middle (Shanxi, Inner Mongolia, Jiling, Heilongjiang, Henan, Hunan, Hubei, Hebei, Liaoning, Anhui and Jiangxi) and West (Sichuan, Guizhou, Yunnan, Tibet, Shanxi, Gansu, Qinghai, Ningxi, Xingjiang, Guangxi) Regions are more backward compared with the Eastern Region (Ma et al. 1997).

selected for this study, is among the largest provinces (in the eastern region) in terms of numbers of polluting TVIEs .

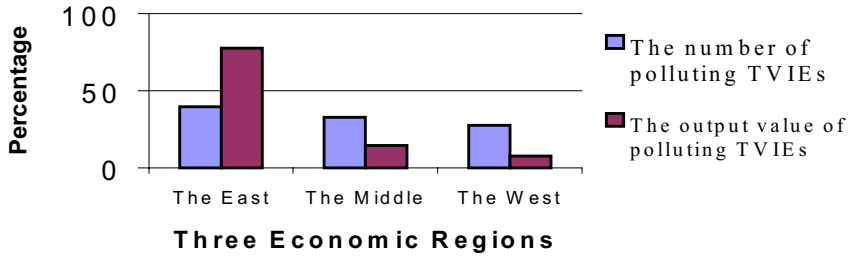

Figure 4.11 Distribution of polluting TVIEs in three economic regions (1995)
Source*: China TVE Environmental Statement*, 1997

4.6.3 Causes of TVIE pollution problems

Environmental pollution caused by TVIEs reflects the low resource and energy efficiency of their production processes and product designs. TVIEs are still growing based on production expansion, not on improved efficiency. This material- and energy-intensive growth mode is not only bringing negative impacts on the sustainable development of the society, but also impedes the TVIEs' own sustainability and threaten their survivals. The government has taken actions to shut down small operations in 15 sectors that have been identified as the most polluting ones. By the end of 1997, more than 65,000 small factories were shut down for environmental reason across the country[37].

The environmental problems in these Small Towns are typical economic growth-induced ones. In addition, the rural/urban dualistic and transitional characteristics of the circumstances in Small Towns, where many TVIEs are located, increase the difficulties and complexities for environmental management many fold. The fact that these Small Towns and TVIEs, in general, are beyond the reach of both the formal environmental regulation agencies and the critical support services makes the situation even worse. Since traditionally the rural pollution problems have been neglected, environmental problems in Small Towns may be the most urgent, but the least-known issues to emerge in a long time.

Previous studies conclude that there are so-called internal and external factors contributing to poorly controlled TVIE pollution. The internal factors refer to those intrinsic features of TVIEs and Small Towns that determine how they react to their

[37] In August 1996, the State Council ordered local authorities to close down small paper mills (output below 5,000 ton/year), leather factories (output below 30,000 hides/year), dyeing factories (below 500 ton/year) and chemical, electroplating, asbestos and other factories with antiquated and heavily polluting technologies. Local government leaders and company managers were threatened with prosecution if they did not comply (*Environmental Protection [Huanjing baohu]*, No. 9, 1996: 2-4)

survival environment. The external factors refer to those factors that are beyond the influence and control of TVIEs and Small Towns. Regarding the internal factors, many researchers (e.g. Wang, 1997) ascribe problems in environmental management of TVIEs to their rapid growth (the annual output value growth rate has been above 25%); large numbers (up to 20 million, of which half are TVIEs); dispersed activities (mostly scattered in the vast rural areas); small-scale operation (only about 5 employees on average); complex composition (including almost all polluting industries); low level of production technology; poor operations and management (very few technical staff with college professional background); lack of financial resources (the average annual profit of enterprises is only 5,000 RMB); and lack of environmental awareness among the entrepreneurs and employees. In a word, extensive patterns of rural industrialization need to give way to intensive ones. Towns are the obvious focal point for such structural transformations and spatial concentrations. Among the external factors that cause environmental deterioration, the following ones are important for these Small Towns:

~ macro-policies which favour economic goals over environmental protection and favor cities over the countryside;
~ very limited environmental management capability at both firm and town levels (no formal environmental agencies at town level and insufficient qualification of environmental staff, see Box 4.1);
~ lack of experience in effective environmental management of TVEs;
~ lack of financing mechanisms for environmental protection in small and medium-sized enterprises; and
~ lack of environmental protection consideration in town construction (Box 4.2).

Box 4.1 Chinese environmental management capacity at town level

In China, environmental management responsibility of TVIEs rests on the Environmental Protection Bureaus (EPB)/Agencies at county/town levels and the environmental protection division of local TVEs' Bureau. However, the institutional capacity and resources barely allow them to perform effective management to TVIEs. According to the statistics in 1994, among 2,148 counties, 2,005 (93%) had established their EPB, 1,808 (84%) had established their Environmental Monitoring Stations, and 1,348 (63%) had Environmental Supervision Stations. The average number of staff per EPB was 9. Environmental Protection Agencies did not exist at town level at all (48,075 small towns in 1994). Considering that more than 20 million TVEs located in about 50,000 towns and 800,000 villages, one can imagine how uncontrolled the situation was. Although the situation is improving over years (in some small towns, an assistant for environmental protection is put at the position to assist the regulation agencies), it is far from enough.

Source: *China Environmental Yearbook*, 1994.

Box 4.2 Environmental Planning of Chinese Small Towns

Although overall plans have been formulated in 34,315 Small Towns (73% of the total number), the quality and implementation of these plans could be questioned (Xu, 1999). Environmental considerations simply did not appear in most of the construction or development planning of Small Towns. This has produced scattered layout and lack of environmental infrastructure in these Small Towns. Polluting factories are often founded located in the wrong places and operate without any waste treatment facilities. Water, electricity, gas and communication systems are not compatible with each other, which increase the construction cost unnecessarily. The landscape and environment of Small Towns has thus been left unprotected. In a very few cases, environmental plans have been made, but they are generally not integrated into the overall plan framework, and no enabling mechanisms are in place to guarantee the implementation of the planning.

Source: *Project document of UNDP-China project (CPR/96/507)*, 1999.

These above mentioned internal and external factors make the environmental improvement of TVIEs in Small Towns a very complex and ticklish task. The contradiction between environmental objectives and economic growth faced by all these Small Towns take sustainable development more or less out of reach at first consideration. However, recognizing the problems and the relations between them is half of the solution. And the question is of course to what extent and how these problems will be enlarged or can be solved, in the ongoing process of economic transformation.

4.7 Bottlenecks and countermeasures

4.7.1 The overall decline of TVEs

However, there is no free lunch, and low-cost expansion often masks delayed cost increases at a later stage. This is exactly the situation TVEs are in today.

Around 1999, there arose a series of relatively sharp nationwide debates on how TVEs could be revitalized so that they could adapt to a changed environment. This was a response to the drop in TVE's annual growth rate from its peak growth rate in 1993 to its lowest point in 1997. Parallel to this dramatic drop was the decline of profits and an increasing scale of losses. According to a report of MOA[38], the loss in 1997 amounted to 80.6 billion RMB, which was 70% more than that in 1995. Since 1994, the return on total assets and the return on investment have been

[38] According to *Basic situation and economic analysis of TVEs (Xiangzhen Qiye Jiben Qingkuang he Jingji Fenxi)*, by the TVE Administration Bureau of MOA, 1998:1, 28, 34.

shrinking/declining. Many TVEs lacked working capital and found it difficult to repay their loans. Questions were asked about the validity of the term TVEs, the rationality of TVEs ownership structures, the industrial structures, management capability, the future direction, etc. It became obvious that the deepening of economic reforms was exposing and intensifying the intrinsic weakness of TVEs in terms of scale of operations, ownership structures, technological levels and managerial skills. At the same time, the constraints imposed on Small Towns by the old *HRS*, the land use system, financial arrangements, institutional settings, personnel management system, and the like remained barriers for town development.

Let us have a more detailed look at the problems TVEs have encountered. First, is the obvious slow-down of TVEs' growth. After the high-speed growth of 65.1% in 1993 and over 20% during 1978-1992 period, the annual growth rate started to drop down to 18% in 1997 (Figure 4.12).

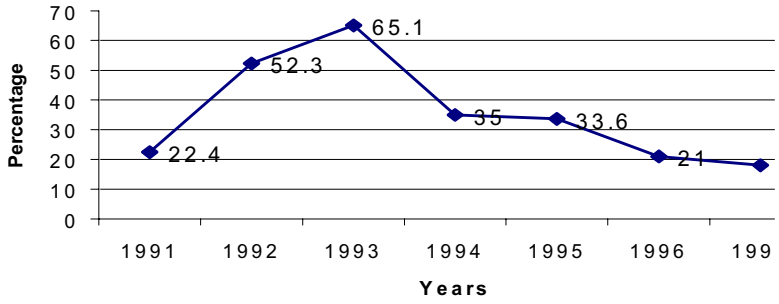

Figure 4.12 TVE annual growth rate of output value 1991-1997
Source: *China Rural Yearbook* of various years.

Second, is the declining profit level. The profit per hundred RMB of fixed assets, capital and sales income continued to fall after 1993 (Figure 4.13). In mid-1998, some 15% of all township enterprises were making significant losses (Kirkby et al., 2000).

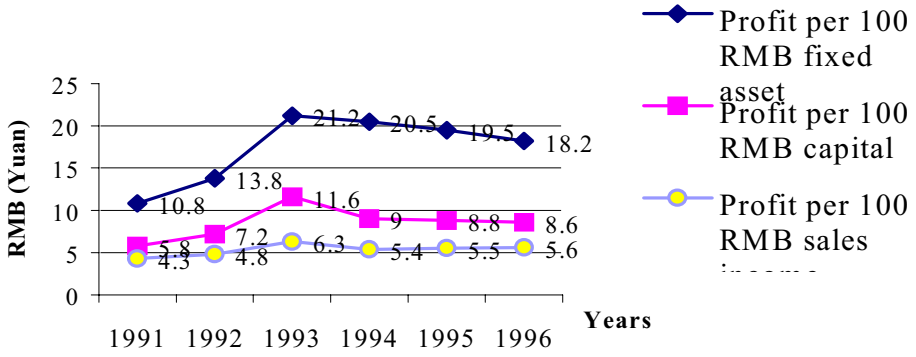

Figure 4.13 Declining profit of TVEs 1991-1996

Source: *China Rural Yearbook* of various years.

Third, the annual growth rate of export slowed down, from 83.5% in 1993 to 20% in 1997 (Table 4.3).

Table 4.3 The growth rates of TVEs export value 1991- 1997

	1991	1992	1993	1994	1995	1996	1997
Export value (billion RMB)	66.99	119.28	235.04	339.83	539.45	600.78	700.00
Growth rate (%)	34.1	73.8	83.5	34.5	68.3	20.5	20

Note: the growth rate was calculated based on comparative prices.
Source*: China Rural Yearbook of various years.*

If employment elasticity drops, the rate output value/employment elasticity increases. In 1997, the newly increased employment was only 70% of the average level of the previous years (Figure 4.14).

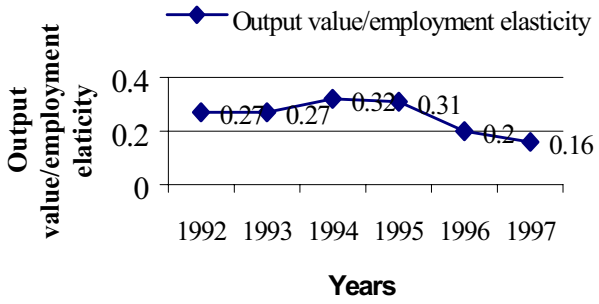

Figure 4.14 TVE output value/employment elasticity 1992-1997
Source: *China Rural Yearbook* of various years.

Since TVEs have become an important component of the national economy, the threatened continuation of their overall stagnation will have a significant impact. The first threat is of negative impact on the rate of national economic growth. It is estimated that every 3.7 percentage of TVE growth rate is associated with 1 percent change of the Gross Domestic Production (GDP). The same would also happen to the export growth rate. Every 2.5 percentage drop from TVEs will lead to 1 percentage drop of the national export growth rate (Ji, 1998).

Secondly, the slow-down of TVE growth will cause more unemployed workers. Some will float to cities, increasing the competition for jobs, where already more than 10 million laid-off workers from SOEs lived in 1997. The rest will return to villages and become a barrier for the transition towards a more intensive farming pattern (Ji, 1998; Zhu, 1998).

Studies on the causes of this development show that both the changes of the external environment and the intrinsic weaknesses of TVEs contributed to this decline and stagnation (J.L. Ji, 1998; P.H, Ji, 1998; Tan, 1999; Zhu, 1998; Xia, 1998; X.M. Ji, 1999; Song, 1998; Liu, 1999; Shen, 1999; Yan, 1998; Guo, 1999; Cao, 1998).

First, the seller's market has given place to buyer's market. With the further establishment of the market economic system, about 95% of the prices are responding to market demand. Only 5% of the products are not meeting the demand. TVEs are losing the institutional and market advantages that existed under the central planned system and scarcity economy. Profit growth can not be based only on quantitative expansion, but has to be focused on qualitative growth.

Second, increasing competition with SOEs, foreign companies and join-ventures. With the reform in SOEs and the growth of foreign companies and join-ventures, the flexibility in business operation is no longer a monopoly of TVEs.

Third, losing preferential policy advantages. The recent reforms and measures regarding financing, taxation, investment, international trade and other macro policies have removed some preferential treatments for TVEs. For instance, the implementation of the new taxation system since 1994 canceled tax incentives for TVEs (Zhu, 1998).

Fourth, the increasing 'brand effect'. Famous brands are more and more becoming important. However, among the 42 famous brands recognized by the State Industrial and Commercial Bureau, only 5 are owned by TVEs.

Fifth, globalization and a world economy, and China's open policy push TVEs to compete in the world market. With China's accession to the World Trade Organization (WTO), TVEs are more exposed to the world market and are required to strengthen their overall competitiveness with foreign firms.

Sixth, the 'leadership economy' era has given way to an 'entrepreneurship economy' era. TVE economy had generally been regarded as a 'leadership economy', in which leaders, especially local leaders, were critical for TVE development during its take-off and high-speed growth stages from 1980 – 1996. Three factors represent the "secret weapons" for TVE success: policies, credit funds and competent entrepreneurs. All these three factors are largely influenced by leaders. It is the local political leaders who create various preferential policies for TVEs. It is with the help of leaders that TVEs could have access to credit funds before banks were commercialized. Without their efforts, potential local entrepreneurship could not have been the driver behind industrialization. The ambitions and enthusiasm of leaders removed various barriers for TVE development, and in fact, strong support from the local governments is a factor wherever TVEs are allowed to grow rapidly. Since 1997, these influences by leaders have been getting weaker since the market has been allowed to decide TVEs' fates with its 'invisible hand'. When TVEs have to compete with various enterprises in terms of prices, quality, and brands in the market, no wise leader dares to say he or she can repeat the 'super speed growth' of TVEs.

In short, TVEs are challenged by the changed market environment, new development concepts, strong competitors and intrinsic weaknesses.

4.7.2 Constraints for Small Town development

Similarly, due to the lack of planning and the constraints imposed by the traditional system, many problems appeared during the development of Small Towns (CCTDR, 1998; Kirkby et al, 2000; Zhang, 1998; UNDP, 1997; Shao, 1996; Yu, 2001):

First, the average scale of the built up town area is too small. According to a sample survey in 1997 (CCTDR, 1998; Yu, 2001), the average built up town area of 18,200 statutory towns was only 1.76 square km. Compared to cities, with a built up area of 10 square km and a population around 100,000, even the best developed statutory towns turned out to be too small. This fact makes it difficult to invest in large scale infrastructure in Small Towns.

Second, lack of short-term and mid-term credit funds. Short-term credit funds are important for housing projects, commercial center construction, industrial district construction and so on, while projects like water supply and sewage system construction, power supply facilities, communication facilities, road construction and pollution treatment, need mid-term credit funds. However, according to a survey done in 60 small towns with medium of high economic levels in 1994, less than 10% of the total funds used for town construction was from credit funds. The rest had to rely on extra-budget investment of the town, individual investment or money raised among the community members (CCTRD, 1998). Local governments, per se, appear to have very limited, if any, resources to borrow. This situation places considerable limits on the long-term investment capacity of towns in building the logistical and environmental infrastructure critical for their sustainable development (CCTRD, 1996). As a result, the economy of scale of construction is often too small to be cost-effective; extra-institutional fund-raising channels can not be integrated into market mechanisms; and the high entrance cost for farmers and investors slows investment, due to the high price of the land leasing or the transfer of land-use rights, which is the major source of the town supplemental-budget.

Third, short sightedness and lack of long-term planning. This is clearly reflected by the typical landscape and built environment found in Small Towns: urban construction sprawling along the main roads, low-density living estates occupying too much land; unnecessarily wide roads occupying cultivated land; poorly-designed lay-outs of the functional districts, which increase the cost of environmental protection at the same time that they spoil the overall landscape of the towns. Although many town plans have a theoretical objective to coordinate socio- economic development and environmental protection, in reality, they rarely consider the broad social economic situation and environmental carrying capacity. This is actually an attempt to address a complicated changing reality with a rigid, inflexible model. Not surprisingly, such planning often encounter difficulties and implementation (CCTRD, 1998).

Forth, the number of people in the floating population and temporary town dwellers equals or even exceeds the permanent population. The amphibious behavior of this non-permanent population hampered the concentration of the rural population and the long-term investment in towns.

Fifth, the underdeveloped administrative and financial institutions of the town government. The fragmented institutional settings and their corresponding authorities

established under the central planning system are not able to handle the new situation under a market-based economic system. Depending on its position in the administrative hierarchy, each government level is granted certain executive powers and is endowed with a given number of administrative departments and civil service staff positions. Because of their grass-root positions, Small Towns are given very limited autonomy and do not have nor are able to develope the capacity for carrying out the new tasks required for effective local governance. Tasks such as selection of town officials, appraisal and approval of projects, land-use planning, urban development and management of public finances, are usually undertaken by a higher level of government. The institutional framework is further complicated by the fact that in addition to county or city governments, functional organizations under vertical bureaucracies exercise jurisdiction over towns in areas such as urban construction, land management and environmental protection, among others (CCTRD, 1996). On the other hand, at the town level, the governments have absolute power over enterprises and involve themselves too much in the operation of enterprises. This often has created negative impacts on the efficiency of the enterprises (Central Institutional Setting and Staffing Commission/CISSC, 2000; Ministry of Civil Affairs/MOCA, 2000).

Sixth, nowhere is the lack of autonomy as problematic as in fiscal management. Towns are still under the regime of "Unified State Control over Income and Expenditure by Upper-Level Governments". Under this regime, fiscal revenues raised by the towns must be handed over in their entirety to the county administration which will decide, in accordance with the county public expenditure plans, on the portion to be remitted to the towns. However, the towns are authorized to retain some "extra-budget revenues" from the collection of fees for local health and education programs, for the leasing of land and for the transfer of land-use rights, etc. This system provides very little incentive to towns to increase their fiscal revenues while it strongly encourages them to raise additional "extra-budget" resources. This has resulted in a relatively opaque and ad hoc management of municipal finance, prejudicial to long-term investment planning and financial accountability (CCTRD, 1996).

Last, the property rights of land are not clearly defined. The collective ownership over land in rural areas leads to two problems. One is the local protectionism which has hindered effective exchange of production elements and optimal allocation of resources. The other is the chaotic administration of land. Since the villages can release or sell their collectively owned land for their own interests, it is difficult for the town to make overall development plans or to concentrate the funds for town construction.

All these problems find their roots in the old institutions. The decades old urban-rural structure and various institutional arrangements associated with it are the reasons why Small Towns emerged, but also the constraints on their further development. The time-lag in reform of the HRS may be responsible for the slow transfer of rural surplus laborers to Small Towns. The centrally planned and controlled financial systems which are in favor of SOEs and cities cannot effectively channel sufficient funds for town construction, nor at the same time effectively raise capital from farmers. For instance, the average annual financial income of 800 statutory towns in Anhui Province is only about 4.9 million RMB. The investments for town construction mainly rely on loans or farmers (Sun, 2001). The growing debt has

incurred lot of complaints from farmers. Reforms on the property rights of enterprises and land will definitely help the concentration of production elements to Small Towns. Even the planning, layout and construction problems, which might be seen as technical issues, have roots in the old-fashioned financial system and administrative functions at town level. Safe business and living environments are critical for those who consider moving to Small Towns. Therefore, a highly efficient and clean government, market-oriented administration system and laws protecting citizens' legal rights and interest are needed to counteract stagnation and stimulate a new period of growth and modernization.

All of these institutional factors are interrelated and intertwined. Although rural economic institutional reform has made the concentration of population elements into Small Towns possible, as long as the other parts of the overall institutional lay-out remain unchanged, this urbanization model will continue to face all the difficulties mentioned above.

4.7.3 Reform experiments

Responding to these new problems, a series of decisions and policies have been made by the Chinese Government to guide and to facilitate the development of TVEs and Small Towns. Since the early 1990s, the former State Commission on Restructuring Economic Systems (SCRES) and more than 10 relevant Departments and Ministries have been jointly conducting research on various aspects of Small Town development. As a result, a "*Circular Concerning Guidelines on Comprehensive Experimental Reforms in Small Towns"* was issued in 1995, paving the way for a pilot program focusing on town development reforms. Fifty-seven Small Towns were selected from 20 provinces as the first batch for experiments on the reform policies (Zhang, 1996). Many provincial governments quickly responded to this initiative, and more Small Towns have become involved directly as pilot towns at provincial level. Up to 1998, the number of national pilot towns increased to 172 (CCTRD, 1999). These experimental towns have been given extraordinary latitude to experiment with measures that would ease the twin transformations implied by both the "move to market" and the emergence of a geographically more intensive pattern of development.

Since Small Towns are the tails of the urban and the heads of the rural, reforms have to touch upon both the urban and rural institutions and policies. Recognizing the bottlenecks described above for Small Town development, the experimental reforms mainly aim to remove the institutional barriers that separate the villages/towns from cities and block the flowing and exchange of economic elements.

The first reform is on the economic and administrative functions of the town governments. The existing institutional framework and functions of Small Towns needs to be reformed to meet the requirement of the newly established socialist market economy. This means empowering the town governments based on a clear demarcation of jurisdiction and responsibilities between and among governments at various levels, especially between the town and county levels. Some authorities and tasks should be delegated to town governments so that they are capable of

coordinating the local social and economic development. This unavoidably requires restructuring the existing institutional setting and establishing new organizations so that some new but necessary functions (such as: infrastructure projects, environmental regulation, maintaining public order, traffic management, sanitation supervision, town planning, etc.) can be added to town governments. However, most agree that the principles of 'small government, big society' and 'small department, big service' should be followed to avoid overstaffing and to reduce government intervention in business operations (CCTRD, 1998; Zhang, 1996; CISSC, 2000).

The second reform is the financial system. Finance is the basis for the construction and development of town's political power. It is an important constituent part of various managerial systems of the towns. However, after several years of experimental reforms, little progress has been made on the financial administration system. Although a so-called 'Separated Taxation System (Feng Shui Zhi) [39] has been introduced since 1994 and has been implemented in many Small Towns in various forms, the reality remains problematic due primarily to: ambiguities in the town's jurisdiction and responsibilities; delayed institutional reform; lack of supervision mechanisms; absence of agencies and personnel for town financial management; lack of stable financial sources for investment in infrastructure projects; etc. Additional efforts need to be made to institutionalize the separation of power between the county and town governments; and to establish reasonable taxation baselines so that towns will be the major beneficiaries of the new system (MOF, 2000; CCTRD, 1998; Zhang, 1996).

Another important reform relates to the HRS. *The Decisions on Several Issues Regarding the Establishment of Socialist Market Economic System*, which was made during the 3rd Plenary Meeting of the 14th Communist Party's Congress in 1993, clearly stated that the HRS should be gradually reformed to allow farmers to move to towns for off-farming businesses (CCTRD, 1998; Ministry of Public Security/MOPS, 2000; Zhang, 1996). Guided by these Decisions, the Ministry of Public Security submitted a report to the State Council based on meticulous investigations and researches. This report became the *State Council's Circular on Experimental Reform Plan of Town's Household Registration System Made by the Ministry of Public Security and Instructions on Improving the Household Registration System in Rural Areas* (State Council document, 1997, No.20). Since then, a two-year program has experimented with the reforms of the HRS. This experimental program involved 382 representative Small Towns across the country, and in total 544,000 farmers changed their former status to town citizens during this two-year period. Although there are still problems that need to be addressed, this reform succeeded in changing the traditional attitudes/bias towards "status (shenfen)".

Parallel to the reform on the HRS has been the establishment of a new land administration system and paid transfer of land use right. The new land administration

[39] This new system aims to classify various tax items and divide them between the county and town governments according to the demarcation of their authorities and tasks. As a rule, the township- and town-level governments sign an agreement with the responsible county- and city-governments to pass on taxes in accordance with the tax responsibility system introduced in 1988. This system applies to all administrative levels in various forms. Generally, a tax-quota is laid down by the county tax offices. This quota is fixed with respect to a base year and takes into consideration an annual rate of increase of taxes (Taubmann, 1998).

system aims to coordinate the contradiction between town expansion and cultivated land reservation based on clearly defined land tenure. Instead of pure administrative allocation of land resources, market mechanism should be introduced to optimize land use. TVEs and residential houses should be zoned in accordance with general land-use plans to minimize the waste of land. Only when farmers who move to towns transfer their lands to those who remain in the villages, can farms increase in economy of scale and efficiency. A land property rights registration system should be established to protect the interests of the state, collectively owned enterprises, private business and farmers (Ministry of Land and Resources/MOLR, 2000; Zhang, 1996; CCTRD, 1998).

The land issue is closely related to the ownership and management of rural enterprises, which is an important component of the reforms in collective property right. As Clegg (1998:66) states, experiments in the reform of property rights and management systems in TVEs have been carried out under the share cooperative system. This system is claimed to achieve 'an alliance between capital and labor', mobilizing cooperation within the enterprises by maintaining the priority of return to labor while also taking advantage of the pooling of capital (MOA, 2000; Zhang, 1996: 5-6). As a hybrid form of ownership, the system is held to play a special role in China's twin transition from a planned to a market economy and from an economy based on individualized production to one based on socialized production (Clegg, 1998: 66-67). It is arguably an innovative mechanism which can avoid 'the exploiting nature of employer-employee relations', 'prevent polarization' and 'gradually eliminate the rural-urban divide'. According to the State TVE Administration Bureau[40], by the end of 1999, through institutional reform, leasing, merging, auction or bankrupt, shareholding and share cooperative TVEs numbered up to 193,089, of which 167,665 were share-holding cooperative TVEs. These reformed collective TVEs have formed an important fraction of the total of collectively owned TVEs, and have demonstrated much better performance than before in terms of growth rate, economic effect and capital structure.

Efforts have also been made to improve the policy environment for investors and to introduce innovative management approaches for public utility projects. Public-Private Partnership (PPP) is encouraged to increase financing channels. Difficulties in obtaining bank loans have served as a major constraint to TVE development. To help TVEs or SMEs in general, since early 1999, a series of laws and measures have been under formulation or put in effect, including the *Law for SMEs Promotion*, *Guidance for the Establishment of Guarantee Facilities for SMEs* and *Foundation for SMEs Initiatives*, etc. A national credit guarantee system to be established soon is expected to relieve the capital crunch for most SMEs (CESTT, 1999). China's Premier Zhu Rongji also pointed out in his *'Government Work Statement'* for the 9th National People's Congress that the government should guide and support TVEs to adjust their structure and to improve their management and technical capacity[41]. In January 2000, the Ministry of Agriculture released *Suggestions for Speeding up TVEs Structural Adjustment*. It stresses that the existing regional structure, geographical distribution, compositions of industrial sectors and products, organization structure and ownership structure should be adjusted to better fulfill various requirements to TVEs [42].

[40] *China Township Enterprises Daily*, No. 3215 of 2000, Beijing.
[41] *China Township Enterprises Daily*, No. 3167 of 2000, Beijing.
[42] *China Township Enterprises Daily (Xiangzheng Qiye Bao)*, No. 3130 of 2000, Beijing.

All these reform measures have been summarized in the *Opinions on Promoting the Sound Development of Towns,* which was released by the Central Committee of CPC and the State Council in June 2000. It will have far-reaching impacts on the prosperity and sustainability of Small Towns and TVEs.

5

The Evolution of Chinese Industrial Environmental Management Strategies

Dragon seed harvests flea from reality.
- Anon

The beginning of the 21st century sees a diversity of industrial environmental management strategies being developed and applied in different socio-economic, political and cultural contexts. This fact reflects underlying differences in political will, socio-economic development strategies/levels and state capacities for dealing with increasing environmental challenges. Nevertheless, an overall trend can be observed in the development of national industrial environmental management strategies. This is partly a result of the internationalization and globalization of the world economy, and partly due to the levels of socio-economic development within specific nation states. China is a good example in this regard.

No matter how severe the environmental situation may have been since the founding of the New China in 1949, China's political responses to environmental issues can not be recorded until 1973. Accordingly, China has barely a quarter of a century of experience in developing policies, promulgating laws and building an extensive institutional apparatus to address environmental problems. Chinese environmental management policies towards industries have learned from the Western experiences, but the structural shortcomings of this Chinese system of environmental protection have increasingly appeared to represent barriers to reaching a cleaner environment, particularly in vast rural areas.

The TVIEs-based industrialization in many Small Towns challenges the current formal system of environmental regulations in China and calls for alternative solutions. This chapter briefly reviews the evolution of Chinese industrial environmental management strategies, before measuring their effectiveness in the real life situations of Small Towns. To be able to understand the background of the relations between TVIEs-Town Government alliances and the state, this chapter addresses three aspects: political determination of the central and local governments; institutional layout for environmental protection; and industrial pollution control policies and enforcement.

5.1 From 'capitalist exclusive' to 'national fundamental policy'

China's environmental policy-makers have come a long way since the era of Mao, when pollution was sometimes described by leading officials as an affliction that only exists in the 'capitalist nations' (*China Environmental Review,* 1997; Duan et al., 2000). The inception of modern environmental policy in China can be traced back to its participation

in the 1972 UN Conference on Human Environment in Stockholm. Today, China has a complex array of environmental legislation and standards backed by a countrywide institutional network. Four major periods during this evolution/development process can be identified (Duan et al., 2000).

During the first period lasting from 1949 to 1973, environmental issues were irrelevant for politics and the new Chinese government was not capable of taking care of environmental problems as there was great pressure to heal the wounds from the long war and to resume the building of the economy. In contrast, mass industrialization activities characterized by overwhelming political enthusiasm achieved their aims largely at the expense of the environment. The 'great leap forward (da yue jing)', which intended to change China into a powerful country overnight, peppered the countryside with numerous small polluting plants (many are small communal enterprises) with little planning and management. In addition, the ten-year Cultural Revolution (wenhua da geming) was not only a disaster for the nation, but also a catastrophe for the environment and natural resources. Class struggle that overwhelmed economic construction at that time led to economic collapse and a high-intensity exploitation of natural resources that violated ecological laws. Poverty-related ecological damage and environmental degradation is one of the legacies of the Cultural Revolution. Unfortunately, few people realized how catastrophic their actions were, and even if they suspected that there was a problem, the environment was not worth the risk of political attack.

It took another decade to warm up China's political concern for environmental issues, resulting in the ultimate enacting of the Environmental Protection Law (and its trial implementation) in 1979[43]. Fortunately, the Chinese government sent a delegation to participate at the Stockholm Conference in 1972. Those representatives of important central governmental ministries appear to have been shocked by what they heard about environmental degradation from elsewhere in the world, especially since it became clear for them that China was suffering from similar environmental problems. The following year China held the first National Environmental Protection Conference in Beijing, which marked the political acceptance of environmental issues. Efforts were also made to issue official documents concerning environmental protection and to set up environmental protection institutions. However, the Cultural Revolution still prevailed and no comprehensive and systematic actions were possible. China's environment continued deteriorating.

It was only after the end of the Cultural Revolution in 1978 that environmental problems started to gain a legitimate place both in political and economic circles. The Updated Constitution of The People's Republic of China enacted in 1978 stipulates that it is the responsibility of the state to protect the environment. This laid a constitutional basis for environmental legislation. The period following the first cardinal law for environmental protection (for trial implementation) enacted by the Eleventh Plenary of the Fifth National People's Congress in 1979 produced a series of laws on environmental protection. However, even at this early stage, environmental regulations in China had to compete with another dominant national strategy – economic development. The high-growth, resource-intensive development strategy China has pursued, coupled with the norms and institutional relationships designed to support this development strategy, have no doubt

[43] This law was amended and fully enacted in 1989.

played a critical role in the deteriorating quality of the environment (Jahiel, 1997 and 1998).

The Second National Conference on Environmental Protection in 1983 marked the third wave of political attention to environmental issues. The State Council announced that "*environmental protection is a strategic task in the socialist construction of China's modernization, and a fundamental national policy*" (Duan et al., 2000). Since then, environmental protection has been elevated to the level of political affairs and enjoys the same status as, for instance, birth control policy since 1984. All governmental reports have dealt with environmental protection as a necessary component. The period of 1983 – 1992 also saw enactment and promulgation of 12 special laws on environmental protection, 22 administrative decrees issued by the State Council, 26 regulations by National Environmental Protection Agency (NEPA), and 263 National Environmental Standards. In spite of this, in China as in the West, local governments have continued to privilege economic goals and environmental protection was often given only lip-service (ibid.).

The United Nations Conference on Environment and Development in 1992 gave another push to China. The central government adopted the strategy of sustainable development and started to integrate environmental protection into economic development. *China's Agenda 21,* which was brought out in 1994, was a rapid response to this strategy. Essential measures have been taken to implement the projects within the framework of this Agenda. In order to realize ambitious targets for its environmental performance into the 21st century, the Central Government launched programs like *China's Trans-Century Green Plan (1996-2010), the National Ninth Five-Year Plan for Environmental Protection (1996-2000),* and *Plans for Control of Major Pollutants*[44]. Apart from new progress on environmental legislation and institutional strengthening, the period since 1992 has also featured increased environmental awareness and concern throughout society and in the emerging environmental NGO sector.

To summarize, over the last three decades, environment has gradually become a mainstream issue in China. Driven by increasing environmental awareness worldwide and environmental pressure from within the Chinese society, both political will and practical efforts to tackle environmental pollution have increased in China. However, for various reasons a clear implementation gap has emerged between the ambitions of her Agenda and the reality. Researchers and analysts credit the legacy of the socialist regime and the widespread institutional gridlock with being the most serious obstacles to effective implementation. The next section is devoted to this topic.

5.2 From 'nobody' to one of 'wuge bawang': institutional development

[44] *China's Trans-Century Green Plan* was conceived to realize the goals of *the Ninth Five Year Plan and the long term targets set for 2010*, which was jointly issued by the State Planning Commission, State Economic and Foreign Trade Commission and SEPA on November 26, 1996. It was estimated that 450 billion RMB would be needed to achieve the targets. *The National Ninth Five Year Plan for Environmental Protection* mainly aims to stabilize the emission levels of SO_2, COD and heavy metals at 1995 levels by 2000. *Plan for Control of Major Pollutants* is featured by prioritizing pollution control resources in the most pressing sectors and regions (e.g. the 'Three Lakes and Three Rivers") (*China Environmental Review*, 1997, Vol. 1, Issue 1).

Lothspeich and Chen (1997) mention three systematic features of centrally-planned economies which threaten the environment: limitations of citizen involvement in environmental issues: an obsession with growth and industrialization; and the high material intensity of production methods promoted at the expense of natural resources. Vermeer (1998) confirmed that, in China, the absence of democratic processes to reach consensus over environmental policies and the distrust of civil protest or action in any form further hamper the efforts to increase public awareness and political support for environmental actions. In addition to these factors, Jahiel (1998) pointed out that there is another factor at play: shortcomings *within* the system of environmental protection. China's environmental protection apparatus has suffered from two lingering problems: insufficient authority and lack of co-ordination between institutional actors.

This last factor has to be understood within the context of the larger Chinese state. China's complex administrative pyramidal structure is constructed along a vertical chain. At the apex of the pyramid is the central government under whose general oversight provincial level authorities supervise cities and counties which in turn, supervise towns and rural settlements. Numerous government and Communist Party functional units at the national level replicate themselves (or their functions) along the vertical chain down to the root level. Power distribution, funding and civil service staffing of a specific unit are closely associated with its position and ranking within this hierarchy. Individual functional units receive administrative guidance from their parent units above them; they are also subject to the leadership of the local governments to which they belong; but horizontal communication between functional units at the same level has traditionally been limited (Jahiel, 1998).

Not surprisingly, institutional development of environmental protection in China has been a continuous effort to elevate environmental institutions to higher bureaucratic ranks within the power pyramid. This has not been a smooth process and it has encountered a number of institutional setbacks (such as those in 1982 and 1994, according to Jahiel, 1998). Nevertheless, the current organization of environmental protection is mainly shaped by the radical institutional reform in 1998[45]. While many governmental institutions disappeared in this down- sizing, NEPA was upgraded to ministerial status and was renamed SEPA (Chan Yee Hon et al., 1998). This promotion was seen as a clear signal that the central government pledged to control environmental pollution.

Similarly to other institutional settings in China, SEPA is the chief agency at the central level addressing the nation's environmental issues. This unit falls under the direct leadership of the State Council, from which it receives almost all of its funding. SEPA has its counterparts (EPBs or Environmental Protection Offices/EPOs) at all lower levels of province, municipality, district, county and even townships in some places (Figure 5.1). It is these EPBs and EPOs who are responsible for enforcement of laws and implementation of policies designed by SEPA. They are also supposed to assist in drafting local regulations to supplement central ones. Thus, they have to work directly with local factories and other relevant governmental agencies. Figure 5.1 shows this relationship.

[45] In March 1998, the Ninth National People's Congress swept in a radical reform of government administration. As a result, the number of government ministry-level bodies had been reduced from 40 to 29, and 50 per cent of government employees has been slated for elimination from governmental payrolls within three years (Jahiel, 1998).

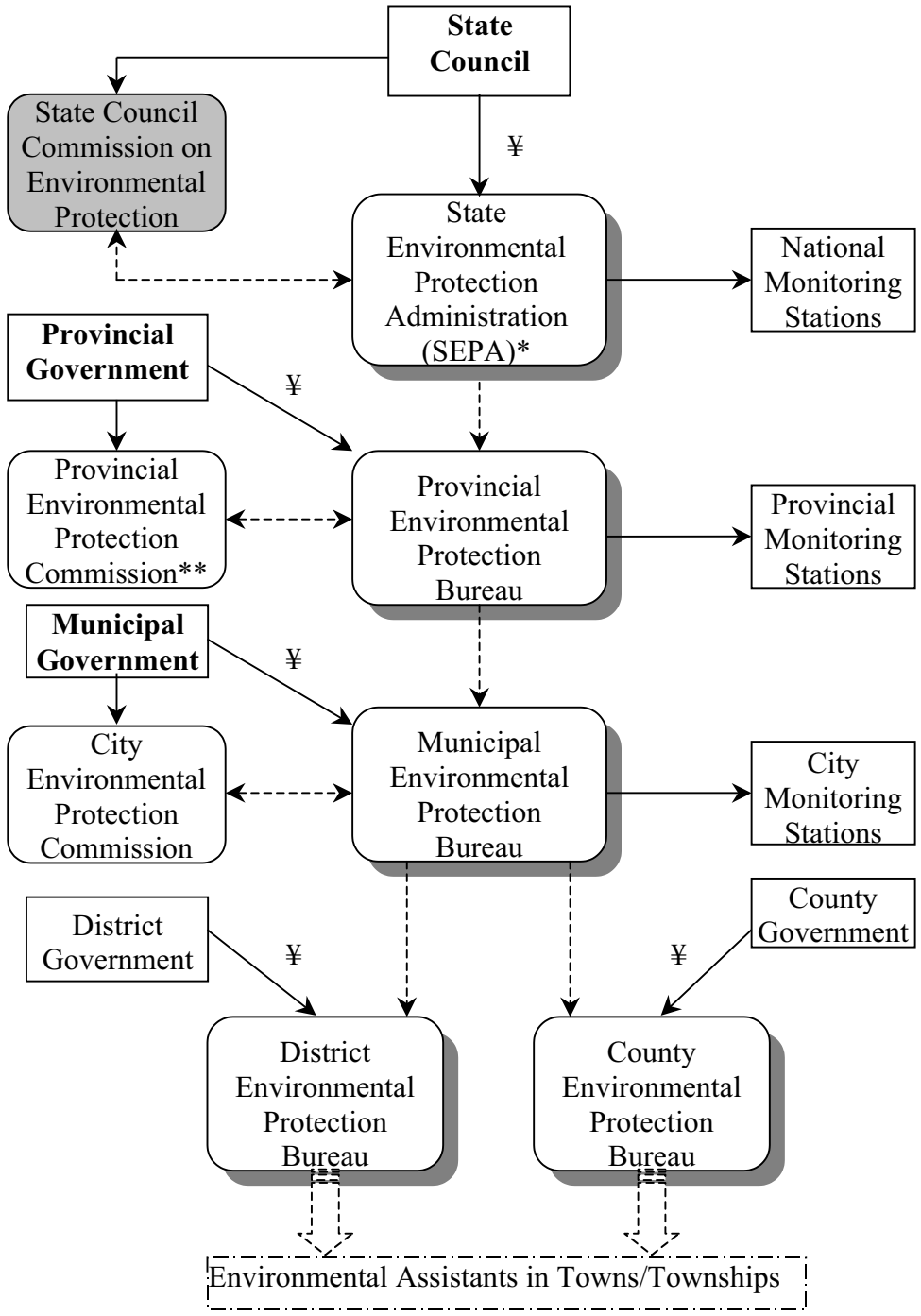

Figure 5.1 Chinese Environmental Protection Apparatus (March 1998)

Source: adapted from Jahiel, 1998: 760.

The nature of environmental protection work requires authorities powerful enough to co-ordinate among and exert influence upon other authorities in charge of economic activities, industrial development, land planning, education and mass media, for instance. It is also important for environmental agencies to be financially independent from the regulated actors and from those actors with whom they have to negotiate. However, due to the *within-the-system shortcomings* or structural weaknesses (as identified by Schwartz 2000), this is far from true at the local level in China. While the local, district, and county EPBs receive Central Government policy directives and guidance for implementation, they have to depend on their local government hosts for their annual budgets. It is also the local governments who decide on the ranking and personnel management of the EPBs. Not surprisingly, EPBs tend to be far more focussed on concerns about their funding sources than on those of the distant and financially unimportant SEPA (Schwartz, 2000; Jahiel, 1998).

Problems multiply from here. Unified environmental regulations and standards receive different interpretations at the local level, due in part to vastness of China mainland and the growing decentralization of the powers from the central to the local level. As a result, environmental enforcement largely depends on the commitment of the local leaders and EPB officials. Where local interest in environmental protection is low, EPBs lack political support, institutional independence, and the corresponding resources to carry out their tasks. By 1992, still 58% of all county EPBs (2,522 EPBs in total) remained divisions of local Construction Commissions or other agencies, and had neither authority to issue orders nor to meet with other more powerful organs. The percentage of independent county EPBs had increased to 75-80% by July 1997, and about half of these independent EPBs became so-called first-tier authorities on a level with the financial or land administration bureaus (Jahiel, 1998).

While the 1998 institutional reform gave SEPA a higher rank in the administrative structure and vested it with more power, its impact on the local, especially the county and town level EPBs is still indirect and limited. Furthermore, efforts to develop independent sources of funding have been even more limited. Some EPBs have developed other income-generating means to maintain their organizations and activities. Two common means have been used: the collection of pollution discharge fees[46] and the adoption of an entrepreneurial[47] approach. Both of these two practices conflict with the responsibilities and missions of EPBs, which in turn also gives room for corruption. The fact that, by the early 1990s, industries were referring to city EPBs as one of the five hegemonic powers (*wuge bawang*) of local government (because they possessed the ability to vote new industrial ventures, Jahiel, 1998), is a testimony to the enhanced authority of the EPBs.

The ongoing institutional reform at county level is, after the institutional reform at the central level in 1998 and at the provincial level in 1999, the latest important institutional reform. This restructuring provides the local EPBs a precious opportunity for strengthening, but it also threatens their current status in some places. Although the signal

[46] By law, up to 20 per cent of fees may be retained by local EPBs to support their work. In fact, many EPBs and EPOs have enlarged their shares or solely lived on the funds collected from polluters. This practice is referred to as 'eating discharge fees (*chi paiwufei*).

[47] By setting up subsidiary research institutes and engineering companies, EPBs have supplemented their government budgetary allocations through fees for services such as Environmental Impact Assessments (EIAs).

from the central government is very clear that "environmental protection can never be strengthened enough"[48] and EPBs are listed in the central Policy Paper No.2 of 1999 as one of the departments for law enforcement which must be solidified, everything depends on how the local EPBs will lobby and convince their own governments that their independence is crucial. The reform plans of some provinces show that there is also a trend to merge county EPBs with other departments. In some other provinces, EPBs are very successful in convincing the governments to promote EPBs to a higher and independent position. The final consequences of this reform are still unclear.

In general, county or lower-level EPBs and EPOs are still short of staff, funds, equipment and technically-trained leaders. Obviously, China's extensive environmental regulation networks fail to manage effectively the rural industrial sector that is both the most polluting sector and one of the fastest growing sectors of the Chinese economy. It is simply impossible to rely on county EPBs to take care of numerous TVEs scattered in towns and villages. As a result, there is an environmental power vacuum at town and township level, compounded by poorly trained staff and lack of basic equipment.

By the mid of 1990s, roughly 40% of the counties had no environmental monitoring stations (NEPA, 1995). There was also no visible form of support from TVE Bureaus and other relevant agencies more directly involved with the polluters. TVE Bureaus do not generally consider environmental protection to be part of their work, but fear it as a potential threat to the growth of TVEs. As a result, they seek, not to enforce the regulations, but rather to protect TVEs from being regulated[49]. Additional difficulties are caused by the absence of environmental divisions or environmental staff within most of TVEs; were these present, they could serve as a critical interface between the factory managers and the regulators.

5.3 Industrial environmental polices and enforcement difficulties

China has developed a broad constellation of policies and regulations to protect the environment. Put it in a simple way, China's environmental policy framework has been built up following so-called *three principles* and *eight approaches*. The *three principles* refer to: *prevention is the priority, combining prevention and control; polluters pay principle; and strengthening environmental management*. In line with these three principles, eight management approaches have been deployed: *environmental impact assessment (EIA); 'three simultaneous practices (san tongshi)'; pollution levy; environmental responsibility system; quantitative examination of the comprehensive improvement of urban environments; pollution discharge permits; mandatory pollution control; and centralized pollution control* (Zhang and Wang, 1999; Wang *et al*., 1993; Shen, 1999, Ma and Ortolano, 2000) (Table 5.1). To support these management approaches, as of February 1999, China had approved 18 laws, 29 regulations, 70 departmental rules, 375 environmental standards and over 900 local regulations (Zhang and Wang, 1999).

[48] Speech by the President, Jiang Zemin, during the Conference on Population, Resources and Environment Work in March 2000.
[49] Interview with the director of TVEs Bureau of Wujin municipality, June 1999.

Table 5.1 Three Principles and Eight Approaches of Chinese Environmental Management

Eight approaches	Basic contents	Objectives	Relation with three major policies		
			Prevention	Polluters pay	Enhancing management
EIA	To assess the potential environmental impacts of the new, renovated or expanded project	Prevent pollution from the operation of these projects	✓		
'Three simultaneous practices'	Pollution control facilities must be designed, constructed and operated simultaneously with the project	Control new point pollution	✓	✓	
Pollution levy	Charge for pollution discharge above the standards	Encourage pollution control		✓	
Environmental responsibility system	Delegate responsibilities to all levels	Stress pollution control and prevention			✓
Quantitative examination	Set pollution control targets for urban environmental improvement	Push pollution control			✓
Pollution permits	Stop discharge without permits	Stop discharge above the standards	✓	✓	✓
Centralized pollution control	Shift from point pollution to centralized control	Increase the effect of scale			✓
Mandatory pollution treatment	Set deadline for pollution treatment	Forceful treatment			✓

Source: Shen, 1999.

Among these management approaches, the most notable and TVEs-relevant policy instruments are *EIA,* 'three simultaneous practices' and pollution levy. Both EIA and the 'three simultaneous practices' and have a foundation in the *1989 Environmental Protection Law*. Article 13 requires that a proponent of a construction project assess the project's environmental impacts (Ma and Ortolano, 2000). EIA safeguards against unchecked environmental impacts of any new construction or expansion project. Local EPBs are in charge of the EIA process for most projects with total investments below 100 million RMB (*China Environmental Review*, 1997). Although an EIA report needs to be submitted along with the project feasibility study, the local EPB will often waive this and determine the depth of the EIA following the feasibility study based on the pressure and intervention of other more powerful parties.

The 'three simultaneous practices' is a typical Chinese measure. Article 26 of the Law requires that pollution control facilities be included in the designing, construction and operation phases of a project. Theoretically, funds from the discharge fees can be allocated to enterprises to help pay for pollution control facilities, and EPBs have the right to vote down a project if it fails to comply with the requirements, although this is seldom the case. Like EIA, this policy tool only applies to new and expansion projects and is administered by local EPBs.

Both the 'three simultaneous practices' and the EIA are designed to be integral steps of project development circle[50]. In 1986, the State Council, the State Planning Commission (SPC), and the State Economic Commission (SEC) jointly issued *Management Guidelines on Environmental Protection for Construction Projects* (State Council, SPC and SEC, 1986). This *Guidelines* instructs on how *EIA* and 'three simultaneous practices' fit into the project development circle (Ma and Ortolano, 2000). It also gives EPBs the first veto power for project approval. This means that if a project fails to get approval from EPB, the *Guidelines* requires the following: the local planning commission is not supposed to approve the feasibility study; the land administration bureau should refuse to authorize use of land previously designated for the project; and the local bank is to deny any loans. Similar sanctions should be imposed on the owner of the project if he or she fail to fulfill the requirements of the 'three simultaneous practices'.

In practice, in many instances, the above-mentioned sanctions are not applied for a variety of reasons. Considering the limited capacity of the local EPBs and strong influence of the local leaders in project development affairs, it is not surprising that many TVEs have violated these rules (Ma and Ortolano, 2000). Moreover, both *'three simultaneous practices'* and *EIA* focus on the evaluation of an already selected production process and equipment. They do not generate alternative process designs and equipment choices (as they are increasingly being called upon to do in the West). Thus, these two policy tools fail to encourage process improvement. In many cases, the evaluators also fail to advise on cleaner alternative process designs.

The pollution levy system is conceived as financial penalties collected by EPBs from manufacturing enterprises which do not comply with the local or national emission standards. Article 18 of China's Environmental Protection Law specifies *that "*in cases where the discharge of pollutants exceeds the limit set by the state, a compensation fee shall be charged according to the quantities and concentration of the pollutants released". In contrast to the other two, the pollution levy applies to all existing polluting producers. The national discharge standards have been designed to promote a basic level of ambient environmental quality which is consistent with China's average level of economic, social and technological development. Polluters are charged a levy only for pollution which exceeds the legal standards, and the levy rate is supposed to exceed the average cost of abatement (Wang and Wheeler, 1999).

A national-uniform set of discharge standards and levies was designed by the State Council in 1982 and revised in 1991. This levy has been implemented across the country, and by 1996 roughly 500,000 factories - of which over 80% were TVEs - had been charged for

[50] The procedure for managing a construction project in China includes the following steps: registration of the proposed project with appropriate authorities; feasibility study (which includes the project's conceptual design); detailed design; construciton; and inspection and approval of the completed facility (Ma and Ortolano, 2000: 25).

their emissions, (Dasgupta et al., 1997; Wang and Yang, 1998). This Chinese version[51] of the 'polluter pays system' had generated about 30 billion RMB by 1996, in the period since it was first introduced in 1979, but the fees collected from TVEs only accounted for about 13% of the total TVEs should have had paid (based on the TVEs output value exceeding 50% of the national industrial output value in 1994) (*China Environmental Review*, 1997; Wang and Wheeler 1999; Wang and Yang, 1998). This deficit suggests that the Chinese pollution levy system cannot be seen to be a true Pigovian charge, as long as it is not enforced effectively against TVEs.

Moreover, many researches (Shen, 1999; NEPA, 1995; Wang and Yang, 1998) suggest that charges are set too low to change the behavior of the polluters. Polluters would choose to 'buy' the right to pollute instead of investing in treatment. Furthermore, the charge aims at meeting the emission standards instead of stimulating continuous improvement and/or innovation in technologies of control. The fact that the largest share of levy collections have been used for end-of-pipe facilities confirms the strong emphasis on end-of-pipe pollution abatement (up to 1994, about 11.8 billion RMB had been used for this purpose, according to NEPA, 1995).

Apart from these widely-applied industrial environmental management approaches, there are very few policies and regulations which exclusively address TVE or TVIE pollution problems, even though TVIE environmental protection is mentioned in several governmental documents regarding TVE development and restrictions or closing down of small-scale operations. *Stipulations on Strengthening Environmental Management of TVEs and Community Enterprises* (or "Policy Paper 135" as it is known in China), which was issued by the State Council in 1984, is the first and major document in this regard. Based on the existing environmental laws and policies, this policy document aims for the following strategies to improve TVE environmental performance:

- Planning. The local governments should make overall planning for TVE development considering the local resources, technological conditions and environmental quality and carrying capacity;
- EIA reporting. All TVEs are required to submit EIA report forms to the local EPBs;
- Implementation of 'three simultaneous practices';
- Compliance with emission standards;
- Pollution discharge levy collection;
- Strengthening supervision and checking;
- Legal means. Environmental accidents caused by TVEs should be addressed by laws;
- Mandatory measures. Polluting projects should be closed down, stopped or renovated;
- Responsibility system. The local leaders and the authorities in charge should take the responsibility of TVEs environmental protection.

More closely considered, this policy document merely stresses the importance of pollution control of TVIEs by repeating the requirements that also apply to any other industrial enterprise. It has raised environmental awareness in and about TVIEs, but has so far failed to come up with concrete enabling measures.

[51] By this Chinese version, the fees are generally set well below the marginal costs of pollution control, they can not serve as an exclusive means of pollution control (Ross, 1988).

5.4 Building environmental management capacity

Comprehensive policies do not automatically generate good results unless they are properly implemented. Obviously, there is a need to build the state capacity for effective environmental management in China. To be able to analyze the preconditions, development and effects of environmental policy activities, I take as the point of departure an OECD Task Force on Capacity Development:

"…capacity in environment relates to the abilities of a society to identify environmental problems and solve them, capacity development in environment relates to the 'process' by which those abilities are developed" (OECD, 1994: 9).

This broad definition makes it clear that there are multiple factors affecting a nation's capacity in environmental policy and management (Weidner, Jänicke and Jörgens, 2001; Weidner, 2002). It is also important to be aware that capacity building is a changing process (Weidner, 2002).

In China, the state is the sole responsible institution for making and implementing laws, regulations and standards. Thus, state environmental management capacity is decisive for the effectiveness. In more analytical term, to assess China's state capacity for enforcement, Schwartz (2000) focuses on a set of preconditions of state capacity. Schwartz presumes that any state meeting these defined conditions of state capacity can be deemed to enjoy high state capacity. Four indicators are used to measure the state capacity in enforcing environmental policies:

1) *Human capital*: The technical and managerial skill level of individuals with the state system.
2) *Fiscal strength*: The financial capacity of the state or a given component of the state.
3) *Autonomy*: The extent to which the state can act independently of external forces.
4) *Reach/Responsiveness*: The degree to which the state is successful in extending its ideology, socio-political structures, and administrative apparatus throughout society; the responsiveness of these structures and apparatus to the local needs of the society.

Using these four indicators, Schwartz identifies some factors weakening or strengthening the enforcement. Among the factors weakening enforcement in China, structural weakness (as it has been discussed in section 5.2) and lack of real commitment are the major ones. Schwartz points out that provincial officials in China are motivated to demonstrate co-operation to central government environmental directives on the one hand, because this will affect their future promotion and access of provinces to economic benefits. On the other hand, they are under intense pressure from relevant ministries, sub-provincial governments and industry to enable industries to continue polluting because it is also their major priority to feed, cloth and assure employment for their citizens. The low status of environmental protection agencies often encourages the decision-makers to choose the pursuit of economic goals over and at the cost of protecting the environment. As a result, a cordial relationship often develops between local governments, EPBs, industries and other actors to "play with" the requirements from central level. This justifies further corrupt behaviors and relationships at lower levels. Seen this way, 'discretionary' is indeed, the right word to describe industrial pollution control in China (Dasgupta et al.,1997).

The optimistic side of this situation is that in some cases the very same factors operate to strengthen enforcement: increasing commitment, enhanced capability of officials, increasing foreign influences and public participation. Although economic goals dominate society, there has been steady increase in the degree of environmental commitment of government at all levels. For instance, the environmental responsibility system[52] has become increasingly associated with the annual evaluation of the performance of officials. The arguable success of the Urban Environmental Quality Examination System (UEQES)[53] and the environmental responsibility system to which it is linked demonstrate the rise of a more integrated approach to urban environmental management (Rock *et al.*, 1999 and Rock, 2002).

There are also clear signals from the Central Government that it intends to do more to control industrial pollution. During a press conference organized by the State Council on June 6 of 2001, the administrator of SEPA, Mr. Xie, said that China had shut down more than 84,000 polluting industries during the Ninth Five-Year (1996-2000) period. The targets set in the Tenth Five Year Plan (2001-2005) for environmental protection aim to reduce the total pollution load by 10% based on the 2000 level (Jia, 2001).

The capability and capacity of environment officials is also improving. More professionally-trained personnel are available and are being hired into the system. Since many international donors adopt environmental protection as one of the principles for investment or aid in China, environmental organizations and individuals get more opportunities to be involved in and to benefit from these kind of projects.

Although still at its early stage, public participation is playing an increasing role in improved enforcement. Governments and enterprises who dislike the negative image associated with pollution do react to public pressure. China's emerging environmental NGO sector and the mass media have increasingly addressed environmentally related issues. In the '*Guideline for Environmental Publicity and Education 2001-2005'* jointly issued by the Central Communist Party Publicity Department, SEPA and the Ministry of Education, special emphasis is put on the environmental education of teenagers, workers, farmers and on the institutionalization of public participation in environmental protection (*China Environmental News*, 2001). All the cities above county level in China must open complaint telephones by the end of 2001 (Jia, 2001).

Although corresponding evidence from Small Towns is still limited, Small Towns and TVEs are undeniably embedded parts of the larger society, and as such they do feel these influences. For this reason, a process of change seems on the way.

[52] Late in the 1980s, NEPA proposed an 'environmental responsibility system', in which provincial governors, city mayors, and county magistrates would be responsible for overall environmental quality in their jurisdictions. This concept is reinforced in the 1989 *PRC Environmental Protection Law* (Ma and Ortolano, 2000: 27).

[53] Since 1989, NEPA has been conducting annual quantitative assessments of the environmental performance of the country's major cities. The provincial EPBs have extended this list by extending NAPA's UEQES to a large number of provincial cities. In both case, quantitative assessments are based on a city's composite score on some twenty plus environmental indicators. These indicators are grouped into three subject areas: (1) urban environmental quality; (2) control of urban pollution and (3) availability of urban infrastructure (Rock, Yu and Zhang, 1999; Ma and Ortolano, 2000).

6

Towns in Jiangsu province: the richest and the dirtiest?

This chapter begins with a brief introduction to the *status quo* of socio-economic development and environmental conditions in Jiangsu province, including its geographic location, population, landscape, natural conditions, economic strength and environmental problems. It emphasizes the characteristics of the local economy, TVIE development, environmental problems related to the development path, and provincial environmental capacity. A similar structure is followed for the introductions of the two selected municipalities, Wujin and Wuxian, and the two Small Towns, Hengshanqiao and Luzhi. The selected TVIEs are presented in the context of the TVIEs-Town Government alliances.

6.1 Natural conditions and socio-economic achievements in Jiangsu

6.1.1 Natural conditions

Jiangsu province lies at the lower reach of the Yangtze river. It borders Shanghai to the Southeast and Anhui province to the Southwest. The Yellow Sea is to its east (Map 6.1).

Jiangsu is one of the most populated provinces in China. Its 102,600 square kilometers of land, comprising 1.06 % of the total area of China, hosted a population of more than 72 million, or 5.8% of the total population of China, in 1999. The population density is about 703 people per square kilometer. The currently operating so-called 'municipalities govern counties/county level cities system' was introduced in 1983. By the end of 1999, there were 13 municipal authorities under direct administration of the provincial government governing 108 counties and county-level cities. In total, there were 1,891 Small Towns, of which 1,167 were statutory towns.

Jiangsu is mainly a low, flat river plain area, with a landscape similar to the Netherlands. Rivers crisscross and lakes divide the land. The province counts about 300 lakes, 1,100 reservoirs and 2,900 rivers. Two of the country's five biggest fresh water lakes, including the Tai lake, are located in Jiangsu. For 400 km, the Yangtze river flows through the province from East to West, and the famous Grand Canal (Da Yun He) flows 690 kilometers from the north towards the south of Jiangsu. Water occupies 18% of the total area. Only 14% of the land ishilly area. Forest coverage is 4.09%. Being in the center of China's eastern coastal line, Jiangsu shares a coast-line of about 1,000 kilometers.

About 120 kinds of minerals have been discovered in Jiangsu, mainly non-metallic minerals, such as coal, pottery clay and phosphate. Agricultural land is intensively cropped mainly with rice, wheat, cotton and rapeseed. Jiangsu is also well-known for silk production and aquatic products. Climatically, Jiangsu is in the transitional zone between sub-tropical and warm temperate zones, with mild climate, plenty of rainfall and four distinct seasons.

6.1.2 Socio-economic significance

Jiangsu is among the richest provinces in China. It has maintained high annual GDP at healthy growth rates during the last two decades. Its GDP of 1999 increased by 10.1% compared with 719.995 billion RMB of 1998. The province hosts highly-developed light and heavy industries. In 1999, four key industrial sectors, machine manufacturing, electronics, petroleum chemistry and auto manufacturing, contributed 48.6% of the provincial total industrial value added. During the 8th Five-Year Plan/FYP (the 1991 to 1995 period), Township & Village Industrial Enterprises (TVIEs) contributed more than half of the provincial industrial economy. During the 9th FYP (1996 – 2000), the provincial government focused on strengthening market mechanisms; restructuring and reforming the state-owned industrial sector; and further encouraging the development of mixed ownership in economic sectors, with an emphasis on TVEs in particular.

Jiangsu is much more industrial than its neighbor, Anhui Province. For example, in 1999 Jiangsu had 18,004 industrial enterprises, of which 5,637 were collectively owned, while Anhui had 3,784 industrial enterprises, with 1,109 collectives. The total industrial output value in Jiangsu was 891.504 billion RMB while it was 153.39 billion RMB in Anhui. It should be noted that these statistics include (all) state-owned enterprises and only non-state-owned enterprises with an annual income above 5 million RMB;[54] therefore the smaller TVIEs are not included. In 2000, the number of TVEs in Jiangsu reached 903,456, of which 405,643 (or about 45%) were TVIEs. The industrial value-added from Jiangsu's TVIEs ranked third among 31 provinces and municipalities in China, while the industrial value added of Anhui TVIEs ranked thirteenth[55]. By the end of 2000, Jiangsu had 748 industrial parks for TVIEs[56].

In recent years, two important changes have been observed in the rural economy of Jiangsu. The first major change is linked to the property rights of TVEs. Formerly collectively owned TVEs have been reformed into enterprises with more diversified property rights arrangements. By the end of 2000, 93.2% of the collective TVEs in Jiangsu had been reformed into different ownership arrangements. The value added of the reformed TVEs increased by 7.58% in 2000, while the collectively owned ones declined by 15.36%[57]. These TVEs are no longer simply complementary to the traditional urban industries, but have formed a separate and more comprehensive industrial system actively involved in technological development. The contribution of

[54] Available in: http://www.stats.gov.cn/ndsj/zgnj/2000/m050.htm, August 1, 2002.
[55] Available in: http://www.stats.gov.cn/, July 30, 2002.
[56] Available in: http://www.cte.gov.cn/zw/tjxx/, July 24, 2002.
[57] Available in: http://www.cte.gov.cn/zw/tjxx/, July 24, 2002.

non-collective TVEs to the total value added of Jiangsu TVEs increased from 40.14% to 53.82%[58] in the same period.

The second change relates to the migration of rural laborers. The farmers do not only leave the farm to work in enterprises (li tu) but also increasingly move to towns and cities (li xiang). The provincial vice governor stated (in year 2000) that the provincial government planned to further promote the secondary industry and service sectors, and private firms in particular. For this, Small Towns would be instrumental in rationally allocating production resources (Jiang, 2000). These changes indicate a new stage of rural industrialization and urbanization in Jiangsu.

Jiangsu's Tenth FYP (2001 – 2005) aims to maintain the annual growth rate of GDP at about 10%. The government attached great importance to the 'Small Town, Grand Strategy' policy. In order to correct the disorderly character of Small Town construction, 509 Small Towns, representing 31% of these towns, have been merged with others. At the same time 222 so-called key towns have been identified as the regional centers of the rural areas[59]. Efforts will be made to reform the Household Registration System (HRS), the land administration system and the financing system in Small Towns. The year 2001 is the first year of Jiangsu's 10th FYP, in which the targets have been set to increase the TVE added value by 12% and the net income per farmer by 4% compared with 2000[60]. In 2001, the net farmer's income per capita reached 3,785 RMB[61].

Jiangsu's economy is also very export-import-oriented. The export-import volume reached 51.36 billion RMB in 2001, an increase of 12.5% as compared with 2000. The foreign direct investment (FDI) increased to 7.35 billion US dollars, which was 11.5% more than 2000[62].

Jiangsu also enjoys some exceptional advantages of convenient transportation by water, road, train and air. For instance, upon the completion of its five Trans-century Projects on Communication and Transportation (1998 – 2002)[63], a network of expressways with a total distance of 1,650 kilometers will be available and will be connected with the national and provincial-level road network. One can get on the expressways within half an hour from any city and county town and travel between the capital city to any other cities within one day. All its 29 cities and county towns will be connected by roads and the roads leading to 3,661 villages will be surfaced with asphalt or concrete. This is in addition to its developed water and air transportation systems.

Besides all the aforementioned advantages for industrial development, Jiangsu also has a high concentration of universities and R & D institutes. In total, 72 universities and colleges are located in Jiangsu, making it the number one province in this regard.

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[58] "Analysis of the Jiangsu TVE economy in 2000", available in: http://www.cte.gov.cn/zw/tjxx/, July 24, 2002.
[59] "Statement of Jiangsu economic and social development in 2001", available in: http://www.stats.gov.cn/tjgb/ndtjgb/dfndtjgb/200203310338, July 31, 2002.
[60] Speech on "Open Up a New Prospect Through Restructuring Economy", by the vice secretary of Jiangsu Communist Party, Mr. Li Yuan Chao. Available: http://www.js.gov.cn/, July 20, 2001.
[61] Available in: http://www.jsdpc.gov.cn/jwnews/, August 1, 2002.
[62] Available in: http://www.jsdpc.gov.cn/jwnews/, July 31, 2001.
[63] *"Five Priority Trans-century Programs (Wu Da Kua Shiji Gongcheng)"*, available: http://www.jscd.gov.cn/ss/js_index.htm, August 20, 2001.

In 1999, about 15% of the provincial industrial value added was generated by so-called high- and new-technology-based industries.

6.2 The richest is the dirtiest?

6.2.1 National focus for clean up: Jiangsu

As one of the most industrialized and urbanized provinces in China, Jiangsu has experienced environmental problems similar to those in other industrialized countries and regions. While its TVEs brought about an economic miracle, they brought an environmental disaster as well.

Jiangsu TVEs have mostly developed in the south, particularly, in Suzhou, Wuxi and Changzhou (including Wujin) areas, where the Sunan model of TVEs has originated. These three cities are all located in the Tai lake basin (Map 6.2). The Tai lake, as the largest lake at the center of the basin, plays a critical role in the region with its vast river network. It is the third largest freshwater lake (2,338 square kilometers) in China and the key source of drinking water of the region. The Tai lake is the lifeline for the socio-economic development of the region. Tourism, navigational transportation and agriculture rely on the lake.

The Tai lake basin is part of the Yangtze delta. It is bounded to the North by Yangtze river, to the South by Hangzhou Bay, to the East by the East China Sea, and to the West by a range of hills (Map 6.2). The whole basin covers seven cities, Shanghai, Wuxi, Suzhou, Changzhou, Jiaxing, Hangzhou and Huzhou, and 38 county-level cities within the jurisdiction of Jiangsu province, Zhejiang province and Shanghai municipality. Its catchment area is 36,500 square kilometers, with 53 percent falling in Jiangsu province. About 75% of the basin consist of plains.

Although this basin occupies only 0.4% of the total area of China, it generates about one eighth of the national GDP. The population density in the Tai lake basin is also the highest of China. The total population in 1994 had reached 36 million. This density corresponds to 946 persons per square kilometer. If water surfaces are excluded, the density equals to 1,135 persons per square kilometer, which is 8 times the average density of China.

In recent years, rapid development of industry and agriculture in the Tai lake basin in the context of a severe lack of control measures, has caused the water quality of the main water body to deteriorate from Class II[64] in the early of 1980s to Class III in the early of 1990s. According to the monitoring data of 1994 to 1995, 1% of the water body belongs to Class V, 10% of the water body belongs to Class IV, and about 70% of the water body belongs to Class III. The major problem is the organic pollution of the river-network and the eutrophication in the lake itself. Every year, about 131,000

[64] The China Water Pollution Prevention and Control Law of 1984 is the law for controlling water pollution in China. There are water quality standards set out in the Environmental Quality Standards for Surface Waters (GB 3833-88). These standards refer to surface water quality of five different classes. The standards of each class indicate the function of the water. For more detailed description of the standards, see Appendix 1.

tons of COD, 31,000 tons of total nitrogen (TN) and 1,800 tons of total phosphorus (TP) are discharged into the lake. The total river system includes 590 km of rivers and canals, of which, around 70% of the river sections were seriously polluted. The 51 rivers running into the lake are the most important sources of pollution, accounting for 80 percent of the total pollutant discharge to the lake[65]. Blue algae, with its explosive reproduction rates, has caused difficulty in supplying drinking water to the cities and towns around the Tai Lake and has affected the normal operation of some factories. For instance, in July 1990, the large scale of the blue-green algae explosion caused a reduction of drinking water production and also affected the production of 116 factories, involving direct economic loss of 130 million RMB (Liu 1996)[66].

There are four major pollution sources: untreated household wastewater; non-point source pollution from farming activities; intensive livestock raising; and rapid industrial development, including from TVIEs. During the last decade, the production output value of TVIEs has increased two to three times, while these industries discharged about one billion tons of un- or improperly treated[67] wastewater every year into the rivers and lake. The main polluting industrial sectors are paper mills, chemical plants, tanneries, and dyeing & printing works.

Environmental pollution and ecological damage have constrained the sustainable development in rural areas. Water shortages due to unacceptable quality have become common. More than 3,000 rivers used for irrigation have been polluted. About one quarter of the arable land has been contaminated to a greater or lesser extent. Pollution in groundwater has also been increasing. In recent years, hundreds of environmental accidents are reported causing huge economic loss. Even worse, pollutant, like mercury (Hg), arsenic (As) and lead (Pb), have accumulated in soil and have caused the degradation of the agricultural sector and contamination of animal products. People's health is also under threat from drinking polluted water[68].

Considering the important economic and ecological functions of the lake and the severe pollution it suffers, in China's Trans-Century Green Plan (1996-2010), the Tai lake is one of three Chinese lakes that are singled out for an immediate clean-up.

Apart from the Tai lake, Jiangsu is also part of the basin of the Huai river, the most polluted river in China, also listed for immediate clean up in China's Trans-Century Green Plan. As in the Tai lake basin, one source of pollution in the Huai basin used to be paper industries, which produced most of the biological oxygen demand (BOD). In both areas, those paper mills under 5,000 tons per year were closed in 1996, and larger factories have been made to install treatment facilities (Vermeer, 2001). Since Jiangsu is located in the lower reaches of the Huai river, it suffers from pollution from

[65] "Water Pollution State in the Tai Lake", available: http://www.zhb.gov.cn/bulletin/tailake/pollution_state.html, June 20, 2002.
[66] Also available in: http://www.zhb.gov.cn/quality/, June 20, 2002.
[67] Available in: http://www.zhb.gov.cn/quality/, June 20, 2002.
[68] During the 8th Jiangsu People's Political Consultative Conference (PPCC) in January of 2001, the participants made a proposal to the Provincial Communist Party Committee and the Provincial Government. This proposal described the existing rural environmental situation and urged the government to strengthen environmental management and pollution control in rural areas. Available in Jiangsu EPB's website: http://jshb.jlonline.com/envir/, September 17, 2001.

the upper reaches. For instance, it was reported in 2001 that polluted water containing MnO_4^- and NH_4^+ flowed into the Jiangsu sections of the Huai and was retained for 7 days. At the time of the report, it was not yet clear what the ecological damage would be[69]. Since the selected Small Towns from Jiangsu are located in the Tai basin, we present additional details about the Huai basin in chapter 7 on Anhui province.

Surface water pollution is not the only environmental problem facing Jiangsu, but it is regarded as the most urgent environmental problem due to its immediate and visible effect on people's health, living, and production activities.

6.2.2 Local environmental management capacity

In chapter 5, I have discussed the state environmental management capacity based on the broad definition of OECD (1994). Capacity is also one of the factors I identified as weakening environmental enforcement, in combination with structural weakness, lack of real commitment, and limited citizen participation. I have concluded that although the overall state capacity is still insufficient for effective environmental enforcement, evidence from some pioneer provinces show increasing commitment, enhanced capability of officials, increasing foreign influences and widening public participation for environmental protection. Jiangsu is one of the pioneers in this field. This section focuses on the local environmental initiatives and practices. It first assesses the political determination of the provincial government; the institutional capacity of the EPB network; the environmental capacity of industries; and the roles of the civil society and market.

Environmental determination of the provincial government

In 1997, responding to the national clean up efforts mentioned above, Jiangsu started a pollution load control plan aiming to reduce the total pollution load of air and water by ten percent by the year 2000 on the basis of 1995 levels. This goal affects 13 cities, 20 major rivers, and a few major provincially administered cities. In the Jiangsu part of the Tai basin, 770 enterprises were on the black list in 1997 for immediate measures to meet the required emission discharge standards and only 32% of these industrial enterprises managed to meet the wastewater discharge standards. One hundred percent of compliance required a total investment of 1.5 billion RMB. This proved too expensive even for a province as rich as Jiangsu. Only 390 million RMB was allocated in 1997[70].

It has become clear that successful pollution control requires more comprehensive approaches than simple shutdown or end-of-pipe-based investments. In order to better coordinate economic and environmental objectives, the provincial government issued *a Circular Regarding Integrated Decision-making Mechanism for Environment & Development Issues* in July 1999[71]. This *Circular* explains the domain for integrated decision-making and the basic principles to be followed.

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[69] *Jiangnan Times (Jiangnan Shibao),* August 13, 2001.
[70] Available in: http://www.zhb.gov.cn/quality/, July 30, 2002.
[71] *Environmental Statement of Jiangsu Province 2000*, in Jiangsu EPB's website: http//jshb.jlonline.com/, July 20, 2001.

Under this guideline, various efforts have been made. In 1999 alone, the provincial government and some municipal governments issued 4 local environmental laws and regulations and about 100 policies concerning environmental protection activities. Inspections were conducted in the Huai river basin and the Tai lake basin at different levels and scales. For the first time, a variety of governmental departments worked together to check the implementation of environmental laws and regulations on site. In total, 4,068 cases of malpractice were penalized[72].

The provincial government also attaches importance to environmental protection in rural areas. Policies have focused on public environmental education, town planning, wastewater treatment plant construction in Small Towns, an environmental responsibility system, ecological farming, and restructuring of TVEs[73].

The provincial government has set clearly in its 10th FYP (2001-2005) that the environmental goals for these five years are to construct a so-called ecological province[74]. The government has indicated that all possible means – industrial & technological policies; economic instruments; legal and administrative instruments; information dissemination; public participation - will be mobilized to achieve these goals.

Enhanced capacity of Jiangsu EPBs

Obviously, the provincial government has created a favorable environment for the Jiangsu Environmental Protection Department (EPD) to operate. During the local institutional restructuring in 2001, the former Jiangsu provincial EPB was promoted from a bureau to a higher rank department: as an integrated department of the provincial government. This promotion is the first and only one of its kind among provincial EPBs in China. It is a strong signal from the provincial government that it is committed to combat environmental problems.

The Jiangsu Environmental Protection Department (EPD) has more than 70 administrative staff. It also has 9 affiliated units: Jiangsu environmental research institute (63 staff); environmental monitoring and information unit (84 staff); environmental supervision and management unit (14 staff); environmental education and publicity center (8 staff); radiation monitoring station (41 staff); hazardous waste registration and management center (30 staff); international cooperation center for environment and economy (20 staff); environmental newspaper (10 staff); environmental engineering and consultation (10 staff); and the society for environmental science (3 staff). EPD has succeeded in influencing the reorganization of the municipal and county level governments. In 2001, 33 of the 58 counties/cities

[72] Ibid. November 2, 2001.
[73] See the policy papers issued by the provincial government in recent years: *Proposal on Rural Environmental Pollution Treatment and Control*; Comments on Small Town Construction; Circular on Developing Ecological farming; and *Guidelines for Jiangsu Economic Restructuring during 2000-2002*. Available in: http://jshb.jlonline.com/envir/envir/news/2001/0101/, June 20, 2002.
[74] See *Circular of the Guidelines for the 10th FYP of Jiangsu Economic and Social Development (Jiangsu provincial government policy paper No. 1 of 2001),* available in: http://jshb.jlonline.com/envir/envir/news/2001/, June 20, 2002.

in Jiangsu established independent EPBs[75]. In total, 7,770 staff members worked in the EPD and on the EPBs system in Jiangsu[76].

Apart from the organizational activity within the EPD, Jiangsu has also defined environmental responsibilities for other relevant governmental departments and organizations, including: planning commission, economic and trade commission, urban construction commission, urban administration commission, foreign trade and economic commission, agricultural commission, development zone administrative committee, financial bureau, industry & commerce bureau, water conservancy bureau, public security bureau, transportation and communication bureau, land administration bureau, power supply companies, financing agencies, judiciary department, and sectoral departments. This institutionalization of environmental responsibilities has laid a base for involving other departments in environmental protection[77].

The Jiangsu EPD has adopted a strategy of "under the leadership of the government, under the supervision of the people's congress and political consultative conference, each department takes its own responsibilities, polluter pays, public participation and mass media help". In this way, EPD and EPBs can focus on environmental supervision and management.

Capability for environmental monitoring is to be enhanced. The Jiangsu EPD has proposed establishing, during the period of 2001 to 2005, a primary automatic environmental monitoring system to lay a good basis for the implementation of a total pollution load control system. Their experience with water pollutant discharge permits since 1987 will also be very useful for total pollution load control.

Jiangsu also takes the lead in China regarding capacity building for environmental supervision and administration work. In 1999 alone, 600 plus staff were trained before being put in work. The environmental supervision and management procedures were opened to the public. Investment for organizational development was increased as well. Since February of 2001, *Jiangsu Provincial Temporary Provisions Regarding Rewards for Reporting Environmental Malpractice* was in effect. The rewards range from 300 to 2,000 RMB. The provincial EPD announced their environmental hotline and received more than 100 reporting calls on the first day.

Although at present rural environmental pollution levels in Jiangsu province are still among the severest in China, there are some reasons to be optimistic. In recent years, with increased environmental awareness at all levels, the lowest level of EPBs have developed innovative practices. For example, it was reported that the first EPB branch bureau was established in Chengze town. This town-level EPB was authorized by the Wujiang Municipal EPB to enforce state and local environmental laws and regulations within the town territory. In another town named Zekou, environmental staff were available in all its villages. A telephone hotline at the provincial level, encourages public participation, by taking environmental reports and complaints. This telephone line has been opened to the public in all cities and counties since August 31 of 2001.

[75] Available in: http://jshb.gov.cn/, August 1, 2002.
[76] "Statement of Jiangsu economic and social development in 2001", available in: http://www.stats.gov.cn/tjgb/ndtjgb/dfndtjgb/200203310338, July 31, 2002.
[77] "Environmental Responsibilities of Relevant Departments and Organizations", available in: http://www.jshb.jlonline.com/envir/envir/news/2001/, June 20, 2002.

Following this example, all the county level EPBs have also opened their own environmental hotlines.

Various environmental education and publicity activities have been carried out to raise public environmental awareness. For instance, in a mass campaign that focuses on Yangtze river protection, more than 40 news media reported on the progress made by identifying pollution sources. In March 1999, the 'Jiangsu Women Environmental Volunteers' was formed. They *published 'A Proposal to Jiangsu Women'* and *'Pledge of Jiangsu Women Environmental Volunteers'* shortly thereafter. Around World Environmental Day on June 5, the provincial EPB and the Education Commission jointly organized a 'Green Action Week' in middle and primary schools to popularize environmental knowledge[78]. These all help creating a social environment that is in favor of environmental management towards and within industries.

In order to raise environmental awareness in rural areas, EPD and their EPBs have organized a campaign called "huanboa xiaxiang (environmental publicity in rural areas)" in 2001. Many artists, entertainers, environmental professionals and lecturers have participated in disseminating environmental knowledge by giving performances, lectures and training courses; distributing posters, books, video tapes; organizing environmental forums, etc. Tens of thousands of people have attended the activities[79].

Environmental capacity of Jiangsu industries

I have mentioned above that, Jiangsu's industries have far more economic power than their counterparts in Anhui. The gap is obvious between these two provinces in terms of the number of industries and the output values. This indicates that, on the one hand, Jiangsu industries cause bigger environmental impact, but on the other hand, they are more capable of paying for pollution control. Are they willing to pay then?

A number of factors can influence the environmental behaviors of the industries: state regulations, market demand and public pressure.

The Jiangsu EPD and local EPBs have been trying to enhance the environmental capacity of industries by enforcing environmental regulations while at the same time providing environmental services. For instance, in order to promote the adoption of ISO 14000 in Jiangsu, an on-the-spot meeting was hold in Suzhou-Singapore Industrial Park in May of 2000, which is the first regional ISO 14001 certificate-holder in China. In June of 2000, the Jiangsu Certification Center for Environmental Management System (JCCE) was established. All these events indicate that increasing adoption of ISO 14001 could be expected in Jiangsu. By the end of 2000, two Economic Development Zones in Jiangsu and 52 enterprises obtained ISO 14001 certificates and another 49 enterprises were working on it. The number of certified enterprises increased to 104 by the end of 2001. Another two industrial zones, Luzhi town and Huaxi village have obtained ISO 14001 certificates. Measures have been taken to assist the first batch of TVEs in the process of ISO 14001 certification. In

[78] Ibid
[79] Available in: http://jshb.jlonline.com/envir/envir/news/2001/, June 20, 2002.

addition, 256 enterprises have been implementing cleaner production projects and have achieved 'win-win' results[80].

Not surprisingly, the environmental industry is comparatively more developed in the Tai lake basin than other regions of China. Over 35 percent of total value added of the environmental industry in China are generated in the Taihu Basin. Jiangsu, Zhejiang and Shanghai contain 60 percent of all facilities in the country providing air pollution control and wastewater treatment services, and Yixing city in Jiangsu Province alone, occupies 18 percent[81]. In Jiangsu, the environmental industrial sector grew at an annual rate of 25% during 1996-2000 period. By the end of 2000, there were 1,711 environmental industries in Jiangsu, a majority of which were TVIEs[82]. In 2000, this sector contributed 5.7% of the provincial total industrial output value. Following Yixing city, which has been named the first environmental industrial park by the Ministry of Science and Technology since 1993, Changzhou and Suzhou cities also established their own environmental industrial parks[83]. The local industries will benefit from the easier access to pollution control equipment and environmental services.

In addition, governmental subsidies for TVE technological upgrading and the TVE development foundation will also improve directly or indirectly the environmental capacity of TVEs. By the end of 2000, the provincial Commission of Science & Technology had done assessments of 321 so-called "high-technology-based" TVIEs . About 700 TVIEs had their own research & development institutes. In 2000, over 40% of Jiangsu TVE output value was from technological advancement.

Green demands from consumers have been increasingly felt by TVIEs after China's entry to WTO, intensified by the influence of foreign investments, bringing with them capital, access to foreign markets, and accelerating internal institutional reforms, transfer of technologies and development of enhanced managerial skills. This has created important advantages for TVIEs which stimulate them to grow to international environmental standards.

At the same time, with the increased public environmental awareness, the year 2002 witnessed the emerging green consumerism: the first "green market" for agricultural products was opened in Nanjing in July 2002. In addition, industries have to face increasing environmental complaints. In 2001 alone, EPBs received 32,908 complaints by telephone.

Investigation in 8 major energy-intensive sectors in Jiangsu shows that, during the first half of 2001, their total output value increased by 16.28% compared to the same period of 2000 while the energy consumption only increased by 6.87%[84]. This

[80] Available in: http://www.jshb.gov.cn/report/2001/, July 30, 2002.
[81] Interview with Shi Han, director of China Center for Environmentally Sound Technology Transfer, November 14, 1998.
[82] "Survey on environmental industries in Jiangsu", available in: http://jshb.jlonline.com/envir/envir/news/2001/0112/, August 1, 2002.
[83] Available in: http://www.jshb.gov.cn/report/2000/p08.htm, August 1, 2002.
[84] According to Jiangsu Economic Information Network: http://www.js.cei.gov.cn/jseicnews/, August 13, 2001.

indicates that these production processes and products are becoming less energy consuming and less polluting per unit of output.

These aforementioned factors, including stronger paying ability for pollution control, more cooperative EPB-industry relationships, availability of environmental products and services, emerging green consumerism and increasing public environmental awareness, have contributed to the improvement of the local environment. However, the environmentally positive effects of these factors are still rather limited and happen mainly in cities. There are still considerable gaps between the willingness and the real ability and actions of Jiangsu industries, especially the numerous small TVIEs. As it comes to TVIEs, when EPB enforcement is not sufficient and the local leaders and TVIE managers are not motivated, TVIEs still have possibilities to choose to maximize their economic profits at the cost of environment.

6.3 Wujin municipality and Hengshanqiao town

6.3.1 Economic development and environmental conditions

Wujin municipality lies in the northwestern part of the Tai lake basin or the south part of Jiangsu province. With this location it can easily reach the sea through Yangtze river (Map 6.2). Wujin has a history of more than 2,000 years. Its present administrative territory covers about 1,580 square kilometers (the city area occupies 37.02 square kilometers), of which 99% of the land is flat and low with an altitude of 5 meters. With the approval of the State Council, Wujin was promoted to a county level city from a county town in 1995. By the end of 1998, there were 40 towns and 16 townships. The total population was about 1.2 million.

Climatically, Wujin is situated at the northern edge of a sub-tropical zone. Its rich land and water resources make it 'a land of rice and fishes'. There are also mineral resources like gypsum, argil and zinc ore.

Wujin is also a hub of transportation and communication. Apart from the ancient Beijing – Hangzhou Grand Canal, both the Nanjing – Shanghai railway and expressway run through Wujin. Changzhou airport is just a half-hour drive. In addition, it has 66 watercourses connected to the Yangtze river and the Tai lake. Tele-communication facilities are very developed compared to other parts of China. Even in the rural areas, every 100 people have 25 telephones.

The advantageous location, favorable environmental conditions and 'open door' policies that started first in coastal regions have benefited the local economy. Especially the economic reforms and the transformation from agriculture to industry and service in recent years have greatly enhanced its economic strength. In 1998, its GDP reached 19.6 billion RMB and the net income per farmer was 5,034 RMB. The industrial sector contributed 56.6% to the GDP while the agricultural sector only generated 9.9% of the GDP. Even before Wujin became a city in 1995, it ranked among the first batch of 'comparatively well-off' counties of China (*xiao kang xian*)' and 'the top ten counties' regarding financial income and science and technological strength. In 1994, it was selected by the Administrative Center for China Agenda 21 (ACCA21) as a demonstration project for county-level town planning.

TVEs, and TVIEs in particular, have become a major component of the local economy. In fact, Wujin's TVEs ranked number two in China among counties in terms of output value[85]. In 1998, there were 9,156 TVEs, of which 5,568 were collective and 3,588 were private. In total, 272,900 people worked in TVEs, of which 241,800 were employed by collective TVEs. In the same year, the total industrial output value of Wujin was 41.6 billion RMB (at current price), of which 36.7 billion RMB was from TVIEs.

These TVIEs mainly belonged to eight sectors: machinery manufacturing, electronic products, chemical industry, metallurgical industry, light industry, textile industry, grain and oil processing industry and construction material. According to the vice-

[85] The number one TVEs county was Xishan municipality (county level) in Jiangsu province.

director of Wujin TVEs Administration Bureau (TAB), the technical level of their TVEs was higher than that of comparable TVEs in other parts of China[86]. By the end of 1998, 93% of collectively owned TVEs had undertaken institutional reforms, by means of which 5,356 enterprises became cooperative share-holding enterprises. The positive economic effect of these reforms was very evident. The reformed enterprises paid more attention to internal management, which led to higher efficiency and flexibility in responding to the market. At the same time, the private sector grew more and more important. There were 4,673 private enterprises in 1998 and they contributed 9.2% to the total industrial output value. Three towns, including Hengshanqiao town, realized sales incomes over 2 billion RMB in 1998[87].

Although it was stated in the Law of TVEs that TVEs include both collective and private enterprises in towns and villages, the administration of private enterprises used to be rather ambiguous. They were only required to register with the Industry & Commerce Bureau (ICB). In Wujin, municipal government-owned enterprises are under the Economic and Trade Commission, town and village-owned enterprises are under the municipal TAB. With the rapid development of private sector, the municipal government decided in 1996 that TAB would also be in charge of private enterprises considering its experience with TVEs. ICB was not considered the appropriate one to manage these private enterprises although ICB argued that all enterprises should be treated the same. In the opinion of the vice director of TAB, ICB was not designed to advise TVEs and other rural enterprises except getting them registered and collecting administration fees. Physically, it was not possible either. Interestingly enough, he suggested that policies should not discriminate in favor of state-owned or collective enterprises. For instance, at the moment, private enterprises have to pay 6% of their incomes as individual income regulation tax, which does not apply to the collective enterprises. In his words, "all enterprises, no matter whether they are named state, collective or private, should be given equal opportunities and support for development"[88].

However, the changing composition of the TVE sector and the ongoing reforms on the property rights in collective enterprises also pose a new challenge to TAB. TAB is required to change its role from administrator to coordinator and advisor. "This is a matter of survival of TAB. If we cannot adapt to the new situation, we will not be needed. Therefore, new types of personnel are badly wanted so that we can provide better services", according to the vice-director of Wujin TAB[89].

One of the characteristics of TVEs development in Wujin is the emergence of big group companies and large and medium-sized TVEs. By 1998, there were 72 group companies and 108 large and medium-sized TVEs. They all together contributed 44.2% of the total TVIEs' output value in Wujin. In spite of the overall difficulties facing TVEs since the mid 1990s, more than 2 billion RMB were invested in 1,081 technological renovation projects in TVIEs in 1998 alone. Hengshanqiao town ranked number one for this kind of investment. In the same year, another 10 R & D institutes

[86] Interview with the vice director of Wujin TAB, Mr. Liu Boshu, May 31 of 1999.
[87] The data on Wujin TVEs are from the web site of Wujin Municipal Government and Wujin TAB. Available in: http://www.wujin.gov.cn/, August 3, 2001.
[88] Interview with the vice director of Wujin TAB, Mr. Liu Boshu, May 31, 1999.
[89] Ibid.

were established in TVIEs and more than 80 patent technologies and products were created[90].

Wujin's economy is also very export-oriented. In spite of the negative effect of the financial crisis in southeast Asia in 1997, Wujin managed to export products with a value of 11.1 billion RMB in 1998 and approved another 45 solely foreign funded and joint ventures with a total contracted foreign investment of 194 million U.S. dollars. In total, 107 TVEs were authorized with direct export and import rights. No other county level city could compete in this regard[91].

The municipal government attaches great importance to small town development. Small towns were encouraged to be creative in building up new images. More than 800 village leaders and town governors have attended the training seminars on village and town development. By the end of 1998, all the small towns have formulated their overall development plan. In 1998 alone, 81 key villages completed their overall plan and 56 million RMB was invested in town construction.

6.3.2 Environmental problems and management approaches

In Wujin, there are four major pollution problems: industrial pollution, agricultural pollution, municipal wastes and eutrophication of rivers and lakes. Given the fact that the industrial sector, especially TVIEs, constitutes the bulk of the local economy, it is not surprising that industrial pollution is the main environmental problem. For the purpose of this study, only industrial pollution and the environmental management efforts focused on that are discussed here.

The main polluting industrial sectors are metallurgy, machine manufacturing, textiles and the chemical industry. Water pollution originates mainly from dyeing, pharmaceuticals, electro-plating, and the like. Air emissions are mainly caused by steel mills. In 1998, there were 750 registered chemical industries, but the actual number was much larger, according to the director of the Wujin EPB[92]. There were more than 30 printing and dyeing plants with a scale of operations above the level which would have caused them to be shut down according to the regulation of '15 small operations'.

Technically, it is possible to treat wastewater from dyeing and printing, but it is very costly. Highly concentrated wastewater from pharmaceutical plants is also very difficult to treat. Although 82 electro-plating factories were shut down in 1998, there are still more than 50 left operating. Just few days before one of my field visits to Wujin, an environmental accident at an electro-plating factory caused by improper operation and inattentive management led to the loss of crops of a few *mu*[93].

Of its 18 main rivers and one lake (named Ge), seven rivers are heavily polluted to Class V, 2 rivers are in Class IV and 10 rivers are in Class III. The Ge lake is the main

[90] The data on Wujin TVEs are from the web site of Wujin Municipal Government and Wujin TAB. Available in: http://www.wujin.gov.cn/, August 3, 2001.
[91] Ibid.
[92] Interview with Mr. Xiaoxing Zhou, director of Wujin EPB, May 31, 1999.
[93] Ibid

drinking water source of Wujin. The water quality is between Class II and III, but nitrogen and phosphorous pollutants are above the national standards. Air quality cannot meet the national standards of Class II[94], due to total suspended particles (TSP) and SO_2 in the air.

This environmental situation requires action from a strong regulatory authority. Since its establishment in 1981, the number of staff in EPB increased from 3 to 73. It was first merged with the Wujin County Construction Bureau in 1985, and resumed its first tier position as the Wujin county EPB in 1988. An environmental monitoring station was set up in the same year and equipped with monitoring equipment worth 3 million RMB. In 1998, six environmental supervision and management teams were formed. Currently, EPB has six divisions, namely, General Affairs Office, Management division, Planning Division, Publicity Division, Supervision and Management Division, and Monitoring Station. The Environmental Research Institute carries out scientific researches to provide effective pollution treatment technologies and facilities. Thus, a primary network has been formed. Strong support from the municipal government is obvious: EPB has two separate buildings for offices and laboratories, which stand out in the government campus (Photograph 6.1). Environmental Protection Offices (EPO) have been established in all the towns, under the direct leadership of and financed by the town governments. In most cases, an environmental assistant and environmental workers carry out the daily work.

The whole territory of Wujin falls within the protected area of the Tai lake basin, and 32 towns and townships are within the protected zones. In order to fulfil the targets set in the *Trans-century Green Program* and *the National 9th FYP for Environmental Protection*, a document entitled *Wujin Taihu Water Pollution Treatment and Protection Plan* was formulated by Wujin EPB in accordance with the provincial plan and has been enforced since 1998. This local plan is even more stringent than the national standards. During the 'one control, two targets' campaign in 1998, 101 million RMB was invested for pollution treatment in 107 key polluting plants in Wujin. As a result, 123 sets of pollution treatment facilities were constructed and about 140,000 ton of various pollutants were reduced in 1998, of which, 9,950 ton of COD, 107 ton of total phosphorous (TP) and 550 ton of ammonia nitrogen. Apart from 19 of the 107 enterprises that failed to treat their pollution and were closed, all the other key polluting enterprises, plus 20 key polluting TVIEs, met the discharge standards before the 'zero hour'[95] in the year 1998.

In order to enforce environmental laws and regulations, more than 6,000 on-site investigations were conducted in 1998 by EPB staff and town environmental assistants. Some were done during holiday times or at night. As a result, 149 enterprises were penalized for illegal discharge of wastes; 85 enterprises were warned or closed; and 35 plants that belong to the targeted '15 small operations' were shut down. Twenty-six of 471 construction projects that were required to obtain environmental approvals from EPB were rejected. The director of Wujin EPB claimed that no new polluting sources were added in the Tai lake protected zones in 1998 and the 'three simultaneous practices' were applied to all new projects. However, the

[94] Air quality of Class II means the minimum air quality that does not threaten the health of human being, animals and plants in urban and rural environments. See Appendix II.

[95] In the web site of the Wujin Municipal Government: www.wj.gov.cn/, August 20, 2001.

resurgence of some enterprises belonging to ' 15 small operations' shortly after the *'zero hour'* did happen, as occurred elsewhere in China[96]. In order to prevent this and to consolidate the achievements of the 'one control, two targets' campaign in 1998, the municipal government in early 1999 called for joint efforts of relevant departments to enforce environmental regulations. In case of malpractice, the Department of Energy should cut off the factories' power supply, the Department of Water Conservancy should cut off the water supply and the Industry & Commence Administration Bureau revoked the business license.

Since July of 1998, enterprises have been required to erect standard sign plates (Photograph 6.2) at all the outlets of wastewater and gases, sources of noises and storage sites of solid wastes to give information on the types of pollutants. The end of 1998 saw the installation of 260 sign plates erected in 137 key enterprises. This helped environmental monitoring and supervision in these larger enterprises, but most of TVIEs were not yet included.

Apart from regular pollution control, seasonal measures were taken to safeguard the quality of the irrigation water during the harvesting period of wheat (from 8 to 25 of May) and the planting period of rice (from 10 to 30 of June). In 1998, 87 polluting enterprises were ordered by EPB to stop production or reduce production during these periods. By doing so, no large-scale environmental accident occurred that year. In addition, EPB joined the '110 Joint Actions' launched by Wujin municipal government in July of 1998 and announced two hot-lines for public reporting and complaints[97].

At the same time, Wujin EPB attached great importance to environmental education and publicity. EPB worked with the Education Department to organize publicity activities on World Environmental Day (June 5th) and to achieve environmental education penetration into the education systems of primary and middle schools. The Municipal School for Communist Party Members[98] also adopted environmental protection as a compulsory course for party members and cadres. In 1998, EPB conducted 11 training seminars for town leaders and TVEs managers.

Since pollution treatment costs money, a foundation was established under the administration of the Municipal Financial Bureau and EPB. The municipal government promised to allocate more than one million RMB annually during the 'Ninth Five-Year Plan' period (1996 – 2000) to this fund. In addition, the SO_2 emission fees collected by EPB were put in this fund. These funds were mainly used for large public environmental facilities, demonstration projects or environmentally sound renovation projects.

The Wujin EPB was much more influential compared to the EPBs in Anhui province. Interviews with the vice EPB director of Wujin and environmental officials of Anhui province left the impression that Wujin local environmental officials had more knowledge about the situation of the local environment and about the current

[96] Jiangsu Economics, 1999/2/2, No. 1512

[97] '110 Jointed Action' is a joint efforts of most of the municipal governmental departments to commit to providing prompt services and solution to emergencies, including environmental accidents. Any one in this case can dial the phone number of 110.

[98] China Communist Party Schools have been establishedat the central, provincial and municipal/county levels, functioning as important training network for junior and senior governmental officials.

environmental policies and regulations. They were more committed to their work and were more active in pro-actively solving problems rather than complaining or waiting. Wujin EPB has been endowed with the first veto power over new and expansion projects, separate from the veto power of the Planning Commission and the Industry and Commerce Administrative Bureau. Any of these projects that can not pass the examination of EPB, based on several key criteria, can not receive positive consideration. EPB examines the new and expansion projects for their conformity with the state environmental policies (e.g. '15 small operations'); local environmental regulations; local industrial policies; rationality of the proposed site; and the cleanness of the production processes[99].

The Wujin EPB has succeeded in drawing significant attention from both the government and the public by demonstrating its capacity for helping both the government and the public. Over the years, it has developed partnerships with both government and industry. In the process Wujin EPB has enjoyed increasing levels of support from the government and has encountered less resistance from the industries.

As an environmental officer from the battlefront of pollution control, the director of Wujin EPB did indicate his belief that pollution control requires more than simply command-and-control (CAC) approaches or massive campaigns, such as 'zero hour' action. While these approaches draw attention from the media and build up environmental awareness, they are hardly tailor-made for specific local or individual situations. Sometimes, they even go against what is possible from a natural science perspective. For instance, the cultivation of bacteria used in bio-chemical method for wastewater treatment takes 3 months, but some plants had to do it immediately before the *'zero hour'*. This will only be a cause for future troubles. In other cases, it takes too long to go through the administrative procedures before EPB can finally stop the polluting activities. In his opinion, the success of the 'zero hour' action was overestimated to please the national policy-makers at the top.

6.3.3 Technology intensive instead of pollution intensive: Hengshanqiao town

Geographical location, natural environment and resources

Hengshanqiao town is located in the northeastern part of Wujin (Map 6.2). It is also at the middle of Shanghai-Nanjin industrial region. It only takes 1.5 hours to drive to Shanghai. Climatically and environmentally, Hengshanqiao town has basically the same overall conditions as Wujin. There are no additional special mineral resources in the town area except rocks for construction purpose in some hills.

Up until 1999, Hengshanqiao town covered a total area of 25.1 square kilometers, with a built-up urban area of 2.8 square kilometers[100]. Permanently, about 23,000

[99] Interview with the vice director of the Wujin EPB, May 31, 1999.

[100] At the end of 1999, shortly after my first visit to the town, Hengshanqiao town merged another neighboring town called Xinan as part of the overall merging trend in Jiangsu province. Hence, the area of Hengshanqiao town increased to 37.6 square kilometers and its permanent population increased to about 35,000 people. However, my second visit in November of 2000 proved that the overall plan and administration structure remained similar to the previous situation except becoming larger in spatial term.

people live in the town, but another 13,000 people live there as temporary population. There were 13 administrative villages.

Socio-economic development

Hengshanqiao town has been crowned with many titles of honors: '*Sparkles' Technology Intensive Zone for Chemical Industries*[101] by the former State Technology and Science Commission since 1987; *Demonstration Town for Science and Technological Advancement* by Jiangsu Provincial Government; *Experimental Town for Comprehensive Reforms* by former State Commission for Economic System Restructuring since 1997; *Pilot Town for Small Town Construction* by the State Ministry of Construction and *Top One Hundred Towns of Jiangsu Province*. It also stood out among other towns for its good education facilities, high level of environmental sanitation, telecommunication infrastructure, piped water and gas supply systems, housing conditions, and social security system. Per capita income of farmers increased to 5,800 RMB in 1998 from 87 RMB before 1978. "All these would not be possible without a sound economic base"[102].

Benefiting from its advantageous location and the radiation of the urban industrial centers nearby, TVEs in Hengshanqiao have been rapidly developing since the late 1970s and ultimately changed the local economic structure and farmers' lives. At present, the non-agricultural sectors generate 97% of the local GDP, a figure that was only 7% prior to 1978. Apart from chemical industries, which form the bulk of industries and contribute 30% of the town's industrial output value, there are other industrial sectors including textile, machinery manufacturing, electronic products, construction material, metallurgic industries, lamps and lanterns, electrical cables and medical equipment. More than 500 TVEs of various scales and ownership arrangements employ about 12,000 people. TVIEs comprise 180 of these 500. The general manager of the town's Economic and Trade Development Company described their TVIEs as "technology-based, export-oriented, quality-concerned and large-scale"[103]. In 1998, 22 enterprises exported more than 30 kinds of products. The total export volume accounted for 17% of the TVIEs' total output value of that year. Three enterprises are named as 'high and new technologies-based'. Seven enterprises have their own R & D departments. Eighteen enterprises have obtained ISO 9002 certificates. Twenty enterprises are accessible via the Internet. There are 34 enterprises with an annual output value over 30 million RMB. Seven large industrial groups have been formed, of which Jiangsu Lanling Chemical Industrial Group and Xiafeng Chemical Industrial Group rank among the top 500 largest TVEs in China. Of its 13 administrative villages, TVIEs' output values in 8 villages are above 100 million RMB[104].

[101] 'Sparkle Program' was launched by the Chinese Ministry of Science and Technology (MOST) in 1986. It is the first program which aims to facilitate the restructuring of rural economy and to accelerate the industrialization and urbanization in rural China through supporting technology intensive demonstration zones and enterprises. Available: http://www.most.gov.cn/, November 26 of 2001.
[102] Interview with Mr. Cao, vice governor of Hengshanqiao town, June 1, 1999.
[103] Based on the document 'Basic Facts about Hengshanqiao Town', and confirmed during the interview with Mr. Yang, June 1, 1999.
[104] Interview with Mr. Yang, June 1, 1999.

Environmental situation and management strategy

Environmental pollution caused by rapid TVIE development was not politically recognized or controlled during the 1980s. Environmental accidents occurred from time to time, including incidences of fish kill from water pollution and hepatomegaly diseases[105], which have reduced the number of qualified healthy candidates for military service. Profit generation was the major concern at the early stage of industrialization. Many small-scale electroplating plants and steel mills got chances to operate. Like other TVIEs, poorly equipped chemical industries were among the dirtiest ones.

Environmental protection appeared on the agenda of the town government only in the late 1980s. Before 1988, one environmental worker under the leadership of the town Construction Office was mainly involved in collecting excess pollution discharge fees and pre-checking of proposed construction projects for chemical industries. In 1988, with the resumption of the former Wujin county EPB in higher status as a first tier bureau, all the towns and townships were required by the county government to appoint one staff as the town governor's special assistant for technological development and environmental protection. This staff is allowed to be on the payment roll as civil servant. This means that his or her salary is allocated to the town government's budget. However, there is no extra financial support for any implementation projects or equipment requisition. According to current assistant, Ms. Wu[106], she only received professional training once a year from the county EPB and one-time a training by the former NEPA (called SEPA after 1998) in 1992.

Since 1990, one town vice-governor has been made responsible for environmental protection work. The town environmental staff works closely with this vice governor for daily work and liaisons with the county EPB regularly. Every year, the county EPB breaks down the environmental targets to towns, including pollution treatment plans, enforcement of 'three simultaneous practices' system, supervision over the operations of the pollution treatment facilities, collection of fees, handling of environmental complaints, environmental publicity, etc. The town environmental staff reports the targets and the implementing progresses to the vice-governor and he brings these messages to the town governmental meetings.

In 1997 when Hengshanqiao was selected as an experimental town for comprehensive reforms and the provincial pilot town for coordinated environmental protection and economic development, a Leading Group, headed by the town governor was formed for overall coordination. An Environmental Protection Office was set up to provide backup to this team. Specific environmental staff were appointed for the agricultural sector, the industrial sector and the service sector. All major polluting enterprises were required to set up an environmental protection section or put a responsible person in place. Hence, information about environmental policies, regulations, plans and technologies can be channeled to these contact persons whenever it is necessary. This established network laid an institutional base for environmental management and supervision (Figure 6.1). Regular meetings are conducted between the Leading Group and the Environmental Protection Office. In some emergent cases, decisions are made

[105] Interview with Ms. Wu, environmental assistant in Hengshanqiao town, June 1, 1999.
[106] Interview with Ms. Wu, environmental assistant of Hengshanqiao town, June 1, 1999. Confirmed with her written report on 'Environmental protection in Hengshanqiao town' (May 2001).

jointly on site. Environmental project proposals are discussed and decided also during these meetings.

In addition, a so-called Environmental Targets Responsibility System has been applied and the results are examined annually. At the beginning of each year, the town government signs agreements with each administrative village and major enterprise, indicating specific environmental targets. These targets are included in the indicators for evaluation of the official performance of the village leaders and enterprise managers at the end of the year. To create incentives, their annual salaries are associated with these evaluation results. Once, a village leader was removed from office due to illegal felling of trees[107]. This system succeeds in drawing the attention of those responsible to environmental targets and consideration.

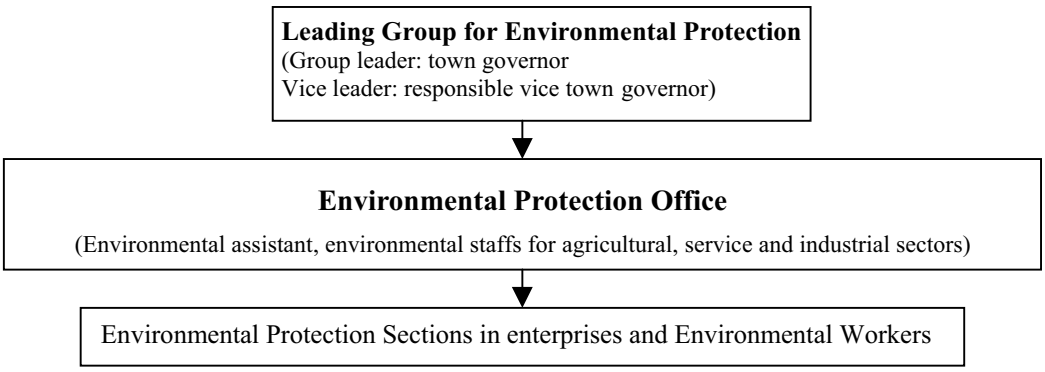

Figure 6.1 Environmental management echelons in Hengshanqiao town

Source: adapted by L. Zhang based on a document that was provided by Hengshanqiao town government (2001).

As an experimental town and a pilot town, the first obligation was to make a good plan. In 1998 the Town People's Congress formulated and approved the*Hengshanqiao Town Master Plan and Town Development Plan'* and the *'Hengshanqiao Town Environmental Plan*. The slogan stating 'better industrial output value 100 million RMB less than producing more pollution' shows the determination of the town government to protect the environment. According to the environmental assistant, the combined effects of the implementation of these plans, together with the catalytic effect of the 'zero hour' action and the "one control, two targets" campaign in the Tai lake basin, produced obvious and observable improvement of the local environmental quality. The air quality satisfies the air standards of Class II and the river water quality has been improved to Class III[108]. The noise level in the town center area is controlled to below 60 decibels. Ms. Wu pointed to an ancient ginkgo tree that grew besides the only Buddhist temple in the town and said "this tree died some years ago due to water pollution from an electro-plating factory nearby, but it starts germinating again now". As an environmental quality indicator, the message delivered by this holy

[107] Interview with Mr. Yang, general manager of the town Economic Development and Trade Company, June 1, 1999.
[108] Written report on the environmental work, provided by Hengshanqiao town environmental assistant in 2001.

tree has raised the environmental awareness of the local people to a higher level (Photograph 6.3). Hengshanqiao town received an award as an 'Environmental Protection Town' of Jiangsu in 1997[109].

These improvements are the direct results of increased investment in environmental protection in recent years, according to the town governor and the environmental assistant. In total, more than 60 million RMB has been invested for pollution control. Eighteen enterprises have installed wastewater and gas treatment facilities[110]. The Number 3 and 8 Woollen Mills together invested about 1.2 million RMB for wastewater treatment, even though they are in difficult financial situations. Other better-off enterprises like the Water Stabilizing Agent Plant, the Fine Chemical Plant and the Lanling Group have invested even more. In order to control smog and dust from chimneys, the town cooperated with Hengshan Thermal Power Plant to utilize the heat generated from the power plant for industrial production. More than 30 million RMB was invested to construct a steam transportation system, allowing the decommissioning of more than 100 chimneys of industrial boilers. In addition, eight hopelessly polluting enterprises, most of them small chemical plants, have been closed. More than ten proposed new projects, such as electro-plating plants, have been rejected due to their negative environmental impacts, and three polluting enterprises too close to drinking water sources were forced to relocate. No additional small brick-making nor mining activities in the surrounding hills were allowed after 2000. Instead, efforts have been made for revegetation, land rehabilitation and nature reserves.

Industrial zoning is considered a future direction too. About 10 million RMB has been allocated for this purpose during the Tenth FYP (2001–2005). In 2000, Hengshan Industrial Park project was officially launched. In principle, all new plants are required to locate in the Park and all new chemical industries must locate in Chemical Industrial District. However, the environmental assistant was not very optimistic about the industrial park strategy. In her opinion, the first barrier is the absence of any self-sustained operation mechanism for technically complex centralized waste treatment facilities, of the type which involves huge initial investment and coordination in operation. Her second point is that it takes a long time to attract a sufficient number of enterprises in one park. "The existing plants here have grown quite big and most of them have installed their own pollution treatment facilities. It is almost impossible to order them to relocate. They have developed their social relationships in their home villages or towns and, emotionally and economically, would not be willing to move to a strange environment."[111] She believed that it is still too early to implement ISO 14001 at the level of the town or industrial park.

Close cooperation and good personal relationships between the economic and environmental staff in the town could be observed during several focus group sessions. Their consensus on industrial development and environmental protection is important in town governmental decision making regarding environmental issues because the town leaders consult both sets of staff. Not surprisingly, environmental

[109] In the web site of Hengshanqiao town government: http://www.wj.gov.cn/web2002/town/hengshan/index.htm, July 21, 2001.
[110] Interviews with Ms. Wu and Mr. Yang in Hengshanqiao town, June 1, 1999. Confirmed with the written questionnaire by Ms. Wu, April 2001.
[111] The written questionnaire by Ms. Wu in Hengshanqiao town, April 2001.

protection has been integrated into the town's '10th FYP' as an important component. During these five years, with further industrialization and urbanization, the aim is to maintain the air quality at Class II, the river water quality at Class III, the noise level below 60 db, and to control the industrial pollution discharge at present level. Industrial Parks will be constructed, and three natural reserves will be established[112].

There are also difficulties in the capabilities of government in the area of environmental management. The environmental staff receives too many tasks: apart from their practical environmental work, they are also in charge of science and technological advancement, and frequent visits and inspections by the upper-level officials from the county, provincial and national levels keep them busy. Since the merger with Xinan town at the end of 1999, the number of TVIEs has increased to more than 430. The environmental staff does not manage to visit each of them even once a year, let alone setting up monitoring programs, giving advice, etc. Consequently, the environmental staff can only focus on the major polluters[113].

The lack of simple, user-friendly and reliable monitoring and analytical equipment is also a barrier. Part of the daily work of the environmental staff is to respond to environmental complaints. With increasing environmental awareness, pollution is often the first thing that people think of when they observe damage to crops or fish. In these cases, the environmental staff carry out on-site investigation. When the damage is confirmed and the responsible polluter (s) can be identified easily, the staff can collect the evidence and order the polluter(s) to compensate the victim(s). Problems occur when the damage can not be identified based on direct evidence, and the services of other technical agencies, such as the Agricultural Technologies Station, are required to analyze other possible causes. Compensation can be claimed only when it proves that pollution is the major factor. Unfortunately, the causes are often unclear. Often victims will go to higher authorities or public media to appeal for justice. This puts the local staff in a very awkward situation. In other cases, even when the damage and the cause are confirmed, it is difficult to identify the responsible polluters if the causes are acid rain or chemical smog, and even sample analysis is inconclusive, even if it were clear who should pay for the sampling and who is competent to do the analysis[114].

When asked if the ongoing institutional reforms of 1997 have made any changes in environmental behaviors of the TVIEs, the environmental staff could not recall significant differences. In Hengshanqiao town, more than 99% of TVIEs had become share-holding companies, share cooperatives, or private companies by April 2001, but this has not really changed their relations with the town government or their host communities[115]. The environmental staff attributed the local environmental improvement to the determination of the government, increased public awareness and an overall social environment that was in favor of environmental protection. This view is partly supported by the interviewed TVIE managers, who also mentioned other considerations behind their environmental strategies.

[112] Document entitled 'Strengthening Environmental Protection Towards Sustainable Development', provided by Hengshanqiao town government, April 2001.
[113] Questionnair by Ms. Wu, May 2001.
[114] Ibid.
[115] Ibid.

6.3.4 Two clean chemical plants and one woolen plant

Wujin Fine Chemical Plant

Wujin Fine Chemical Plant is located in Xiyan village of Hengshanqiao town (Photograph 6.4). It is very close to the Shanghai-Nanjing Railway and expressway. It is only about 20 kilometers from Changzhou airport, Zhangjiagang harbor and the Jiangying Bridge over Yangtze river. This plant started operations in 1979 with a small investment of only 28,000 RMB. The first product was HPMA, which was mainly used in industrial cooling water systems as dispersing agent. After 20 years of development, the firm has become the largest producer in China of water quality stabilizing chemicals, and it forms the core of Jiangsu Xiafeng Group. It was among the top 100 TVIEs in the chemical industrial sector in 1994. In 2001, it had 250 employees and covered a land area of 150,000 square meters. About one third of its staff are technical. In 1997, it was restructured into a share-holding company.

Since the early stages of its development, technological development and quality control have been the core of its business strategy. The firm invited engineers and experts from state-owned enterprises in cities to give technical instructions and, in this way, it developed partnerships for R & D activities. Several major products were developed during the first five years, which prepared it for an economic take-off.

In 1984, it established a formal cooperation relationship with Nanjing Chemical Industrial College. This action was the first of its kind in Wujin at that time. In 1987, it invested 500,000 RMB in Nanjing Chemical Industrial College for staff training and education programs. The overall qualification of employees has been improved and a technical team has been formed. Since then, it has also developed permanent partnerships with many other universities and research institutes for technical cooperation. Its own R & D institute was set up in 1988 for product development and other kinds of technical support. Together with the implementation of a quality management system, it maintained a rapid annual growth rate of 40% for 12 years and occupied 20% of the domestic market. It also started exporting to Hong Kong, Taiwan, Southeast Asia and Japan. Since 1992, more new products have been introduced and its export volume exceeded 10 million RMB in 1995[116]. In the future, "we will become more export-oriented apart from a sound domestic market share. We will seek foreign investment to expand the production"[117].

Even so, the production process is not pollution free. The company used to pay Wujin EPB about 150,000 RMB every year for excess pollution discharge. This was the situation till 1999 when overall environmental enforcement became much more stringent. As one of the targeted polluting enterprises during the 'Two Targets' campaign by the end of 2000 and 'Zero Hour' clean-up action in the Tai lake basin, Wujin Fine Chemical Plant was approached by the Wujin EPB to discuss potential solutions. Finally, a decision was made to invest 3 million RMB for the construction of a wastewater treatment station. According to the vice-director of Wujin EPB, there

[116] According to the written material *Introduction of Wujin Fine Chemical Plant*, which was provided by Wujin Fine Chemical Plant on June 1, 1999.
[117] Interview with the vice-manager of Wujin Fine Chemical Plant, June 1, 1999.

was not much resistance from the company's decision-makers. The local TVIE managers all have participated in one or two training seminars that were organized by EPB or even SEPA. They are well-informed about the state environmental policies and regulations, also through the documents passed down by other authorities or simply via newspaper and television programs. They are also required to conduct internal environmental training for their employees. Nowadays, most of the local enterprises are willing to treat their pollution when it is technically and financially possible[118]. Biological and chemical methods are used for water treatment. After it is in operation, the annual operational cost will be about 600,000 RMB, but, at the same time, the firm can earn about 1.4 million RMB from recovering chlorhydric and acetic acids[119].

With this environmental investment in wastewater treatment, this firm has survived the forceful closing campaign in 2000. Wujin county EPB regards it as a cooperative enterprise and the town government is happy that the firm can continue to generate profit and job opportunities for the local community. In the decision-making process of the firm, the intervention of the county EPB through the town leaders and environmental staff have played positive roles.

Lanling Chemical Company

Similar to Wujin Fine Chemical Plant, Lanling Chemical Company is the core company of Jiangsu Lanling Chemical Industrial Group. It was established in 1980 as a collectively owned TVIE which became a share-holding company employing more than 800 people, in 2001, of which 20% were technical staff . The plant is located on the northern slope of Fangmao hill in Hengshanqiao town and enjoys green surroundings. It covers 250,000 square meters.

Lanling Chemical Company is a well-known manufacturer of industrial paints, marine paints and building paints in China. It has an annual production capacity of 25,000 tons of more than 400 kinds of products. In 2000, its sales volume reached 150 million RMB. Its brand of 'Lanling' is among the most famous brands of Jiangsu province. In 1997, it obtained an ISO 9002 certificate. Among its numerous awards for good management, sound quality, bank credibility, technical innovations and so on, it is worth mentioning that it was awarded by the Ministry of Chemical Industries as 'Clean Chemical Industry' since 1991 and 'No Leaking Plant of Jiangsu' since 1988[120] (Photograph 6.5). How has Lanling built up this 'clean image'?

Since its early stage of development, as part of the company's 'image building' strategy, the managers attached great importance to cleaner production and pollution prevention. They believe that a company is like a person who can not be successful without being honest, reliable, and responsible to others. In the words of the chief of the company's General Affairs Office[121]:

[118] Interview with the vice director of Wujin EPB, June 1, 1999.
[119] Interview with the manager of Wujin Fine Chemical Plant, June 1, 1999.
[120] Written material in title of *Introduction on Clean Production in Lanling Chemical Company*, provided by Lanling Chemical Company, April 2001. Also in Lanling Chemical Group's website: www.cei.js.gov.cn/, September 10, 2001.
[121] Interview with the chief of the General Affairs Office of Lanling Chemical Company, June 1, 1999.

"we feel obliged to protect the environment while making profits. Actually, we become more profitable, more attractive to our employees and more respected by society through implementing clean production strategy. We take environmental management as part of our overall management system. In our case, environmental protection is related to quality management, technological innovations, services to clients, marketing plans and so on. It can not be addressed as an isolated issue."

In this regard, Lanling is quite different from many other TVIEs. To coordinate various managerial aspects and to make overall arrangements, a group that consists of the top managers was set up and an internal network was established for communication and implementation. Apart from adopting cleaner production processes, the overall management targets, including workshop sanitation, quality examination, operation and maintenance of the equipment and workers' safety are broken down to various levels, with resources made available for implementation. The performance in relation to these indicators is checked and recorded every month, with results being evaluated and summarized quarterly and annually. Measures awarding or punishing the staff are based on the evaluation results. These measures prove very effective. In this plant, 99.7% of the equipment is maintained in good condition, and leaking of chemicals at static and moving points is controlled at 0.14% and 0.29%, respectively[122].

Apart from the production process management, Lanling Company also invested every year for plantation of trees and grass. By the end of 2000, 80% of the area surrounding the factory was green, and whole plant looked well-embedded in its green surroundings.

With its outstanding environmental performance, Lanling enjoys a good and cooperative relationship with the local environmental authorities. Wujing EPB and the town environmental staff use Lanling frequently as a good example of cleaner production. This case demonstrates the important role of entrepreneurs in environmental protection. Lanling's clean practices are not limited to passive compliance with environmental regulations, but represent an integral part of its management strategy in pursuit of a more reliable company image. Only far-sighted entrepreneurs focus on long-term profit and believe that a reliable image is critical for competing with other companies. Environmental protection is increasingly accepted as one of the inalienable responsibilities of contemporary industrial enterprises. To meet the new social requirements, enterprises must combine their economic and social benefits, take care of the interest of their employees, contribute to the solving of the social problems, and establish a more friendly relationship with their communities (Chen, 1999). Lanling is a good example in this regard.

Hengshanqiao Woolen Mill No. 8

Hengshanqiao Woolen Mill No. 8 was established in 1985 as a town-owned enterprise and was transformed into a share-cooperative company in 1997. Currently, it has

[122] Written material *Introduction on Clean Production in Lanling Chemical Company*, provided by Lanling Chemical Company, April 2001.

about 400 employees and covers an area of 6.3 ha. It has a complete production line from dying, spinning, weaving to finishing. The designed annual production capacity is 800,000 meters of woolen fabric. Most of its machines and equipment were imported from Italy, Switzerland and the United States[123].

This production process generates about 500 ton wastewater per working day mostly from the dying process. Obviously, 'three simultaneous practices' was not enforced at the time when it was constructed. Wujin EPB was aware of this fact shortly after its commencing operations in 1986, and approached the town environmental assistant and plant managers. As required by Wujin EPB, the plant had to construct its wastewater treatment facility before EPB allowed it to operate. In this case, the plant managers decided to invest in a wastewater treatment station. Jiangsu Provincial Textile Industrial Design Institute was contracted to design a wastewater treatment station in 1986. About 1 million RMB was raised in 1987 for construction. The real construction started in 1987 and the treatment plant was in operation in 1988 (Photograph 6.6). This wastewater treatment station was able to treat 1,100 tons of wastewater per day.

However, due to lack of maintenance and passive management during past 10 years, some of the equipment and pipes of the wastewater treatment station were corroded or damaged, so that wastewater could not be treated properly. The company had to pay Wujin EPB about 50,000 RMB every year for the pollution discharge that exceeded the allowed standards.

The company allowed this situation to continue until 1998 when it became a must for all polluting enterprises in the Tai lake basin to meet the discharge standards. The EPB staff and the town environmental officials had several meetings with the plant managers, informing them the objectives of the 'zero hour' action and the consequences of noncompliance. Responding to more stringent environmental regulations and increased public environmental awareness, the company's top management called for an internal meeting on pollution treatment in February 1998 in order to survive the environmental campaigns. Consensus on the pollution treatment issue was reached during the meeting. In the words of the company manager, "we want golden mountain, but also green mountain and clear water"[124]. As a result, a leadership group headed by the company manager was formed shortly after the meeting. A vice-manager was made responsible for the implementation of this 'satisfying discharge standards' project. An analysis of the condition of the facilities concluded that it was not possible to meet the wastewater discharge standards with the existing facilities. Thus, a decision was made to thoroughly renovate the wastewater treatment station within two months and 150,000 RMB was allocated for this purpose.

First, some old equipment, such as wastewater pump, pipes and valves were replaced with new ones. Leaking in the wastewater ditch was stopped. All the other facilities were treated against corrosion. In addition, having learned from several other newly constructed wastewater treatment stations for printing and dying plants, two new chemicals (polypropylene amid and sodium hypochlorite) were added to enhance the treatment effect. The number of staff at the wastewater treatment station was

[123] Data and information about Hengshanqiao Woolen Mill No.8 are obtained by interviewing the town environmental assistant, Ms. Wu, and the plant manager, Mr. Tang Weihua, June 1, 1999.
[124] Interview with Mr. Tang Weihua, manager of Hengshanqiao Woolen Mill, June 1, 1999.

increased from 2 to 4. All of them had taken professional training and passed the EPB examinations. Their daily work includes taking and testing samples, applying remedial chemicals according to the testing results, and making daily records. Through these efforts the treated water satisfied all the five standards on COD, chromaticity, pH value, sulphide and suspended substance. However, the treatment cost per ton increased from 1.5 RMB to 2.2 RMB[125]. The environmental staff are required to report the monitoring records to the town environmental assistants monthly, who will forward to Wujin EPB. Wujin EPB conducts unannounced on-site checks. So far, this plant has survived the enforced 'closing' campaigns, but dealing with more stringent regulation in future remains a question.

6.3.4 Summary

In many aspects, Hengshanqiao represents the Sunan Model, which has been followed by many other towns and villages in China, particularly in southern Jiangsu. The local governments and community leaders played an essential role in the development of TVEs up until the early 1990s. TVEs in Hengshanqiao were mainly government-driven, collectively owned and expansion-oriented. During the first few years of the 1990s, after restructuring and merging, some large company groups emerged with enhanced economies of scale and competitiveness. The ongoing reforms in relation to the property rights of TVEs beginning in 1996 have injected further vitality and prepared these TVEs for the second surge of development.

Hengshanqiao is also typical regarding the environmental cost and economic losses caused by TVIEs. It is the good fortune of the town that the town government and the local people learned quickly from the lessons. They have started to prevent new pollution and, at the same time, to clean up the existing incidences of pollution. Although most of their TVIEs have so far succeeded in complying with the state pollution discharge standards through upgrading technologies and investing in pollution treatment facilities, they are aware of the limits of these mainly end-of-pipe approaches. The conflict between environmental protection and economic development in the short term is regarded as a motive for ecological construction instead of a barrier to it. Apart from end-of-pipe treatments, more comprehensive and systematic approaches have been adopted to reduce negative environmental impacts, including function-based land-use planning; restructuring the composition of industries; phasing out obsolete technologies and products; upgrading the existing equipment and technologies; comprehensive utilization of resources; and focusing on the key targets. In the words of the town governor: "environmental protection must be in accordance with the local economic level, quality of life, and environmental capacity. We can not fix the environmental problems overnight, but it will come gradually with increased environmental awareness and knowledge, improved financial capability, access to technological means, etc."

There have been hardly any recorded incidents of fierce confrontation between the polluting TVIEs and local EPB or town government in Hengshanqiao. This confirms once again the interdependence that existed between the community, the town

[125] Written material *The Renovation of Wastewater Treatment Station of Hengshanqiao Woolen Mill No. 8*, provided by Hengshanqiao Woolen Mill No. 8, June 1998.

government, the local EPB and other parties involved in the local environmental regulatory game. This fact also explains why community pressure and state economic instruments play only minor roles in the continuous improvement of the local environment. The town environmental assistant stated her belief in the importance of the local government's determination to combat environmental pollution. "No other individuals or organizations can mobilize the required resources and implement the environmental plans more effectively under current conditions. In the towns and villages, the community governments share common interests with TVEs, including environmental protection." She attributed the improved environmental performance of TVIEs not to separation of TVIEs from the town or village governments, but to the strengthened financial capability and increased environmental awareness of the entrepreneurs and the town decision-makers.

6.4 Suzhou municipality, Wuxian district

Since 1983 when Suzhou was promoted to prefectural level, it became one of the large cities in China in terms of population. Suzhou is located in the center of the Yangtze river delta and the south of Jiangsu province. The Tai lake is to its southwest and the Yangtze river is to its northeast (Map 6.2). Souzhou measures a land area of 8,488 square kilometers. About half of the land is flat and half is surface water. Suzhou has similar natural conditions to Wujin. At the end of 2000, about 5.8 million people lived in Suzhou. There are 8 districts and 5 county level cities under its administration. Historically, Suzhou was famous as 'the heaven on earth' with its mild climate, abundant resources and products, flourishing economy and numerous tourist attractions. Suzhou is one of the communities where Sunan Model TVEs have developed. Export-orientation is another feature of the local economy: up until the present, 80 of the world top 500 transnational co-operations invested in Suzhou. Since 1990, the average annual growth rates of its economy have remained above 20%[126]. Suzhou city ranked number four among 46 key cities designated by SEPA based on the Urban Environmental Quantitative Examination System (UEQES).

Suzhou city center is surrounded by Wuxian, which became a county level city in 1995 but was merged into the new district of Suzhou city in early 2001. Wuxian district covers 2,963 square kilometers, and is divided into 3 special zones and 29 towns. Similar to other counties in southern Jiangsu, collectively owned TVEs in Wuxian have been growing into an important sector of the local economy over the course of the last two decades. The average annual growth rates remained at 27.75% during this period. In 1998, there were 3,350 industrial enterprises, of which towns and villages collectively owned 94.8%. These TVIEs are in sectors such as machine manufacturing, electronics, construction materials, chemicals and pharmaceuticals, silk production, and food processing. TVIEs generated about 80% of the total industrial output value of Wuxian[127]. Its GDP ranked number 6 among 64 counties and cities in the province in 1999, while Wujin ranked number 5. But the export volume of Wuxian ranked number 5 in 1999, while Wujin ranked number 7 in the same year. As to the farmers' net income per capita, Wuxian ranked number 6 (5,278 RMB) and Wujin ranked number 9 (5,105 RMB) [128].

6.4.1 Wuxian district: a powerful EPB

The Wuxian EPB shares many characteristics with the Wujin EPB regarding internal divisions, functions, ranking status and number of staff. It employed more than 60 staff in 2000. Similarly to Wujin, Wuxian EPB has extended its networks down to town, village and firm levels.

The high density of industries in the town has resulted in a high concentration of pollution in Wuxian. "The main task of our EPB is to control environmental pollution

[126] According to Suzhou Municipal Government web site: www.suzhou.gov.cn/szgovsite/szgk/, September 20, 2001.
[127] Available in: http://www.suzhou.gov.cn/wx/, September 20, 2001.
[128] Available in: http://www.jssb.gov.cn/jsnj/jsnj05/, August 5, 2002.

during the rapid TVEs-driven industrialization process," according to the director of the Wuxian EPB[129]. Realizing that this task can not be fulfilled without concerted efforts of the whole society, Wuxian EPB has focused on environmental publicity and education directed towards various groups, as a complement to exercising their administrative and legal powers. "I have been in this position since 1987. I have seen the changes of the local environmental conditions and people's attitudes towards environmental protection". The director believed that the most important and effective approach is to raise people's environmental awareness by giving environmental information. His office has used a variety of means, including newspaper, radio and television programs, public advertisements, show windows, banners and various competitions, to popularize environmental knowledge. Every year, on 'World Environmental Day', the secretary of the Communist Party and the mayor of Wuxian make public speeches on environmental protection on television, radio and in local newspaper. The Youth Leagues and women volunteers have also been mobilized for environmental publicity.

In order to gain political attention and support, Wuxian EPB has been very active in lobbying officials from Departments that are in charge of personnel, organizational structure and legal institutions by inviting them for environmental training seminars, and reinforcing this by regular sending environmental newsletters. Training seminars are also organized two or three times a year for managers from polluting industries. These training seminars are tailor-made for different industrial sectors to inform them on relevant environmental laws, regulations and pollution treatment technologies. Since the mid 1980s, an agreement has been signed between Wuxian Education Bureau and the mayor, in which environmental education targets are specified. From 1989 on, EPB has worked directly with the Education Bureau to allow environmental education to penetrate into primary and middle schools. Not surprisingly, students' environmental groups dominate among all types of students' groups in Wuxian.

EPB's strategy has proved very successful. A social environment that is in favor of environmental protection has been created. In 1997, Wuxian Government issued a policy that gave EPB veto power on any new project that failed to meet environmental requirements. An Environmental Responsibility System has been in force since 1989. Negotiations between the county leaders and town governors result in specifying yearly environmental targets for the city mayor, town mayor and enterprises' managers who are in charge of environmental work. The fulfillment of these targets is closely associated with the awards and sanction system for governmental officials. Over the years, EPB workers have enjoyed increasing cooperation from the polluting enterprises. Participation of citizens and farmers has also helped considerably. The EPB receives more than one hundred environmental reports and complaints per year[130].

Wuxian EPB has also extended its network to town and enterprise levels. Environmental assistants are available in all Small Towns. In every polluting enterprise, there is at least one manager who is in charge of environmental work, and additional designated environmental workers. All the environmental workers at the firm level must pass professional exams required by Wuxian EPB before they can

[129] Interview with Mr. Zhou Genyuan, director of Wuxian EPB, November 28, 2000.
[130] Ibid.

start as environmental workers. Like the situation in many other counties and cities, the rights for administrative sanction and laws enforcement are in the hands of Wuxian EPB. However, many EPBs can not fully exercise their authority due to their weak position in the power hierarchy. During the local institutional reform of the governmental organizations in 2000, the Environmental Supervision and Administration Team of Wuxian, which is affiliated with the EPB, was promoted to a higher rank with a purpose to further strengthen the enforcement of environmental laws.

Environmental protection has become an important component of the local Development Master Plan. Environmental indicators are used to measure and evaluate the rural modernization level, civilization level, sanitation, and official performance of major governmental and communist party leaders. The latter serves as the core of the environmental responsibility system. The chapter on environmental protection in the annual Plan by Wuxian Planning Commission is also getting more and more important. This has laid a good base for implementing more comprehensive regional environmental plans, which require concerted efforts and commitment from different organizations. According to the EPB director, since the early 1990s, the Wuxian EPB has successfully cooperated with the Wuxian Communication and Transportation Department to enforce the installation of oil-saving devices on more than 2,000 transportation boats; with the Water Conservancy Department to dredge 200 rivers; with the Agricultural Department to promote the application of organic fertilizer; with the Public Security Bureau to control tail gas emissions of motor-driven vehicles; and with the Industrial and Commerce Bureau, Land Administration Bureau and the Planning Commission to prevent the operations of new polluting projects.

During the 'zero hour' action and the 'one control, two targets' in the Tai lake basin in 1998 and 1999, 157 enterprises were singled out as key polluting sources and another 1,418 enterprises were identified as less polluting sources. Of the key polluting sources, 92 were TVIEs. These 157 key polluting sources contributed about 80% to the total smog, 75% to the total industrial dust, 69% to the total SO_2 and 77% to the total COD discharges of Wuxian. In 1998, 69 main water polluters were ordered to treat their pollution before a deadline. All the air polluters along the main roads and railways received similar orders in 1999. In 1999 alone, 135 enterprises were ordered to renovate their pollution treatment facilities. Administrative sanctions were exercised 35 times. All the polluting enterprises on the black list of EPB were required to install ultra-sonic water meters or COD online monitoring devices. In total, 235 standard signs were erected at the outlets of pollution by the end of 1999[131].

Efforts were made to prevent pollution at source as well. Local policies were issued to tighten the project approval so that no more polluting projects could be allowed in areas along Tai lake. In accordance with the policy that bans the operation of 15 types of small industries (SEPA, 1998), the Wuxian EPB published a list of obsolete production processes and equipment and made it explicit that they will not have a chance in Wuxian. Within two years, 11 small industries were shut down. Eight stacks in three cement plants were blown up on the World Environmental Day of 1999 to show the determination of the government to combat pollution[132].

[131] Written material in title of 'Report on Reaching Pollution Discharge Standards by Industrial Polluting Sources', provided by Wuxian EPB, December 30, 1999.
[132] Written material in title of 'Report on Reaching Pollution Discharge Standards by Industrial Polluting Sources',

The EPB is also committed to the promotion of cleaner production and centralized pollution treatment plants. This effort has resulted in three enterprises passing the environmental audit conducted by the provincial EPB to win the title 'Cleaner Production Enterprises' in 1999. Being close to big cities like Shanghai and Suzhou, the Wuxian EPB is more sensitized, and quicker to promote ISO 14000 among their target groups than their counterparts in other provinces. Training seminars on ISO 14000 for firm managers have been conducted regularly and about 20 enterprises were preparing for certification in 2000. Luzhi town even came up with its own initiative to obtain a regional certification. According to the EPB director, "These practices have contributed a lot to the improvement of the local and regional environmental quality."

The achievements of Wuxian EPB have been praised and celebrated on many occasions, although the question remains as to what extent the improvement of the local environmental quality was due to effective enforcement of the national laws, policies and regulations. There is a clear tension between the environmental policy and reform progress and efforts of the local environmental EPBs on the one hand, and the national policies and regulations on the other. One EPB officer was rather anti-spoken on the national environmental policies and staff:

"I have received many inspection delegations and governmental officials from Beijing in recent years. Every time, they stayed for a short time and had few meetings and on-the-spot visits. Their knowledge and impressions about the local environmental situation and management capacity rely very much on what we told them. I did not want to give them false information, but sometimes I had to. Telling the truth will only lead to underestimation of our work. But we have done the most we could. In my opinion, it is better to use our energy and time for real works instead of receiving these study tours, which have little added value. For example, personally, I am not in favor of campaigns like 'zero hour' action in the Tai lake basin. All of our forces were kept busy to ensure that our enterprises would meet the discharge standards at that specific time point. This was a kind of disturbance to our normal work."[133]

The local Wuxian EPB environmental staff interprets the statement of 'all polluting resources must reach the discharge standards by zero hour' as being rather ambiguous in relation to the following questions. First, what are the bases for defining pollution sources? Second, what is the scientific rationality for reaching the discharge standards before that particular time point? Third, how real is the sustainability of these kinds of campaign-driven actions?

Not surprisingly, the Wuxian EPB, like other local EPBs, behave strategically by producing reports to SEPA that follow exactly the SEPA guidelines and policies, but acting as they have planned this by themselves. The Wuxian EPB staff do not believe that the main incentive for solving local environmental problems is the interference or pressure from the top authorities. Local motivations and initiations are considered much more important.

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provided by Wuxian EPB, December 30, 1999.

[133] Interview with Wuxian EPB director assistant, December 30, 1999.

The conclusions of this research on Wuxian EPB support Schwartz's (2000) conclusion that, compared with EPBs in Anhui province and other parts of China[134], the environmental officers in Jiangsu province more often express a commitment to their work and they appear more knowledgeable about regulations and policies and about the processes by which those regulations and policies are disseminated and enforced. When EPB officials found that the national environmental policies and standards did not fit their situations and preferences, they uniformly chose to act at their own discretion and followed their own priorities, strategies and policies, even when these contradicted the national ones. The local EPB can take a large degree of freedom and flexibility in making and implementing industrial environmental policy.

6.4.2 'Number one environmental town of China': Luzhi town

Introduction

Luzhi town is located in the eastern part of Suzhou, only 18 kilometers away from the city center and 58 kilometers from Shanghai Hongqiao International Airport. Luzhi was known as an ancient water town. Rivers and lakes crisscross its 50 square kilometers of land. The built-up town area covers 6 square kilometers. Luzhi governs 32 villages and had a permanent population of 40,825 people in 1999. Another 50,000 people from other areas worked there. In 1999, the town's GDP was about 1.2 billion RMB and the net farmers' income per capita was 5,295 RMB.[135]

Luzhi is famous for both natural beauty and cultural relics, and has been attracting more and more tourists in recent years. Luzhi is, at the same time, an industrial town; as in other towns in southern Jiangsu province, its TVEs were mainly driven, invested in, and owned by town government or village committees. In many cases, the community governments were the legal persons of the TVEs. Taking advantage of local resource and business traditions, textile mills, including printing and dyeing plants, constituted the bulk of the local industries.

In its early stage of industrialization, the numerous cultural relics and historic sites were once regarded as barriers for economic development in Luzhi. In the late 1970s, the local people even tried to build factories within the historic old town area. Some rivers were filled and some old residential houses were demolished. Several small enterprises were established but could not develop well due to inconvenient transportation caused by many small rivers and bridges. In order to find another way out, the town government invited Tongji University in Shanghai to make a master plan for Luzhi in 1986. In this plan, the whole town was divided into four functional zones: protected ancient town, industrial zone, residential zone and resort zone. According to this plan, the factories within the old town area were gradually relocated into the industrial zone. The factories also took the opportunity to upgrade technologies and equipment to be less polluting. New projects in the industrial zone

[134] See chapter 7 for Anhui province. In addition, EPB officials from Shangdong, Yunnan, Liaoning and Guangdong provinces have been interviewed.
[135] The website of Luzhi town: http://2.2.102.14.5/www/dwxx/wm/lzzf/zbgk.htm, November 9, 2000.

were required to adopt new technologies, to be energy efficient and to operate at an effective economy of scale. Within this zone, TVIEs have been able to share the infrastructure and services such as electricity and water supply, and centralized wastewater treatment since 1992. With all these above-mentioned measures, the energy efficiency has increased dramatically and the industrial wastewater has been treated, reducing the demand for heat production by 60%, and coal consumption by more than ten million tons annually.

Since 1993, Luzhi has been crowned as the first 'Pilot Town for Centralized Wastewater Treatment' and has been named by NEPA as 'A Demonstration Project for Coordinated Economic Development and Environmental Protection'. The former administrator of NEPA, Mr. Que Geping, called it 'the number one environmental town of China'. How did Luzhi people deal with the development-environment dilemma? What is behind their decisions? How can this project be implemented under current social, economic and political conditions? To what extend, can this model be applied in other towns? What are the lessons and experience?

Many experts recommended Luzhi town for a study of environmental protection in Small Towns. Indeed, Luzhi presents an extremely typical case: a strongly TVIEs-based economy with large-scale TVIEs-caused water pollution. The decision-making process towards this plant and the way town policy makers and TVIE managers overcome difficulties demonstrate how the town government and TVIEs can cooperate, even after the ownership reforms. This section gives a brief introduction of Luzhi town and then focuses on the roles of the town government and TVIEs managers in the decision-making process towards this central wastewater treatment plant and the operation and maintenance mechanisms[136].

Towards a centralized wastewater treatment plant for the industrial zone

Up until 1988, there were nine old printing and dyeing plants and another 150 enterprises of different sectors within the industrial zone, which had been expanded from 2 square kilometers to 4 square kilometers. Of these nine old plants, five plants already had wastewater treatment facilities. However, wastewater could not be treated properly because the facilities were seriously overloaded. Several options were discussed, and it became clear that renovation and expansion of the existing treatment facilities would be too expensive and would result in even higher pressure on the already scarce land, especially if all the new factories had to construct their own facilities. But, if the factories were allowed by the town government to discharge without any treatment, it was believed that the environmental standards would be seriously jeopardized and there would be no drinkable water in Luzhi after two years. The town government realized the irreversible consequences of the 'pollution first' option[137]. They also learned from potential foreign investors that it would be difficult to attract foreign investment if there was no waste treatment infrastructure in the

[136] Sources for the rest part of Section 6.4.2 are: 1) written material in title of 'Introduction Of The Construction and Operation Of Luzhi Wastewater Treatment Plant', provided by Luzhi town government in November of 2000; 2) interviews with Mr. Wang, the director assistant of Wuxian EPB and Mr. Xu, the manager of Luzhi Wastewater Treatment Plant in November of 2000.

[137] 'Pollution first' option is similar as 'business as usual' approach in dealing with environmental pollution, which ignores the negative environmental impact of the production activities and the environmental responsibilities of the polluters.

industrial zone. Based on these considerations, the decision was made by the town government to construct a centralized wastewater treatment plant in the industrial zone, focusing first on serving the nine old plants.

In 1991, Luzhi General Company for Agriculture, Industry and Commerce[138] invested 4.2 million RMB in the construction of a central wastewater treatment plant (WWT) with a daily capacity of 6,000 ton of wastewater, and also including the water collection network. Beijing Municipal Environmental Science Research and Design Institute made the design. This central plant was put into operation in October of 1992. The treated water satisfied the state water discharge standards. It was estimated, based on the data from these nine plants, that, apart from saving land, 2.08 million RMB construction cost were saved compared to the 'separate treatment plants' option. Annually, the treatment cost would be 800,000 RMB less. This central treatment plant also improved the investment environment of this industrial zone.

WWT plant as a self-sustained enterprise

The idea of a central treatment plant is not really new. But Luzhi is a pioneer in running a centralized wastewater treatment plant, which used to be a public utility, as a business entity. From the very beginning, this WWT plant has been defined as an enterprise, as an independent legal person. It is affiliated to Luzhi General Company but is an independent accounting unit. Its business scope ranges from operating the facilities, treating the wastewater in a professional manner, collecting fees based on the contracts signed with the polluting enterprises and bearing responsibility for the quality of treated water and other financial risks. As for the internal management, the responsibilities and targets for each position were specified. Under the condition that the treated water satisfies the state discharge standards, the profit is linked to the salaries of individual staff. Thus, the plant is motivated to minimize the cost and increase energy efficiency.

As a specialized wastewater treatment plant, it requires professional management and operation. Key technical staff were sent to colleges and universities to upgrade their knowledge and skills. At the same time, all the workers got training from Wuxian EPB on environmental laws, regulations and standards, technological process, monitoring and analysis, equipment operation and maintenance. Operators were required to work in different positions to become skilled in all posts. Every month, management staff must work in operations posts for at least 4 days to gain direct experience.

When this WWT plant was put into operation in 1992, it served nine polluting plants in the industrial zone. Later on, it set up its own engineering company to contract external wastewater treatment projects. More revenues were generated from these businesses. At present, the Central Plant covers a land of 17,000 square meters. Its fixed assets are worth 4.2 million RMB. It has 20 employees. Wastewater from more

[138] Luzhi General Company for Agriculture, Industry and Commerce belongs to the town government. It functions as a business manager on behalf of the town government, including developing, investing in and managing various TVEs projects.

than 30 enterprises and part of household wastewater is treated up to the state discharge standards. By 1999, all the initial investment had been recovered. In the same year, an expansion project was started to meet increasing demand at an investment cost of 30 million RMB to expand treatment capacity from 6,000 tons per day to 20,000 tons per day. It was expected that the new facilities would be in operation by the end of 2000.

However, this model did not develop without difficulties. First, the cooperation of the polluting factories is essential for the quality of treated water. Environmental responsibilities of the polluting TVIEs could not end just by their agreeing to send their wastewater to the treatment plant. If the enterprises felt free to produce as much wastewater as they liked without restriction on volume and concentration of the wastewater, normal operation of the treatment plant can not be guaranteed. This required that consensus be reached between the polluting TVIEs and the WWT plant management on what can be good for the treatment. Respective responsibilities were specified in the contracts. For example, the polluting TVIEs should control the volume and concentration of the wastewater within the limits set in the contracts. The polluting TVIEs were obligated to split the polluted water and clean water within the factory as much as possible, via internal recovering and recycling systems.

Second, it proved difficult to set a reasonable price for water treatment. Since there were no reference prices for this, the central plant followed a principle of 'income and expenses are balanced'. However, this proved very problematic in practice. The biggest barrier was the measurement of the pollutant concentration. On the one hand, the monitoring data collected by the WWT plant staff were not protected by any law, and the local EPB was not able to conduct regular monitoring in all the TVIEs in Luzhi due to limited capacity. On the other hand, the data that were collected by the polluting TVIEs themselves were not reliable. In addition, the concentration of pollutants varied with changes in the products and other factors. To simplify this issue, volume-based standard prices were set for different sectors based on negotiations with the polluting units. For example, textile companies had to pay 1.2 RMB per ton of wastewater, food-processing industries 1.5 RMB and household wastewater 0.8 RMB. These prices could be subject to alteration if the balance was not reached.

Even so, to measure the volume of wastewater remained difficult at the beginning. Although water meters were installed at the wastewater outlets of the polluting TVIEs, it was discovered later on that some enterprises discharged wastewater into the collection pipe network during daytime, but discharged wastewater directly to surface water through hidden outlets during nighttime. To stop these malpractices, the central plant managers sought other ways to measure the wastewater volume. Fortunately, water supply in Luzhi was controlled by one Water Plant. Based on the products and production processes, wastewater volume could be estimated according to water consumption. However, some polluting plants started to manipulate the records on the water meters before the Water Plant staff came to check. Consequently, the Water Plant and the WWT plant staff had to make unannounced visits to the enterprises apart from their regular checks. They also tried to calculate and estimate the correlation between electricity consumption, steam consumption and wastewater volumes. Enterprises were warned that estimations would be made based on the consumption of electricity and steam in case of uncertainty.

In addition, many enterprises delayed paying treatment fees from time to time. While the majority of private or village-owned polluting enterprises could pay their fees on time, these were small in number. Joint-ventures also paid according to the contracts. But more than half of the town-owned enterprises, which were the majority of the target group, were unable to pay the fees in a timely way. The main reason they gave is that they were 'brothers' with the WWT plant. Both these town-owned enterprises and the WWT plant were affiliated with Luzhi General Company. Profits were shared between the enterprises and the General Company, which represented the town government, according to various arrangements. In these circumstances, the town government and Luzhi General Company stepped in to coordinate. Those enterprises who did not pay the fees in time were ordered to pay before a deadline, otherwise the fees would be transferred directly from the General Company to the WWT plant. With this protection, the WWT plant managed to clear its accounts once a year.

Since 1997, the majority of the former town or village-owned enterprises have reformed as private enterprises of varying forms, with the except of the Thermal Power Plant, the Water Plant and the WWT plant. The General Company could not directly control these private enterprises any longer nor directly affect the fee collection. To make fee collection easier, the General Company decided to entrust fee collection to the town Water Plant. Respective responsibilities were specified for the Water Plant and the WWT plant to guarantee that treatment fees would be transferred to the Central Plant in time.

The Luzhi model proves that it is possible to run a self-sustained central wastewater treatment plant in small towns. The Luzhi model combines centralized treatment of industrial wastewater with entrepreneurial operation and management, market-conforming prices, and socialization of the services. To transform waste treatment into a business is believed to represent a new trend in China.

The role of the town government

The success of the Luzhi model requires several conditions: stringent environmental regulations towards TVIEs; concentration of TVIEs in a restricted geographical area; financial capability of the government and the enterprises; determination of the town government; and consequent payment of industries for treatment services. The role of the town government and key leaders has proved to be decisive among these conditions. It was the town government which took the initiative, made the decision and raised money for construction. The involvement of the government in setting treatment fees and solving the problem of delayed payment was essential for the survival of the Central Plant.

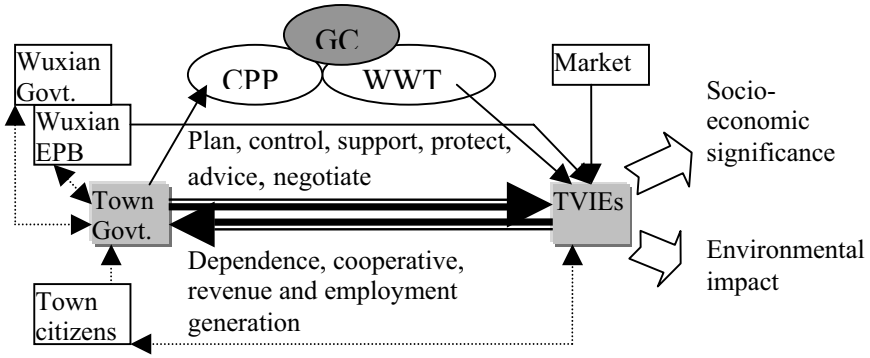
On the other hand, after the town government allowed the WWT plant to be an independent legal person, it never once interfered in the daily operation and management of the WWT plant. Different from the common 'not separated relationships' between the government and town-owned TVEs in other towns, Luzhi leaders never put their fingers on the personnel management of the Central Plant. This was of crucial importance for selecting professionally qualified staff instead of

staffing based on social relationships or personal influence. It also limited the influence of TVIE polluters on the WWT plant.

Luzhi government also functioned as an overall coordinator. It paid attention to other policies and decisions that might conflict with the interest of the WWT plant. For instance, Luzhi government stuck to the principle that, for investment promotion, the wastewater generated by a new project should be within the treatment capacity of the WWT plant. If not, the project would not be considered, no matter how profitable it would be. This demonstrated the environmental awareness of the leadership and its full support to the WWT plant.

The town government also realized that future pollution abatement and control should be achieved through technological advancement and restructuring of industries and products, rather than relying on end-of-pipe solutions. Regional certification of ISO 14001 for the industrial zone was already on the agenda in 2000. In the words of the general manager of the WWT plant, "this is not only to remain as a pioneer in small town environmental protection in China, but also to protect our enterprises in international competition". As it wished, with great support from the Wuxian EPB, Luzhi obtained regional ISO 14001 certification in 2001[139].

Obviously, the Luzhi model has emerged as a good example for introducing market mechanisms into centralized wastewater treatment in a transitional society, but also as a model of new relations between state and markets/firms. Figure 6.2 illustrates the main actors and their interrelationships in this Luzhi model. Important functions of the town government can be seen in all the links.



GC: Luzhi General Company for Agriculture, Industry and Commerce
CPP: Luzhi Central Power Plant
WWT: Luzhi Central Wastewater Treatment Plant

Figure 6.2 Main actors and the interrelations in Luzhi Pro-active Model

[139] *Jiangsu Environmental Statement 2001*, available in: http://www.jshb.gov.cn/report/2001/p07.htm, July 30, 2002.

6.4.3 Conclusions on Wuxian, Luzhi

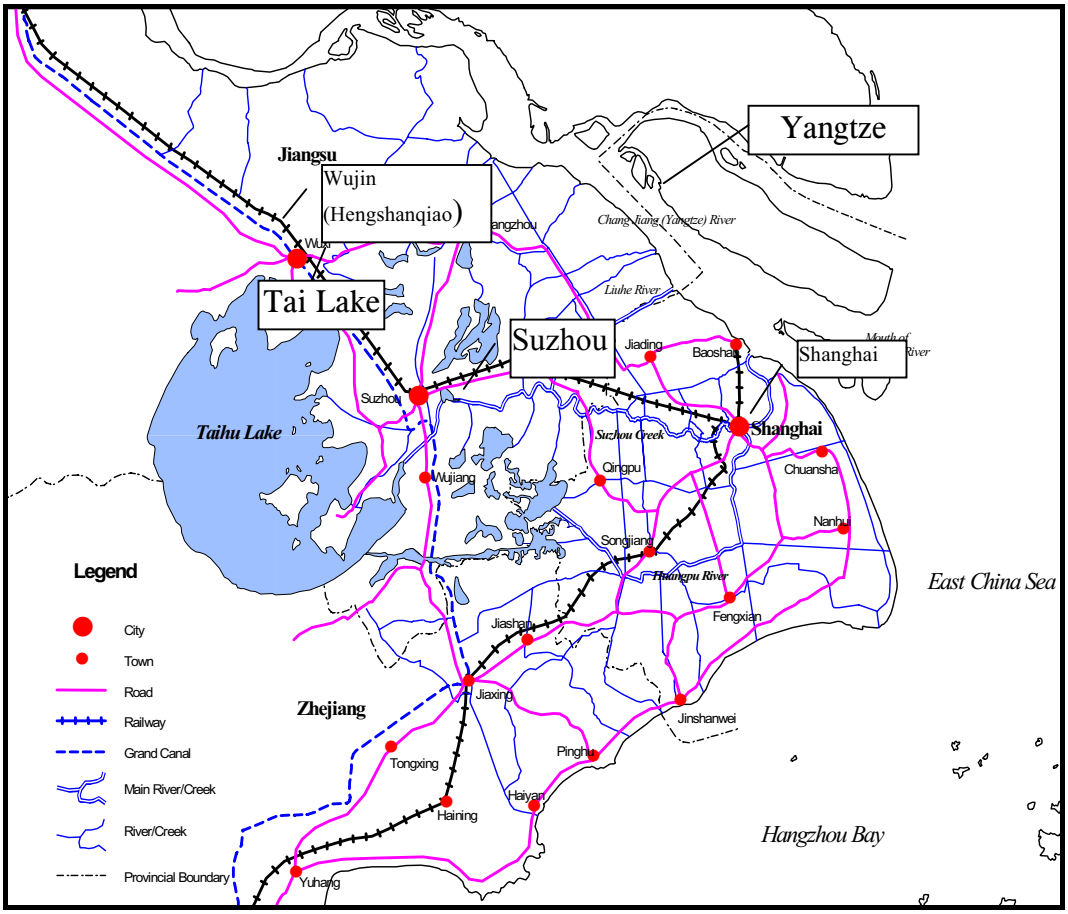
In Luzhi Town, the local environmental protection depends largely on the initiatives and commitments of the town leaders and TVIEs. Once environmental protection is placed at the top of the political agenda, environmental staff in the town have more power in decision making and enforcement.

Upper-level EPB staff approaches the town leaders, environmental staff and TVIE managers as helpful partners by providing information, training, advice and technical assistance. Through delegating and decentralizing some environmental management responsibilities to towns and TVIEs in the form of Environmental Targets Responsibility agreements, the EPB enjoys better achievements and saves its resources for other functions, such as monitoring and supervising.

The Wuxian EPB functions not only as an upper-level environmental regulatory authority, but also as an environmental education and publicity organ. Most environmental publicity activities have been jointly organized by the Wuxian EPB, town environmental assistants and the town government. Cleaner environmental profiles also bring a good reputation and enhanced competitiveness to the town government and TVIEs. Although individual environmental complaints occur, self-organized environmental social groups do not exist.

Wuxian government remains in the background, and does not interfere in the town's affairs, but the favorable policy environment it creates is the precondition for the town's economic prosperity and environmental improvement. Two such conditions are (1) the implementation of separated taxation system between the county government and the town governments and (2) the flexible household registration system that allows freer movement of rural population. Since Jiangsu province is in general at the frontier of China's reform and open-door policy, the direct and indirect influence of direct foreign investment on Luzhi's economic and social life and environmental protection are important.

Map 6.1 Map of People's Republic of China



Map 6.2 The Tai lake basin

Photograph 6.1 The office building of Wujin Municipal Environmental Protection Bureau

Source: L. Zhang, November 2000

Photograph 6.2 An example of the standard sign plate for pollution discharge

Source: L. Zhang, June 1 1999.

Photograph 6.3 An ancient ginkgo tree besides the Buddhist temple in Hengshanqiao town

Source: L. Zhang, June 1999

Photograph 6.4 Wujin Fine Chemical Plant

Source: L. Zhang, June 1999

Photo 6.5 Some awards owned by Lanling Chemical Company

Source: L. Zhang, November 2000

Photograph 6.6 Wastewater treatment station of Hengshanqiao Woolen Mill No. 8

Source: L. Zhang, June 1999

Map 7.1 The Huai river basin

Photograph 7.1 Hualong Cement Plant

Source: L. Zhang, 2000

Photograph 7.2 Dicheng cement plant

Source: L. Zhang, 2001

Photograph 7.3 Yuejin paper mill under renovation

Source: L. Zhang, June 1999

Map 7.2 Daxing town Overall Planning 1996-2010

Source: Daxing town Overall Plan 19960-2010.

7

Towns in Anhui province: Advantages and Disadvantages of Later Comers

This chapter follows the same structure as chapter 6. It starts with a general introduction about the socio-economic status of Anhui and the environmental problems facing it, Followed by relevant information is presented to assess the provincial environmental management capacity. Subsequently, profiles are drawn for the three case study Small Towns, including a description of the municipalities/counties where they are located; data on their economic strength and environmental situations; logic behind their environmental strategies; and the characteristics of the TVIE-Small Town government alliances. Of these three towns, Digang town and Guandou town are under the administration of Wuhu municipal government and Daxing town is under the jurisdiction of Hefei municipal government.

7.1 Introduction

7.1.1 Natural conditions

Anhui province lies in the hinterland of eastern China. It covers a total area of 139,000 square kilometers (about 1.3% of China's total area) and borders six provinces, including Jiangsu province to the east (Map 6.1). It enjoys the so-called 'golden section' of the lower and middle reaches of Yangtze river. The Yangtze river flows through Anhui from east to west for 416 kilometers, and together with two other parallel rivers – the Huai river and the Xingan river - divides the whole province into three natural regions, namely, *Huaibei* (north to Huai river), *Jianghuai* (between Yangzte and Huai rivers) and *Jiangnan* (south to Yangtze river).

Anhui has a larger land area than Jiangsu, but it is less populated. About 62 million people lived in Anhui as permanent residents in 1998 and more than half of this population forms a rich labor resource. The capital city, Hefei, sits right in the middle of the province[140]. By the end of 2001, there were 930 statutory towns[141].

Climatically, Anhui lies within the humid subtropical monsoon zone. There are four distinct seasons. Anhui also abounds in mineral wealth. Its reserves of iron, copper, sulphur, limestone and alumstone rank it among the top five provinces in China, and there are in total 96 discovered minerals. The reserves of coal rank number 6 of the country.

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[140] *Anhui Annals*. Available in: http://go1.163.com/~hyuh/histroy.htm, December 16, 2000.
[141] Available in: http://www.stats.gov.cn/tjgb/ndtjgb/dfndtjgb/200203310336.htm, July 31, 2002.

Energy, steel, non-ferrous metallurgy, chemical and building materials industries have developed through exploitation of these resources.

7.1.2 Socio-economic development

Anhui is an important agricultural province. About 80% of its population are engaged in agricultural production, cropping about 124 million *mu* of land. Its agricultural economy ranks ninth among the provinces of China. The agricultural sector contributed about 23% to the provincial gross domestic production (GDP) in 2001[142]. Farmers' net income was 2,020 RMB in 2001, which is about half of the net income of Jiangsu farmers[143].

Anhui has also established a relatively comprehensive industrial system. About 50% of the industries are located in Yangzte river basin. During the period of 1993-1997, Anhui experienced an unprecedented high growth rate: the average annual growth rate of GDP reached 14.1% (2.36 percent higher than the national average during the same period). The proportion of primary, secondary and service industries was adjusted from 38:38:25 in 1990 to 23:43:34 in 2001. However, compared with Jiangsu, Anhui's GDP was less than half of Jiangsu's GDP in 1999[144].

Over 60% of the industrial output value in Anhui is generated by state-owned enterprises, compared to about 30% in Jiangsu. This indicates that the non-state-owned industries, including collective TVIEs, share-holding companies and foreign-funded companies, have not become as dominant as their counterparts in Jiangsu province. In 2000, TVEs contributed about 23% to the provincial GDP, of which TVIEs generated over 70%. However, the TVE sector has been growing rapidly in recent years. In 2000, there were 711,000 TVEs, employing 4.8 million workers. The last couple of years saw steady increase of private TVEs and the emergence of TVE development zones[145].

Compared to Jiangsu TVEs, the export-oriented TVEs in Anhui are smaller in terms of number and scale. Only 112 TVEs have obtained licenses for direct export.

Apart from these disadvantages, economic development in Anhui has been accompanied by increasing social pressure from population growth, unemployment and environmental degradation. According to a survey by the Rural Economic Research Center of the Ministry of Agriculture (2001), at present, about 23% of the rural laborers in China are moving to urban areas to make money, and this percentage in Anhui is 24%. It is estimated that the rural labor surplus was above 10 million in Anhui. Although Small Towns have absorbed 4.64 million rural laborers since 1978, it is only about 30% of the rural laborers who need to be moved.

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[142] *Statistics of Anhui's socio-economic development 2001*. Available in: http://ahtjj.ah.gov.cn/tjgb/tjgb/2001.htm, August 2, 2002.

[143] Available in: http://www.jsdpc.gov.cn/jwnews/, August 1, 2002, and in: http://ahtjj.ah.gov.cn/tjgb/tjgb/2001.htm, August 2, 2002.

[144] Available in the website of Jiangsu Statistic Bureau: http://www.jssb.gov.cn/jsnj/jsnj06/r61/r6102.htm, August 2, 2002.

[145] *Analysis of the economic development of Anhui TVEs 2000.* Available in: http://www.cte.gov.cn/zw/tjxx/, July 24, 2002.

In addition, Small Town-based rural urbanization in Anhui has not been satisfactory. In 1998, only 22% of Anhui's total population were registered as urban population. This figure is lower than the national average of 30%. In rural areas, only 7% of the rural population lived in towns in 1997, while this figure was 8.1% in its neighbor province Jiangsu. The local experts described the urbanization progress in Anhui with four words: low (only 22.3%), late (started only in the 1990s), slow (only increased 3.2 percent from 1995 to 1998), poor (poorly educated population, lack of infrastructure, poor urban management skills, poor sanitation and environmental management). To a certain extent, the level of rural urbanization has been raised by new administrative divisions[146].

7.2 Environmental challenges and management capacity

7.2.1 How polluted is the environment?

Anhui is also a focal province of the national environmental protection programs. Anhui alone has one river (Huai river) and one lake (Chao lake) to clean up in the priority program of *Three Rivers Three Lakes (sanjiang sanhu)* in *China's Trans-Century Green Plan (1996-2010)*[147]. Pollution in the Huai river and eutrophication in the Chao lake are only part of the environmental problems of Anhui, which also suffers from agricultural pollution, air pollution in cities, overall ecological deterioration, and similar problems.

The Huai river is the life line of a big population and many industries in Anhui, as important as the Tai lake is to Jiangsu province. The Huai river basin covers five provinces: Henan, Anhui, Jiangsu, Shandong and Hubei (Map 7.1). Of its total area of 206,191 square kilometers, this basin in Anhui province occupies 66,940 square kilometers (almost half of the total area of Anhui) or about 33% of the whole basin. The Huai river flows through Anhui for 430 kilometers. In 1997, about 35 million Anhui people (56.4% of the provincial total population) lived in the basin (Anhui EPB, 2001). The whole basin generates about 8% of the national GDP[148].

The Huai river basin used to be a 'land of rice and fish'. However, the last decade of the 20th century proved an environmental disaster to the Huai river. Due to the uncontrolled pollution discharge into the river, no fish could survive. In 1994 and 1995 a succession of catastrophic pollution accidents in the Huanhe basin set off alarm bells ringing at the highest levels of the Central Government. Even tap water smelled disgusting. It became common to see people in cities digging their own wells or buying clean bottled water. The Huai river became the dirtiest of the seven major rivers in China (Bai, 2000; Cao, 1998). Frequent pollution accidents plus floods in the early 1990s[149] were seen as the revenge of the environment. According to a subsequent survey, 75 per cent of the river sections in the Huai river basin were seriously polluted and had lost all natural functions. Eighty per cent

[146] Anhui Provincial Statistics Bureau, 1999.
[147] See section 6.2.1.
[148] In the web site of SEPA: http://www.zhb.gov.cn/, June 20, 2002.
[149] In 1991, more than 4 million hectares of farmland in the Huai river basin were flooded, striking more than 50 million people and causing direct economic losses of more than 30 billion RMB. The next year, the river's main stream was seriously polluted by a wastewater spill of 150 million cubic meters, making the water unusable for industry and drinking (Vermeer, 1998)

of its tributaries had black/green water. Millions could not use drinking water from nearby, and factories had to close. The most serious pollution was caused by the paper, chemical, dyeing, tannery and liquor industries. In 1994, only 12 per cent of the 2.5 billion cubic meters of wastewater were treated. Death rates were several times higher than elsewhere (Vermeer, 1998; Anhui EPB, 2001).

Among the polluters are small-scale TVIEs that have been developed rapidly in the last decade in the Huai basin. Small paper mills and breweries, in particular, generate about 30% of the total industrial wastewater in the basin. Water pollution has caused heavy economic loss and social instability. The period from 1978 to 1992 witnessed 160 severe water pollution accidents, which involved direct economic loss of over 120 million RMB and immeasurable indirect loss (Liu, 1996).

In 1995, temporary regulations for the Huai river (the first of its kind for a river basin) were issued by the State Council. It adopted *The Huai River Water Pollution Prevention and Control Plan* for the following year, which stated that, by the end of 1997, all factories in the basin should meet standards of discharge, and that the Huai river should be clean by 2000 (Vermeer, 1998). In 1996, the State Council ordered local authorities to close down all small paper, leather and dyeing factories as well as chemical, electroplating, asbestos and other factories with polluting technologies before 30th September of 1996. As a consequence, more than 60,000 enterprises were shut down. It was a clear signal to the polluters that enterprises could choose to wipe out pollution or to be wiped out by pollution (Bai, 2000). However, it was not clear where the money for clean-up could come from. In 1995, the estimated cost to clean up the Huai river and to advance it to class III in the national standards[150] were estimated to be 12 billion RMB, or 0.77 per cent of the region's GDP in the previous year (Vermeer, 1998).

After six years of efforts, and especially through the 'zero hour' clean up action[151] in 1999 and the 'total control, two targets' campaign in 2000[152], it was reported that pollution in the river was controlled to the level of 1995 (Wang, 2001). According to the monitoring data (China Central Environmental Monitoring Station, 2001), COD of the Huai river met class III of the national standards, and the major branch rivers reached class IV. However, this success was still far from a real clean river.

7.2.2 Environmental management capacity

Given the environmental challenge in Anhui, the political attention attached to environmental issues is also high. For instance, as a quick response to the *Circular*

[150] According to the State Standards for Surface Water Quality (GB3838-88), Standard III is for the water quality which is good enough to be used as drinking water source. See also Appendix I.

[151] 'Zero-hour' clean up action is a forceful action to support 'total control, two targets'. All the industrial polluters on the list are checked at zero hour of the year.

[152] 'Total control, two targets' are the most important national environmental targets set by the State. It was first stated in *State Council's Resolution Regarding Several Environmental Protection Issues* (State Council document No. 31, 1996) that total pollution load must be controlled, all industrial polluters must meet the national or local pollution discharge standards by 2000, water and air qualities in key cities must satisfy function-based standards. These goals were further stressed in the *State Council's Comments* (September 3, 1996) on the Ninth Five-Year Plan and Long-Term Targets toward 2010 for Environmental Protection.

transmitted by State Council on the further promotion of the implementation of China Agenda 21 suggested by State Planning Commission and State Commission for Science and Technology in 1996, Anhui is among the few pioneer provinces in China to form a special Leading Group to speed up the implementation of the local Agenda 21 within the province. The Anhui Agenda 21 Leading Group is headed by one vice governor, and has members from 30 authorities directly under the provincial government. This shows clearly the determination and commitment of the Anhui government to strive for sustainable development. The fact that a local Agenda 21 Office was planted within the provincial Planning Commission[153], which is one of the most powerful departments at the provincial level, indicates that the provincial government has determined to integrate sustainable development into its overall planning. This office is responsible for the formulation and implementation of the guidelines of local Agenda 21; carrying out experimental projects for demonstration; screening priority projects; establishing database of the priority projects; promoting these projects; and conducting training and popularization activities. With the strong support from the provincial Planning Commission and the provincial government, the Anhui Agenda 21 Office has been very active striving for international supports. For instance, the Clean-up Project in the Chao lake was funded by the Asian Development Bank (ADB) and the Clean-up Project in the Huai river used World Bank loans[154].

The Anhui Environmental Protection Bureau (Anhui EPB) is another major authority that is responsible for environmental protection in Anhui. The Anhui EPB was first set up in 1979 and had 30 staff. It merged into the Commission for Urban Rural Construction and Environmental Protection (later changed to a Department) in 1983. It resumed the title of EPB in 1992. Since then, governments at all levels, for the first time in the history, were required to integrate environmental protection into various development plans. By 1994, 2,245 staff worked in the Anhui EPB system, and over 60% of them were professionals and technical staff. Over the past few years, the EPBs at all levels have been continuously strengthened. By the year 2000, the number of organizations of all kinds[155] within the EPB system increased to 361, employing 4,104 people. Among the towns and townships, 135 statutory towns had made their environmental plans. The Anhui EPB is now a governmental agency which is responsible for the enforcement and supervision of national and local environmental laws and regulations; making provincial environmental plans; conducting EIA for government's development plans and major projects; resolving environmental disputes within Anhui and between provinces; carrying out environmental publicity and education; protecting natural and industrial environment; carrying out environmental monitoring; processing environmental data; and managing international projects. In its "Ninth FYP", the major environmental targets include: pollution discharge

[153] After the institutional reform since 1998, Anhui Planning Commission is functioning as a government agency who takes care of the comprehensive economic development by providing consultancy to the provincial government, macro-planning, policy making, overall regulation. Vertically, it reports to the State Planning Commission, and controls over the Planning Divisions within various Departments at the provincial level horizontally. It is how the national planning is broken down to the provincial level and translated into different sectors. On behalf of the provincial government, Planning Commission formulates short-term and long-term objectives and plans for the regional social and economic development according to the financial capability of the governments and other resources. It also has the authority to allocate certain amount of fund to guarantee the investment of some projects.

[154] Interview with Mr. Hesheng Xu, division director, Anhui Planning Commission, Feburary 1999.

[155] Anhui EPB system consists of the provincial EPB, Environmental Supervision and Management Team, Environmental Monitoring Station and Anhui Environmental Research Institute that are affiliated with EPB; EPB's counterparts at municipal and county levels.

in the Huai river basin should meet the required state environmental standards by the year 1997; in the Chao lake basin pollution discharge should meet these standards by the end of 1999; all other industrial polluters should meet the standards by the year 2000. These targets are in accordance with the national "Ninth FYP and the Long–Term Targets Towards 2010".

To respond to country-wide campaigns, such as 'one control, two targets' and 'zero hour' clean up actions in key rivers and lake basins, various means have been mobilized at provincial level to achieve the goals. In order to realize the goals of 'one control, two targets' by the end of 2000, the governor of Anhui stressed in a television and telephone conference that the government would stick to the targets, requirements, timetable and standards as it was planned. Political leaders at all levels of governments were required to fulfil their environmental responsibilities and this would be an important indicator for evaluating the performance of the leaders. The governor was also personally involved in on-site inspections. He made an unannounced inspection visit to a small cement factory 30 days before the 'zero hour' without informing the factory in advance. Many other leaders followed the governor's action partly because their performance could positively affect their personal political careers. These 'extra' interventions of the political leaders helped draw attention of the public and the media to environmental issues, but the sustainability of these actions is questionable.

With this strong political support, the Anhui EPB had the opportunity to build up its authority and reputation. In 2000 alone, more than 200 publicity activities were organized across the province on the World Environmental Day. Over 70 television speeches by important political leaders were broadcast. The provincial EPB organized three training courses that involved 80 county EPB directors. EPB at all levels conducted 25,000 on-site inspections to enforce compliance with pollution discharge regulations. As a result, 132 million RMB in discharge fees were collected. In total, the EPBs responded to 449 environmental cases from local People's Congress and Political Consultative Conference, 4,911 letters of complaints, 7,710 telephone complaints and 3,790 visits. Upon the 'zero hour' of 2000, Anhui EPB declared that 6,251 of the total 6,275 polluting industries listed for 2000 had satisfied the discharge standards. SO_2 emission was reduced by 14,000 tons. And they managed to maintain the total pollution load at 1995 level. The Anhui EPB also boasted that 90.6% of the 619 construction projects had done an EIA and 98.2% of the 113 projects which were required to apply the 'three simultaneous practices' had had their results checked and accepted. In the same year, 2.514 billion RMB in total or 0.83% of the provincial GDP was invested in pollution treatment. Four firms obtained ISO 14001 certificates in 2000 (Anhui EPB, 2001). However, it must be noted that most of these figures were calculated based on data that excluded TVIEs. Only some large key TVIEs were included.

Similar to what happened everywhere else in China[156], some industries in Anhui which were shut down during the campaigns opened again and were even protected by the local governments because the polluters are also the companies that generate the local revenue.

[156] According to investigation in key regions and basins, above 10% of the industries that met the discharge standards due to the pressure in 2000 are discharging over the standards again, and about 30% of those that were shut down in 2000 started production again (Wang, L., June 1, 2001, in *China Economic News (jingji shibao)*). To deal with this situation, governments in many provinces took actions to control, e.g., Qinghai province, Liaoning province and Hainan province, according to *China Environmental News (zhongguo huanjin bao)*, 2001.

Part of the environmental improvement that was achieved in 2000 has been offset by this illegal conduct. If this situation continues there will be no guarantee for the realization of environmental targets set in the provincial "Tenth FYP". Responding to this relapse of pollution, the vice-governor called for a television and telephone meeting on June 20, 2001. In his speech he required the government officials at all levels to take environmental protection as seriously as political issues. He also called on the media and the public to play their roles in this action. Joint efforts were afterwards made by the Anhui EPB, the provincial Economic and Trade Commission, the Department of Supervision and the Department of Forestry to investigate and punish those polluters who violated environmental laws and regulations.

Governments in Anhui have a clear political commitment to environmental protection, but they have to cope with environmental issues under great pressures of unemployment, rural urbanization and demand for further economic growth. Since Anhui is in the midst of rapid economic growth and transition, the complexity of sustainability issues is large. However, it is also the advantage of the late comers (compared to Jiangsu province, for example), that lessons learned from others can prevent repeating the same mistakes.

7.3 Fangchang county, Digang town

7.3.1 Introduction of Fangchang county

Fanchang is one of the three counties under the administration of Wuhu municipality. Wuhu is situated in the southeast part of Anhui, along the Yangtze river. Wuhu is part of the lower Yangtze river plain. Wuhu is in a strategic position for the opening and development of a so-called "T-shape" region, which includes the eastern coastal areas and the economic belt along the Yangtze river (Map 7.2). Apart from three counties, Wuhu is divided into four districts. Fanchang county and Jiujiang district are the focus of this study because Digang town is located in Fanchang and Guandou town belongs to Jiujiang (Figure 7.1).

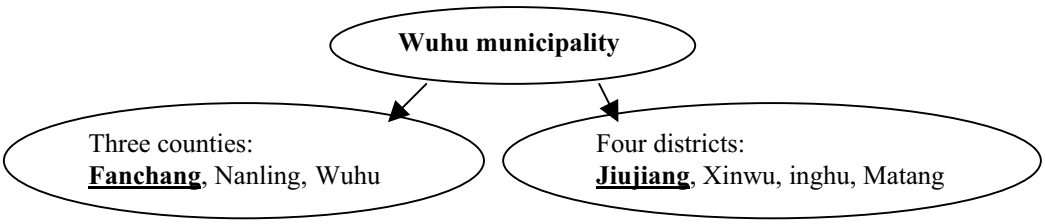

Figure 7.1 Administration division of Wuhu municipality

Fanchang, a prosperous county, is situated in the western part of Wuhu. It is on the southern bank of Yangtze river and is known as "the gate to southern Anhui". Its history dates back to 109 B.C. when it was made a county named Chungu. Currently, it covers 880

square kilometers of land and has a population of around 451,000 people. There are nine towns and 11 townships within its territory.

Fanchang is very rich in mineral resources, having deposits of 34 kinds of minerals. Fanchang is also in a very advantageous location for development and transportation. It is between two major cities, Wuhu and Tonglin, and within the radius of the Shanghai economic region. An all-dimensional transportation network based on Shanghai-Tonglin railway, Wuhu-Tonglin highway, 42 kilometers long waterway of Yangtze river and numerous roads and rivers makes it easily accessible.

Benefiting from abundant natural resources and a convenient water-road transportation network, various industries have developed in Fanchang, and some of them have become very export-oriented. In 1997, the total export volume ranked number one among the counties and cities in Anhui. The private economy has been encouraged here and every year this sector contributes about 30 million RMB to the local revenue. Over the last few years, the appearance of Fanchang has been renewed with improved urban infrastructure and was ranked number two “civilized county” in Anhui in 1997. In recent years, it succeeded attracting more and more investments. One example is, the investment by Conch Group in Digang town to build up a cement plant with an annual production rate of 3 million tons. This project will make Fanchang the “number one cement county” in China.

Markets have been developing in the period since the ‘open door’ reform. Approved by Anhui Planning Commission in 1993, E'qiao Tea Market is listed as one of ten key construction projects. "To buy famous tea from whole China, to sell famous tea to whole China", is the leading principle of the E'qiao Tea Market. Sanshan Vegetable Market is also well-known in the region.

Since 1993, Fanchang has been opened to foreigners with the approval of the State Council. In 2000, this county ranked eighth in Anhui based on a comprehensive economic strength evaluation of counties and cities. Fanchang farmers’ net income per capita was the highest of all counties in Anhui. Fanchang also ranked among ‘top ten counties of China’ regarding TVEs development.

However, like the overall situation in Anhui, the conflict between limited arable land and increasing rural population in Fanchang county is obvious. In 1998, Fanchang had a total population of 451,915 people, of which 383,323 were classified as rural. These rural people had to make a living from 333,887 *mu* arable land, making the average arable land per capita of rural population only 0.87 *mu*. Although accurate monitoring data are not available, water pollution and air pollution by mining and other living and production activities were rather visible during field visits for this research.

Unfortunately, the county EPB, which was established in 1996, has only 15 staff including the director and seems unable to control the pollution in an effective manner. Even after the institutional restructuring in 2000 at local level, the county EPB is still affiliated with the county Rural and Urban Construction Committee as a second-tier organization. The 15 EPB staff work in three functional sections, namely, the General Affairs Office, the Supervision & Administration Section and the Monitoring Section. With very limited resources, this EPB is supposed to be in charge of the environmental protection work in 20 towns and townships within Fanchang county. It now has liaison persons/environmental

assistants in only 7 towns and Digang is one of these. Although the present EPB director, who was appointed after the local institutional restructuring in 2000, is very concerned about the local environmental situation, he can not do more than collecting the discharge fees on which the EPB lives, producing some environmental publicity via local radio and television, training of the enterprise managers, and assisting the upper level EPBs when it is required. Besides the EPB director, who is on the pay roll of the county government, the salaries of the other staff are from the pollution discharge fees they collected. The fees are also used to cover some other costs of the Fanchang EPB[157]. The EPB has been gaining influence and power in the decision-making structure of the government, but it can only advise on proposals and projects, which hardly ever result in any change in decisions. It is also beyond the capability of the EPB to advise industries systematically on pollution treatment and prevention technologies. Although the EPB was granted some basic monitoring equipment by UNDP project (CPR/96/507, see chapter 1) in 1998, its staff still need to be trained to operate the equipment properly, which had not been done until relatively recently[158].

7.3.2 Digang town

Geographical location, natural environment and resources

Digang is a town with more than 1,700 years of history. It lies at the south bank of the lower reach of the Yangtze River. It is about 45 kilometers away from two major cities of the province, namely Wuhu and Tonglin. It covers a total area of 47.6 square kilometers, of which the built-up town area was 3.5 square kilometers in 1997.

Digang is surrounded by mountains on three sides and opens to the Yangtze river at the west. More than one third of its land is hilly and the rest belongs to alluvial delta. Intensive human works on the land over the past decade have reshaped the landforms especially around the town proper area. For instance, the hills named Qingshanchong, Huangjiashan, Tongshan and Laobutou have been partly or completely leveled due to mining activities. A waterline of 7.5 kilometers from the Yangtze river offers the town access to navigation all the way to Shanghai. There are 28 wharves for freight and passenger vessels along the Yangtze river (8 of which are 3,000 ton class and one of which is 10,000 ton class).

Digang enjoys a mild subtropical monsoon climate with four distinct seasons. Thanks to the favorable climate and geographical location, water shortage is never a problem there. But, on the other hand, it is under the risk of being flooded whenever the water level of the Yangtze River exceeds 12.5 meters. Since 1900, 31 floods have been recorded.

Digang is very rich in iron ore, coal and limestone. The proven reserves of limestone are as large as 370 million ton, and can be used for road construction, cement or as auxiliary material for ferrous metallurgical industry. The town is also well-known for its rich aquatic products.

[157] Interview with the former EPB director, Ms. Chen in July 1997.
[158] Interviews with the former EPB director, Ms. Chen, in July 1997 and the environmental assistant in Digang town, Mr. Zhang, in March 2001.

Socio- economic development

Digang became a town first in 1952. It experienced several changes up until 1984 when it resumed its town status following the new *Constitution*[159], which came into force in 1983. It governs ten administrative villages, and has a total population of 44,000, of which 26,000 are registered as urban population (but only 15,000 live in the built-up town area). At the town level, there are four major authorities, namely, the Digang Communist Party Committee, the Digang People's Congress, the Digang Town Government and the Town People's Political Consultative Conference. It is the town government that is responsible for social economic affairs involving town construction, land use, finance and taxation, civil affairs, birth control, education, transportation, water conservancy, judicial affairs, etc.

According to the "*Urban System Plan of Wuhu Municipality Through Year 2010"*, Digang will be developed into a sub-central town in Wuhu city, the economic center of Fanchang county and a base for the expansion of the urban industries. Therefore, infrastructure construction is the priority for investment in the town, and at the same time there is a need to fortify the town's position as a base for construction material industry. In accordance with this regional plan, Digang modified its "*1994's Overall Development Plan"* by taking the villages into consideration. The built-up area of the town was planned to expand from 3.5 square kilometers to 12.5 square kilometer in 2010[160].

Digang experienced its most rapid industrial growth following the inception of the Open-door Policy around 1980. With the advantage of rich limestone resources it has established a strong base for the cement and construction material industry, which in turn have helped the development of metallurgical industry, machine manufacture, chemical industry, textile, transportation and ship making. More than 1,000 industrial products are produced in Digang, of which ten have received awards for their quality by Ministrial and provincial authorities. Its cement production ranks second in the country among towns and townships. The number of TVEs has increased from 30 in 1986 to around 2,500 (including private enterprises and farmers cooperatives) in 1999. Over 60% of the total TVE output value is generated by TVIEs. In 1999, the net farmers' income per capita was 2,976 RMB, increased by 62.7% compared with 1995[161].

Changes in Digang's industrial composition have contributed to its economic growth. Historically, Digang urban area used to be a center for commercial activities and the local economy was based on agricultural production. Since the early 1980s, with rapid development of TVEs, its industrial output value has been increasing steadily. In 1985, when the agricultural output value was 6.43 million RMB, the town and township owned enterprises contributed 15 million RMB to the town's total output. Since then, industrial enterprises gained a dominant position in its economy. In 1997, the industrial sector and

[159] According to this new *Constitution*, communes were replaced with towns and townships. See also chapter 4.
[160] Digang town government entrusted Wuhu Municipal Planning and Design Institute to formulate an Overall Town Development Planning in 1994, including land use plan, road construction plan, water supply and sewage, communication infrastructure plan, etc, according to *Report on Digang Town Development* offered by the town government during the author's visit in November 2000.
[161] *Report on Experimental Work of UNDP Project CPR/96/507 in Digang (Digang zhen UNDP xiangmu shidian gongzuo huibao),* provided by the town government, 2001.

the service sector contributed over 99% to the town's GDP. The agricultural sector has been losing its importance while the service industry has been increasing. The industrial sector maintained its dominant position.

In 1997, there were 2,059 industrial enterprises in Digang, of which 20 were owned by the town, 45 by villages, 229 were household cooperatives and the rest were private. All together they owned total fixed assets of 350 million RMB, of which 240 million RMB belonged to the town-owned enterprises. Four enterprises, namely, Jindao Group, Yangshan Group, Suya Group and Development Cooperation, achieved each an annual output value over 100 million RMB. There was a leading enterprise in each industrial sector followed by others, such as: Jindao Group for building material sector, Yangshan for mining sector, Powder Metallurgical Plant for machine manufacturing, Plastic Powder Plant for chemical industry, and Shuyao Group for textile and clothing sector[162].

Due to its outstanding effort in town development, Digang has since 1995 been listed as a pilot town for experiments on town construction and comprehensive reforms by the China Center for Town Reform and Development (CCTRD), the Ministry of Construction, and the United Nations Development Program (UNDP). Between 1997 and 2001, improvements included the reconstruction and concrete surfacing of three major roads leading to Wuhu, Fanchang and Tongling cities, and the removal of more than 10,000 cubic meters of silt from a lake in the built-up town area, after which the area became a public park. With expansion of one market, commercial buildings and residential districts of 10,250 square meters grew up around the market area.
Digang is combining rapid economic growth with town development. Under the guidance of its *Overall Development Plan*, it aims to become the political, economic, cultural and commercial center of its surrounding rural area, collecting and distributing goods and products from the 14 towns and townships on the one hand, and information and ideas on the other.

Environmental situation

Digang is known as a dusty town where air pollution (from particulates) is the most serious pollution problem. Sources of air pollution include dust from cement factories, road dust, and dust from mining, coal and iron forging, along with industrial emissions and household coal smoke. Since environmental monitoring is not carried out regularly for each town, air emission data used in this study are based on monitoring done by Wuhu Municipal EPB in 1993 as requested by Fanchang. Although the town government has taken some measures to improve air quality in last few years, the fundamental problems have not been solved.

According to the data on SO_2, Total Suspended Particulate (TSP), dust, NOx and fluoride[163], Digang is the town that most suffers from air pollution in Fanchang county. Its

[162] UNDP Project CPR/96/507 document, 1999.
[163] The method of *Pollution Load against Evaluation Standard* is used to calculate the pollution load against the evaluation standard of a certain pollutant in air by following the formula: $Pi = Ci/Csi \times Qi \times m$, in which, Pi is the pollution load against the evaluation standard of pollutant i, Ci is the actually measured average concentration value of pollutant i in mg/l , Csi is the evaluation standard for pollutant i in mg/m^3, Q is the volume of the waste gas containing pollutant i in ton/year, m is the coefficient of waste gas conversion. The pollution load against evaluation standard of a pollution source (a factory, for example) is the sum of the pollution loads of all the pollutants it generated. The same idea applies to the calculation of the total pollution load of a region or the total pollution load of a certain pollutant in a region.

enterprises contributed 59% to the total emission load caused by TVIEs in the whole county. TSP have the largest share, or 92.5% of the total load followed by SO_2 and Nox, with cement factories responsible for 81.3% of the total air pollution load. Table 7.1 shows the shares of some major air polluters in Digang. Digang Town Cement Plant (Box 7.1) ranked as number one air polluter by contributing 26.2% to the total air pollution load[164].

Table 7.1 Top five air polluters in Digang town (in % of total air pollution load)

Pollution sources	Shares in percentage (%)
Digang Town Cement Plant	26.2
Wuhu Minicipal Cement Plant	15.9
Qingshan Cement Plant	10.1
Hualong Cement Plant	9.4
Hualian Cement Plant	5.5

Source: UNDP Project CPR/96/507 document *China Small Town Environmental Policy and Planning (zhongguo xiao chenzheng huanbao zhence yu huanjin guihua yanjiu),* 1999.

Box 7.1 Digang Town Cement Plant

Digang Town Cement Plant is owned by the town government. It is located along Qingshan road, which is a main road of the town proper. It owns a fixed asset of 13.674 million RMB. It has 2 production lines with an annual capacity of 88,000 ton for each and one production line with annual capacity of 44,000 ton. Data of 1993 shows that it produced 89,100 ton of common silicate cement and 50,600 ton of chamotte.

Limestone, clay soil, iron powder and coal are the main raw materials. Its production process mainly involves pulverizing raw materials, mixing with water, calcine in the kiln, pulverizing the chamotte, grinding, selecting, sieving and packing. Dust emission is mainly from pulverizing, grinding, calcining, sieving and packing process. In 1993, this plant generated 6,157 ton dust, or 43 kg for every ton of final product. This was 239 times the allowed emission level for cement sector (GB4915 – 85, 0.18kg/ton in district of Category V). SO_2 emission was 456 ton in the same year. According to the audit, more than half of the dust was from pulverizing the raw material without any dust collection equipment. There were either static electric dust collector or dust bags for other processes. This plant also discharged 56,000 ton waste water from its cooling process without any treatment.

Source: "*Pollution Sources in Digang Town (Digang zhen wuran yuan)"*, provided by Digang Urban Planning and Environmental Protection Committee (*Chengjian Huanbao Weiyuanhui), 1999*.

The data on air pollution in this section are based on these calculations done by the environmental team of UNDP Project CPR/96 in 1999.

[164] According to the UNDP Project (CPR/96/507) document *China Small Town Environmental Policy and Planning (Zhongguo Xiao Chenzheng Huanbao Zhence yu Huanjing Guihua Yanjiu),* 1999.

Due to poorly controlled land use in the past, 7 cement factories are located within the town central area and are scattered along the mountains. They are also located in the direction of the prevailing wind through the year. These inappropriate locations immediately cover the residential districts downwind in dust. Most of the cement plants in the town central area are collectively owned by the town. They were poorly equipped when they were established in 1970s and 1980s. Although some measures have been taken to control dust emissions by upgrading technologies and equipment, the improvements vary from plant to plant. For instance, dust emission per unit of product is 57 kg/ton in Qingshan Plant, while Hualong Plant managed to reduce the dust emission to 13.9 kg/ton.

Air emissions come not only from industries, but also from the burning of coal by households and restaurants in the town area. In 1993, more than 2,200 ton of coal were burnt, which generated about 107 ton of smog and dust and one ton of SO_2.

According to the National Air Quality Standards (GB3095 –82), air quality in Digang town area is worse than class III[165]. The average level of TSP is 0.67Mg/m^3, SO_2 above 0.08mg/m^3, and NOx above 0.06 mg/m^3. With further social and economic development, the industrial output values in 2000, 2005 and 2010 are predicted to reach 2.52 billion RMB, 3.1 billion RMB and 5.44 billion RMB, respectively. Mining and building material sectors are expected to grow significantly, consuming more coal (and cement). Consequently, environmental quality in Digang will likely degrade continuously if no effective control measures are put in place. The UNDP made projections on the trends of coal consumption, SO_2 emissions and dust emissions for the years 2000, 2005 and 2010 (Table 7.2). The air pollution level will increase continuously if there is no control, and TSP and dust concentration will by far exceed national standards (Table 7.3).

Table 7.2 Projection of the air pollution sources in 2000, 2005 and 2010 in Digang Town

Items (in ton)	2000	2005	2010	Notes
Coal consumption (industry and households)	228,000	330,000	482,000	
SO_2	1,026	1,485	2,169	With sulfur content of 0.45%
	1,368	1,980	2,892	With sulfur content of 0.6%
Dust	884	1,280	1,870	Dust emission coefficient: 3.88×10^{-3}

Source: UNDP Project (CPR/96/507) document *China Small Town Environmental Policy and Planning (Zhongguo Xiao Chenzheng Huanbao Zhence yu Huanjing Guihua Yanjiu),* 1999.

[165] See Appendix II.

Table 7.3 Projected concentration of air pollution in Digang in 2000, 2005 and 2010 (annual average)

Items	2000	2005	2010	Air quality standards*	Notes
SO_2 (mg/m^3)	0.061	0.075	0.087	0.15	Based on sulfur content of 0.6%
TSP (mg/m^3)	0.55	0.58	0.69	0.5	
Dust ($ton/month/km^2$)	56.72	58.63	60.12	3.0 mg/m^3	

* According to national and Anhui provincial 'Ambient Air Quality Standards'.

Source: UNDP Project (CPR/96/507) document *China Small Town Environmental Policy and Planning (Zhongguo Xiao Chenzheng Huanbao Zhence yu Huanjing Guihua Yanjiu*), 1999.

Compared with air pollution, industrial and domestic water pollution is a minor problem. There are no wastewater treatment facilities in the whole region. The Wuhu Municipal Environmental Monitoring Station monitored Digang section of the Yangtze river in August and November 1994. Their data show that water quality in Digang section of the Yangtze river was good and meets class II of the national standards[166], due to a relatively small amount of wastewater and strong self-cleaning capacity of the river. However, the water quality in Hehua Pond and Desheng Pond only meets class V standards. These two ponds are both located in the central part of the town and take in domestic wastewater and wastewater discharged by factories. Although these polluted waters have not affected the Yangtze river, their impact on the local environment will increase with the growth of the population, water consumption and growing local industries. A chemical factory and an electro-plating factory, both creating a considerable amount of water pollution, were closed down in 1997 in response to the ban on small operations in the 15 most polluting sectors.

Solid wastes and noise problems have not been put on the agenda. In fact, no monitoring and reliable data on these problems exist.

Environmental management of Digang

Environmental protection in the town is the responsibility of the Digang Urban Planning and Environmental Protection Committee (chengjian huanbao weiyuanhui). Three staff were appointed by the town government for environmental work. Their work involves communication with and/or assistance to the county EPB in case that is required. They are also responsible for disseminating environmental information to firms, checking environmental impacts of the proposed projects and advising the town leaders on environmental decisions.

The organizational structures at both county and town level indicate that the EPB and the town environmental workers depend very much on the county or town governments, from whom they get their salaries and other supports. As second-tier functional divisions, they have to take orders from their immediate bosses and the leaders of the county or town

[166] See Appendix I.

government. The county EPB has no direct influence over the selection of the town environmental staff, and therefore can neither play any direct role in the decision-making process nor influence other departments' work.

This institutional weakness is clearly reflected in the (lack of) enforcement of the pollution emission fee collection system. This fee system was first applied to state-owned enterprises in 1982, but fee collection from the more numerous township enterprises only began in 1993. Fees are imposed once every year and the fee calculation is based on either on-site monitoring (only once a year) or an estimate of pollutants emitted based on the levels of production, figures which depend on the factories own reporting to the county EPB. The fees from the state-owned enterprises based in Digang are collected directly by the county EPB, while town environmental workers collect fees from TVEs. In both cases, 70% of the fees should return to the factories to use for pollution control measures. It appears that it is not clearly monitored as to whether these fees are actually used for pollution control in the factory. Of the remaining 30%, 10% is sent up to the Wuhu Municipal EPB and 20% goes to the county EPB. Since only one position in the county EPB is paid by the government, the vast majority of the fees goes to the salaries of the bureau members. Therefore, it is theoretically possible that none of the fee collected from the polluting factories goes into any form of pollution control other than the labor costs of the environmental protection system. Understandably, the town environmental staff members are not motivated to collect fees from their TVIEs if they do not benefit[167].

Given this system, towns and villages can not count on this county EPB to safeguard their environment. Fortunately, the Digang town government has been making its own efforts to take care of local environmental quality. In 1994, a report entitled *Implementation Measures for Environmental Protection in Digang Town*[168] was passed during the 11th town People's Congress. Since then, environmental protection has become one of the components of the overall development plan of the town. In order to base environmental planning on a scientific evaluation of the local environmental situation, Digang town invited the Wuhu Municipal EPB to conduct a comprehensive evaluation of the environmental quality in Digang in 1995. Based on this evaluation, specific remedial measures have been proposed by the Wuhu EPB. This environmental information has slowly built up the local political awareness on environmental issues. Subsequently, the town government adopted a strategy to gain external attention and support by presenting their problems and their willingness to improve, instead of hiding their environmental problems. Severe air pollution even became the selling point of their environmental project proposals to attract national and international aid. The aforementioned UNDP project and experimental projects by several ministries on sustainable Small Town development have further enhanced local environmental capacity.

In order to demonstrate the commitment of the town leadership to implementing the UNDP project and other experimental projects, a *Plan for Environmental Pollution Treatment in Digang* and *Administrative Measures for Goods Transportation along Yangzte River and at the Wharves* have been formulated and put into effect. Some 60 million RMB has been invested to improve several major roads used for transportation of cement, in order to reduce dust. A watering car was bought to spray water on the roads. Wharves for cement

[167] Interview with Mr. Zhang Qing, environmental assistant of Digang, June 3 of 1999.
[168] Written material provided by Digang government, June 3, 1999.

and gravel have been improved as well. A household waste collection station and land-fil site were constructed at a cost of 200,000 RMB, the first of its kind among the towns in Wuhu. Seven heavily polluting quarries have been closed. Hualong cement plant invested 3 million RMB for ten sets of high-pressure static electric dust collectors and bag-type dust collectors. Digang town cement plant invested 4 million RMB for dust control. At the end of 2000, the town government declared that most of the major air polluters in the town met the emission standards. The 'three simultaneous practices' and the environmental impact assessment (EIA) have been applied to all the new or expansion projects to prevent new pollution sources. Factories are required to report their pollution emissions to the town environmental assistants so that profiles of pollution sources can be established[169]. However, information on emissions is still mainly provided by enterprises themselves, and the county EPB and town environmental assistants can only do random inspections and checks. The quality of the data depends largely on the willingness of the factory managers to tell the truth, as well as the attitude and skills of the individuals who fill in the forms and the means at their disposal to monitor the pollution. Although it is too early to judge the effectiveness of these measures (the investment for pollution control facilities and road construction, environmental pollution reporting system, closing of the most polluting factories, environmental planning and implementation of environmental regulations), at least these are clear signals from the town government that environmental protection is on the political agenda. According to the town environmental assistant, as a result, TSP level has been reduced from 0.67 mg/ NM^3 in 1995 to 0.36 mg/NM^3 in 2000.

In addition to the aforementioned remedial measures, the town government has also considered a longer-term strategy to reduce pollution emissions by adjusting the composition of industries and the locations of industries. In the future, other less-polluting industries will be encouraged to increase the diversity of the industrial sector. According to the *Digang Overall Development Plan*, within its 3.5 km^2 of the built-up town area, no more polluting industries will be permitted. Three types of districts have been identified based on their functions. The UNDP project team has made proposals for relocating the cement plants gradually.

While this land zoning will definitely help pollution control, its ultimate success relies on the effective implementation of the plan and other relevant policies. There will be no fundamental change if the *Digang Overall Plan* remains a 'paper tiger' only. Unfortunately, the necessary monitoring, supervision, management, technical and financial capabilities are not there yet. In addition, relocation of a factory is not merely a matter of money, but a social issue as well. Market is also an important factor. Employment and social stability associated with relocations is the primary concern of the town government. The ongoing institutional reforms in collectively owned TVIEs on the one hand separate government from business by introducing a clearer definition of the ownership, but on the other reduce the control of the town government over the TVIEs. Although only 3% of the collectively owned TVIEs were turned into private or co-operative share-holding companies by 1999, this percentage is expected to increase rapidly. It will be no longer easy for the government to order the plants to relocate or change their operations.

The lack of a reliable monitoring network also contributes to the difficulties in implementing any effective environmental planning. Sound environmental monitoring data

[169] *Digang Town Environmental Protection Work Report*, provided by the town government, November 2000.

form the basis for environmental and spatial planning, supervision and regulation. However, neither the means nor the know-how in Digang are adequate to serve these purposes. Although the county EPB has been equipped with some basic monitoring equipment, their staff needs further training before they can operate the equipment correctly. And even then, the existing staff will not be able to do all the necessary monitoring. This leaves other environmental management goals, such as total pollution load control in industrial zones; quantitative examination of pollution treatment in plants or environmental target responsibility contract system, with no solid basis. Alternatively, in many cases, estimations of pollution emission based on annual production of the factories are used to decide on the excessive discharge fees or for other purposes. This gives environmental workers and enterprises a large degree of discretion in bargaining over, for example, the fee levels. Consequently, enforcement of environmental regulations at local level is discretionary at best.

Since there is no formal branch agency of the county EPB in Digang, the three environmental assistants have no authority to enforce environmental standards, regulations and policies. They can only provide assistance to the county EPB. They are also not in the position to impose pressure to the town leaders, who are their bosses. While ecological construction requires integrated operations, different functional departments of the town government tend to make decisions based on their own interests[170]. For example, Digang's "*Overall Environmental Plan"* does not fully match with its "*Overall Land Plan* and *Financial Plan".*

Although Digang has managed to invest about 70 million RMB for environmental protection since it was listed as an experimental town for reforms in 1995, there remains a big gap between its financial capability and the investment required to fully implement its *Overall Environmental Plan*. While the town government decision-makers have been convinced about the long term benefit of environmental investments, the budget constraints of the town government hinder the ability to finance the most urgent things, for instance, the establishment of an environmental monitoring system, training of environmental staff, the relocation of several cement plants, the strengthening of the local environmental protection force and the upgrading of inefficient technologies. The lack of funds has also handicapped the enforcement of the 'three simultaneous practices' and the EIA process.

Besides money, there are other problems. The existing environmental capacity of the town government still needs to be enhanced in order to do scientific planning in a systematic manner, and then to implement these plans. The information and technical services for Small Towns are limited, and it is deemed too expensive to involve an external institute. When asked about the concept of ecological construction, one town environmental assistant felt that it was too difficult to understand. Digang has had the advantage of being able to establish a geographical information system (GIS) work station with the support of UNDP. This enabled them to process a variety of information and data on land use, road networks, pollution sources, river networks, etc. Based on a more comprehensive analysis, the original *Overall Development Plan*, which was made in 1994 was modified to fit the new situation. The town GIS station also cooperated with the county Land Administration Bureau to conduct an investigation on land use in the entire county, and at the same time formulated the *Overall Land Use Plan* of Digang[171].

[170] Interviews with the town environmental assistants and the vice director of Fangchan county EPB, March 2001.
[171] *Report on Experimental Work of UNDP Project CPR/96/507 in Digang*, provided by the town government, 2001.

The leaders and residents in the town are well aware of their environmental problems. About 40% of the total town budget has been allocated to the town Urban Planning and Environmental Protection Committee. The motivation of the town leaders for this is also to please the upper-level government by being a model town for environmental protection, a status which is supportive of high level careers. Within a period as short as 5 years, four town governors and vice governors had been promoted to higher positions, at least partly because of their cooperation in the environmental protection program. Sometimes, this meant exaggerating the real achievements. Not surprisingly, the current town governor is in a very difficult position. He can not risk failing to demonstrate a better environmental performance than his predecessors, although the real situation is more serious than it has been reported in the past[172]. Once, during my meeting with the town environmental workers, the town communist party secretary stepped in. As soon as he realized that my research did not mean bringing the town external aid, he showed no interest and left the room. This indicates that environmental protection is not only an internal motive of the political leaders of the town.

The town residents rarely complain officially, although people find the air quality intolerable[173]. Some of them chose to move to other towns or buy houses in the county town. When asked about the environmental complaints from the local people, the vice-mayor of the town stated proudly that no one had complained that year. This answer can of course mean anything, and certainly does not prove that environmental deterioration has been solved. One of the town environmental assistants stated that residents' complaints could not influence the enterprises' behaviors, since TVEs respond mainly to the market or to direct orders from the town government. Only if complaints influence either of these they will have an impact. At the same time, there are no regular communication channels nor information mechanisms to release pollution information or warning about environmental impacts on people's health (if these data are available); neither is there a feedback complaints in decision making procedures.

7.3.3 What is happening in TVIEs

Two cement plants, namely Hualong and Dicheng have been selected for case studies at firm level. Both of them are located in Quejiang industrial zone and were on the list of major air polluters in Digang before measures were taken. Recently, both plants reformed their ownership structures. Hualong plant, as the largest cement plant in Digang, offers a successful story for pollution control. Dicheng cement plant was a typical plant that belonged to '15 types of small operations (*shi wu xiao*)' as it was identified by the State. It survived the enforced "closing" campaign by shifting to pulverizing processes instead of making cement chamotte, due to the intervention of the town government. These two cases demonstrate the interdependence of the Small Town Government-TVIEs alliance and their reaction to environmental regulations.

[172] Interview with Mr. Jianfu Yao, general consultant of UNDP Project CPR96/507, August 2000.
[173] Interview with the vice-mayor of Digang town, November 2000.

Hualong Cement Plant

Hualong cement plant is affiliated with Hualong Cement Company Limited, which merged with Digang town cement plant in 1995 (Photograph 7.2). It is located within the Quejiang industrial zone, on the northern side of Digang-Fanchang road. It occupies an area of 180 *mu* and employs 540 workers. The construction first started in August of 1993 and it was in full production after one year. Hualong plant has two cement production lines with an annual capacity of 100,000 ton each and one cement chamotte production line with an annual capacity of 7 ton. In 2000, its output value was 42 million RMB and it earned profits of 1.7 million RMB.

Environmental protection was considered during the construction of the first production line in 1993. Advanced high pressure static electric dust collectors were installed in the most polluting parts of the production process, such as: raw material mills, cement mills and packing machines. A dust settlement chamber was also constructed on the kiln. In other dust-generating parts, cyclone dust extractors and bag type dust collectors were installed. By doing so, Hualong fulfilled the requirements of "three simultaneous practices" and EIA at that time. However, during the construction of the second and third production lines in 1995, only a few dust collectors were installed due to the lack of funds.

In 1996 when Digang town was selected by the UNDP for reform experiments, environmental issues were again high on the agenda of the town government. However, according to the fixed revenue regime at that time[174], Hualong could not raise money for pollution control other than for maintaining the existing facilities. The situation became more difficult when environmental regulation got more stringent and market competition became more severe in 1998. In order to give the plant more flexibility in responding to the market, the town government decided to reform the ownership structure. In 1999, the plant was contracted to a private manager for a ten-year period. Since then, economic results have improved but the pollution levels have remained the same.

During the 'one control, two targets' campaign in 1999, officials from the Anhui EPB, Fanchang EPB and other relevant departments paid several visits to the Hualong plant to discuss feasible solutions with the plant managers. Under this pressure, and based on a market investigation and its long-term business strategy, the plant manager decided to introduce fundamental dust pollution controls. Another 3 million RMB was invested in installing dust collectors at 48 dust generating points. In December 1999, the county EPB did a primary on-site check before the 'zero hour' and concluded that the emission standards had been met. With these measures, over 90% of the dust is collected and about 10,000 tons (about 5 % of its annual production) of cement is saved per year, which generates considerable economic benefit.

In order to guarantee the safe and efficient operation of dust collectors, management measures have been taken to link pollution control with economic incentives. The responsibilities of the individual workers include a requirement to treat the dust collectors as part of the production equipment. The workers who operate the dust collectors are required to pass exams after receiving training. The plant's management checks the

[174] Tax revenue targets were broken down to enterprises. Enterprises must fulfill the targets on time no matter how big the profit was. This left the enterprises little money to invest in pollution control facilities.

workshops twice a day and makes records of the performance of the dust collectors. Environmental protection has also become one of the elements in the annual personnel evaluation, thus influencing salary increases. Ten percent of the evaluation indicators for workers are related to dust control. Workers have realized that dust control is related both to their personal economic interest and to the fate of the their plant.

When discussing the key factors to the company's economic and environmental success, the manager indicated that the separation between government and the business has been of crucial importance in enhancing the competitiveness of his company. When business goes well, it is possible to invest in pollution prevention and treatment. It is also equally important that environmental management be integrated into the overall management of the plant, so that the installed dust collectors can function properly. The management of this plant believes that the future for TVIEs lies in increasing the production scale for higher efficiency through recombination, mergers and other institutional reforms. With more and more stringent environmental regulations and increasing environmental awareness TVIEs can no longer seek to maximize economic profit at the cost of environmental quality.

Dicheng Cement Plant

Dicheng cement plant is affiliated with Yongnian Group, which was established in 1999 and is privately owned by Mr. Yongnian Zhang (Photograph 7.2). Yongnian Group is located in the Quejiang zone. About 260 workers work for Yongnian Group. The owner started his private business with a small cement plant in early 1980s. The annual production capacity of this small plant was only 20,000 tons of common silicate cement. In 1997, in order to encourage the optimization of capitals, Digang town government decided to lease a town-owned cement plant with an annual production of 44,000 ton to Zhang. In 1998, Zhang purchased this plant and merged it with his old plant into a larger Dicheng cement plant. After one year, the business of Dicheng plant improved significantly. In early 1999, he purchased another cement plant called Hualian, which had an annual production of 100,000 ton cement chamotte. A few months later, the Yongnian Group was formed.

According to the national policy of closing 15 types of small operations, cement plants with an annual production of less than 88,000 ton had to be shut down and those with annual production above 88,000 ton had to comply with the state emission standards by the end of 2000. Since both the small cement plants of Dicheng were established in the early 1980s, they were typical poorly equipped small operations. Although they had merged and business had improved for a while, Dicheng's permit for cement production was revoked by the State Construction Material Industry Administration Bureau in 1999. It was obvious that the Dicheng plant had to be closed if the policy was to be enforced.

Considering the negative social and economic consequences of closing this plant, negotiations between the town government, the plant owner, the State Construction Material Industry Administration Bureau and the county EPB took place. Finally, they made a tacit agreement to allow Dicheng to continue operations provided that the plant could prove real environmental improvement. In order to give Dicheng plant a chance to

survive, the owner tried all possible means and raised 4 million RMB to renovate the Dicheng cement plant, including investing 1.2 million RMB for pollution control. Two obsolete production lines were eliminated, nine high-pressure static electric dust collectors and bag-typed dust collectors were installed on cement mills, and dust from packaging machines and crushers was also collected. In this way, 99% of the dust was controlled. An environmental protection section was established to strengthen overall environmental management. Similarly to Hualong, environmental workers conduct occasional checks on each working position and the results are linked with the salaries of the workers. Training and other efforts raise environmental awareness of the employees. With these efforts, Dicheng survived the closing campaign. The protection of the town government was crucial in this decision.

At the same time, the construction of a cement production base in Digang by Conch Group provides Dicheng a good opportunity to avoid further environmental attack. With the intervention and support of the town government, Dicheng was the first one to sign an agreement with the Anhui Conch Group to pulverize high quality cement chamotte produced by Conch and sell the cement powder under Conch's brand. In this way, the Dicheng plant managed not to violate the state policy and at the same time to create job opportunities.

The Dicheng cement plant serves as a typical example on how the town government interfered in the enforcement of environmental regulations against polluting TVIEs. Although Dicheng was a private plant, closing it would increase unemployment, reduce local revenue, and exert pressure on the town government. In this regard, the plant owner and the town leaders had the same interest. Therefore, the alliance between them motivated them to bargain with the environmental authorities. At the same time, the town government had to fulfill its administrative role as local representative of the state, charged with enforcing state environmental policies. The town government needed to maintain good relations with other governmental departments, such as the county EPB. It had to help Dicheng to find alternative solutions. The town officials and the environmental workers argued that simply closing the polluting TVIEs would not help environmental protection in long run, especially for less developed areas. Environmental decisions should be made in a more discretionary way and based on specific situations[175].

7.3.4 Summary

Digang is a typical TVIEs-based Small Town. It became rich and dirty mainly because of the development and dominance of cement plants. Digang, compared with Small Towns in Jiangsu province, faces more limitations in financial capacity, technological level and local environmental management capability of the Small Town Government-TVIEs alliance.

The town government adopted a strategy to explore external assistance by presenting their problems and drawing attention from upper levels of government. They got on the list as an experimental town at national level for town construction and comprehensive reforms so that it would have increased access to experts, government officials and the benefits

[175] Interviews with the town environmental assistant and the town official, December 2000. *Report on Environmental Protection in Digang*, provided by the town environmental assistant, 2000.

from preferential policies. For instance, as part of UNDP assistance, Digang was given an opportunity to experiment with reform policies in favor of the town. The town government has been given certain authority to approve infrastructure and technological renovation projects; to agree on foreign direct investment projects; to decide on land use and organizational structure; to develop its own personnel management; to exercise a revenue-sharing system based on clearly defined rights and responsibilities; and to participate in the relevant decision making structures at the county level. The communist party secretaries and town governors were invited to attend relevant meetings of the county People's Congress and county government[176].

All these measures to improve environmental performance are top-down government initiatives. The whole process hardly involves any discussions among the citizens (or the employees) and neither the citizens (nor the employees) are well-informed about the impacts of projects if the governmental plans are followed. Citizens are not involved in decision-making in any organized manner, nor do they play any active role in supervising the activities of the town government and the TVIEs.

It is useful at this point to focus on the institutional role of environmental assistants in the town. They grew up there and had their higher education away from hometown. When they return home and work there, they often feel different from the local people. On the one hand, they are very concerned about the local economic development brought by TVEs because it relates directly to their personal benefit. On the other hand, they have to behave as government agents and enforce various environmental standards, regulations and policies. As such, they often face difficult choices. Although they know how serious pollution is, emotionally, they feel difficult to close a polluting enterprise because of the negative social and economic consequences. One assistant indicated that he would rather help those TVIEs instead of closing them[177]. Unfortunately, environmental assistants have limited freedom and resources to act. Like the situation in other Small Towns, assistants can only coordinate between government, environmental regulators, TVIEs and citizens. Even after the restructuring of ownership, good relations and cooperation between the above-mentioned actors are crucial for both business successes and local environmental improvement. The Dicheng plant is a typical example of these social processes.

[176] *Report on the experimental work of UNDP Project CPR/96/507 in Digang town*, provided by the town government, 2001.
[177] Interview with the town environmental assistant, December 2000.

7.4 Jiujiang District, Guandou town

7.4.1 Jiujiang District

Jiujiang district is in the northeastern suburb of Wuhu and occupies three quarters of the total area directly administrated by Wuhu. It became a district in 1990 and governs three towns, including Guandou town. The total population is 140,000 people, of which 80,000 are rural.

Being close to Wuhu city, Jiujiang enjoys a highly developed transportation network. Its 14.7 kilometers of Yangtze River shoreline hosts a modern coal harbor and the Wuhu international harbor, the largest of its kind in Anhui. A recently opened Wuhu-Yangtze road-and-railway bridge connects several main railway lines. One can also easily reach Wuhu by highway or via air.

Since Jiujiang became an administrative district, the local economy has developed rapidly, especially after Jiujiang was selected for experiments with comprehensive reforms by Wuhu municipal government in 1995. With this status, Jiujiang received increased authority in planning; financial administration; personnel management; land administration; urban construction; household registration; etc. TVEs have been the major contributors to the development of the local economy. Twelve key industrial sectors have emerged; including metal products manufacturing; mini automobiles and spare parts; electric appliances; paper mills; electric cables; cloth making; and building materials. Many large and medium-sized enterprises and industrial zones are located in Jiujiang district: the Wuhu National Economic and Technological Development Zone; the Industrial Corridor along the state road number 205 and the Wuhu Private Industrial Zone, also the only one of its kind in Anhui. Jiujiang ranked 87th in terms of comprehensive economic strength in 1990, but climbed to number 22 in 1997 out of more than 100 counties and districts in Anhui. In 1996, all its three towns ranked among the 'top 100 towns' of Anhui based on a similar evaluation[178].

The environmental management capacity is rather weak in Jiujiang. The director of the Jiujiang EPB[179], who was promoted to that position in March 1998, felt that it was very difficult to fulfil all the tasks of the EPB with only 7 staff and limited resources. Thus, his team can only concentrate on stopping new polluting projects by conducting EIAs. In some cases, the Wuhu municipal EPB or external experts are invited for EIAs of large projects. During the 'one control, two targets' campaign in 1999, more than 50 enterprises in Jiujiang were identified as major polluters. However, the EPB director did not believed that meeting the discharge standards alone was enough to control total pollution loading. "The current end-of-pipe-based approach will not work"[180]. The director strongly felt that cleaner production and centralized pollution treatment deserved more attention and efforts, and he directed the EPB staff not only to play the role of environmental regulator as is legally required, but also to actively assist enterprises to develop more environmentally sound projects and production methods.

[178] In the web site of Wuhu Municipal Government: www.wuhu.gov.cn/, July 2001. Confirmed with Mr. Zhou Tongbao, the governor of Jiujiang District, June 5th, 1999.
[179] Interview with the Jiujiang EPB director, June 5th, 1999.
[180] Interview with the Jiujiang EPB director, June 5th, 1999.

Although environmental planning has been made one of the components of the district Master Development Plan, full implementation requires resources and environmental capacity, which are often not available.

7.4.2 Guandou town

Socio-economic development

Guandou is an important town in the northeastern part of Wuhu municipality. It lies on the eastern bank of Yangtze river, and is situated between four inter-city highways. It was promoted from township to town in 1997. There are 19 villages under its administration. It covers a total area of 56 square kilometers, of which the built-up area is 10 square kilometers. It has a population of about 50,000, of which 30,000 are urban.

Since 1995, Guandou has been one of the 'top 100 towns and townships' of Anhui. In 1996, its financial income and the net income per farmer ranked respectively seventh and second among counties and districts in Wuhu. In 1999, the net income per farmer increased to 3,482 RMB. Over 80% of farmers' income was from TVEs. Regarding the comprehensive economic strength, "Guandou is the strongest one in Jiujiang"[181].

Various industries have developed along the highways. In 2000, there were 633 TVEs, of which 176 were TVIEs, and the majority were private. Only 41 enterprises were collectively owned before the institutional reform, but they have been transformed into share-holding companies, cooperative share-holding companies and private companies. Eight major industrial sectors have emerged, including paper mills, mini-automobiles, construction, welding rods, etc. Four industrial areas have emerged in Guandou, Wanli Industrial Park being the most important. In 1998, the total number of TVE employees in Guandou was 6,302, of which 3,924 people worked in TVIEs.

It can be expected that, in the future, TVIEs will further develop and at the same time the contribution of the service industry to the town GDP will increase from 24% to 50%. Economically, the agricultural sector will become less important. TVIEs will increasingly be concentrated in industrial parks or zones. The town government aims to increase the net income per farmer to 3,800 RMB by the year 2001[182].

Environmental situation and management

Ten years ago, environmental protection was hardly on the agenda of the town government. However, since the early 1990s, with the increasing environmental awareness all over China and a strong push from the Central Government towards environmental protection, environmental issues have been drawing increasing attention. While environmental regulations first focused on industries located in urban centers, polluting

[181] Interview with the district governor, Mr. Zhou, who was the former town mayor and communist party secretary of Guandou. He was promoted due to his good performance in Guandou, June5th, 1999.
[182] Interview with Mr. Wang, the governor of Guandou, June 5th, 1999.

industries sought to locate in peri-urban areas like Guandou town where they could invest and operate without undue environmental controls. Environmental accidents always brought about complaints from farmers in the past[183].

Gandou has neither any real environmental motivation nor adequate environmental management capacity. The idea of "development first" prevails among the town officials. In contrast to Digang town, basic environmental protection tasks are assigned to the town Economic and Trade Committee (ETC), which is one of the most important and powerful governmental departments in all towns. This arrangement is based on the argument that the ETC deals with all industries, including TVIEs, and environmental protection should be integrated with economic development. However, this "integration" often puts environmental concerns at a disadvantage.

There is no clear division of manpower, time or funds within the ETC so that nothing is allocated for environmental protection, and no clear division of tasks exists among its staff. For environmental work, the ETC mainly functions as a liaison point between the district EPB and the town government. One of the five ETC staff members, in addition to his other tasks, is responsible to communicate with the district EPB to receive the latest information on environmental policies, regulations and the like. This staff person also attends meetings and joins study tours organized by the district or higher level EPBs. Following the practice of the Municipal EPB, the ETC has veto power on polluting projects, but the exercise of this veto depends strongly on how much pressure the ETC receives from the district EPB and how much a veto affects the town economic goals. In principle, the district EPB has the authority to order a factory to treat its pollution before a deadline or even to shut down a factory. In practice, discretionary decisions are often made based on negotiations between the government, the ETC, polluting plants and the district EPB. This is not very surprising considering the attitude of the district EPB director towards environmental enforcement in industries.

Nevertheless, according to the town mayor and the town environmental worker, the influence of district EPB in the town government decision making has been increasing in recent years. One example is that environmental protection has been included into the *Town Overall Plan.* Environmental impacts of the construction of industrial parks and proposed new projects have been checked by the district or the municipal EPBs. Through these measures, the ETC feels that it can boast that no more new polluting sources have been introduced into the town, especially since no environmental accidents have been reported since 1998.

To deal with the existing polluting factories, especially those factories that were established in the 1970s, the town government follows three principles. The first strategy is to shift investments from industrial enterprises to the service industry. This is the case both for new investments and for existing enterprises. Several TVIEs, which were located in Shengshankou, shifted to commerce and trade during the expansion of the road from Wuhu city. Secondly, in case a factory has no future, it should be closed. This happened with a very noisy old factory for punched products in 1998. Third, if a factory is still profitable, investment in pollution treatment is worthwhile. For example, in 1999, Yuejin paper mill was undergoing a fundamental environmental renovation[184].

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[183] Interview with Mr. Wang, the governor of Guandou, June 5th, 1999.

[184] *Promote Sustainable Development through Raising Environmental Awareness and Technological advancement (tigao*

Since the construction of Wuhu-Hangzhou highway and the expansion of Wuhu city, the town feels it is very important to concentrate siting of TVEs in order to save scarce land. The construction and expansion also sought opportunities for Guandou to shift investments to less polluting service industries along the highway, investments in hotels, restaurants, gas stations and other service facilities.

Due to the absence of environmental monitoring data at town level, it is difficult to assess current local environmental quality, to evaluate the effects of measures and environmental policies, or to make any sound environmental planing. Not surprisingly, the town government environmental official took it for granted that no industrial environmental problems existed because all TVIEs did comply with the permitted discharge standards. She appeared to be happy as long as TVIEs were not fined or bothered by EPBs, and did not appear to believe that there is any other way of checking environmental performance of individual enterprises. At the same time, continuous improvement of industrial environmental performance does not seem to be of major concern of the town government[185].

7.4.3 'A good boy'

Yuejin paper mill was established in 1978 as a town-owned enterprise but was reformed to become a share-holding company in 2000. This paper mill is located in Wutao village, surrounded with farmers' houses. In 1999, about 300 employees worked in Yuejin. Waste paper is its raw material. The main products are board paper and corrugated paper. Its annual production value was above 50 million RMB in 1998.

Yuejin paper mill is economically important for Guandou town, but its production process generates polluted wastewater. It took over highly obsolete equipment and technologies when it was established. Yuejin contributed 0.12% of the total industrial wastewater discharge in Wuhu municipality. Its water pollution discharges to nearby rivers became so severe that it had to pay farmers to dig wells for drinking water. However, no one had the heart to shut down the factory considering its economic importance to the town.

The 1998 closing campaign became a real threat for Yuejin. Yuejin was the only polluting TVIE in Guandou that did not meet the wastewater discharge standards before the "zero hour" of 1998 and it was ordered to stop operation by the district EPB[186]. In order to avoid major economic loss and under pressure from the soon-to-be unemployed workers, the town government decided to solve the environmental problem of Yuejin in a fundamental way. In 1999, the factory invested 12 million RMB to install a new production line with annual production capacity of 12,000 ton brown board paper. Compared with its old production lines, this new production line saves two thirds of the water consumed for the same amount of product. Shanghai Tongji University designed the pollution treatment facilities for this expansion project using air flotation techniques. The construction of this wastewater treatment station cost 400,000 RMB. In 1999, the plant was undergoing

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huanbao yishi, yikao keji jingbu, cujin jingji he shehui ke zhixu fazhan), provided by Guandou town government on May 24, 1999.

[185] Interview with the vice town mayor of Guandou, June 5th, 1999.

[186] Interview with the district EPB director, June 5th, 1999.

thorough restructuring to upgrade the production lines and to install pollution treatment facilities. Through the operation of this treatment station, all the wastewater from the old and new production lines is believed to be able to meet the discharge standards (Photograph 7.3).

After it survived the closing campaign, the town government transformed Yuejin into a share-holding company in 2000. This change resulted into improved efficiency and better internal management. The manager of Yuejin has felt increased pressure from industrial environmental regulations and from market competitors: "we used to avoid meeting EPB officers, but now we need their help to comply with environmental stands. It is no more the case that we could expect the town government to protect the plant with funds[187]." Interestingly, after turning itself into an environmental 'good boy', the company lobbied for closing other smaller polluting paper mills, presumably as much for its own competitive benefit as for its new-born environmental conviction.

7.5 Hefei municipality, suburban district, Daxing town

7.5.1 Hefei municipality

Hefei municipality is located in the center of the province. It became the capital city of Anhui in 1952. Hefei governs 3 counties, 4 districts and 3 Economic and Technological Development Zones.

Although Hefei is neither along the coast nor along the Yangtze river, it enjoys the same preferential policies that were given to some key coastal cities since 1992. This is mainly because of its strategic position (similar to Wuhu) serving important functions for both eastern China and the middle and lower reaches of Yangtze river basin by linking up and integrating different regional economies. Therefore, both Wuhu and Hefei were approved by the State Council to be cities open to foreign investments in 1994, experimental cities for optimizing capital composition in 1996, and experimental cities for state-owned enterprise reforms and technological innovations in 1997. Since 1992, Hefei has been ranked among the "50 top cities" in China based on an evaluation of comprehensive strength[188].

TVEs in towns and villages around Hefei have benefited from their location in the orbit of the capital city, and have developed rapidly. The number of TVEs employees increased from 67,000 in 1978 to 400,000 in 1998. The average annual growth rate of the Hefei TVEs' industrial output reached 63% during 1990 – 1995[189]. However, as is generally the case in China, spatial relocation of the rural population lagged behind the shift of their occupations. This resulted into small-scale towns, scattered distribution of TVEs and poor control of TVE-generated pollution.

[187] Interview with the manager of Yuejin paper mill, 2000.
[188] In the web site of Hefei Municipal Government: www.hefei.gov.cn/, July 11 of 2001.
[189] In the web site of Hefei Information Net: www.hfic.gov.cn/, July 11 of 2001.

Following the activities of provincial government, a steering group at municipal level was formed in 1998 to promote Hefei Agenda 21. This steering group consists of leaders from all municipal governmental organizations. An administrative office was installed in the Hefei Planning Commission for Agenda 21 daily work. As an experimental city designated by the provincial government for sustainable development, Hefei was the first city in Anhui province to formulate its local Agenda 21 planning document. This document became a guideline for making the *Tenth*th *Five-Year Plan 2001-2005*. Small town development has been an important component of its strategy toward sustainable development. At present, Hefei has 109 towns and townships in total, of which 43 are statutory towns. The municipal government has recently approved to experiment in 11 selected towns as a prelude of further town development. According to its *Overall Plan* (1995-2010), the future urban system of Hefei will be a network that "centers around Hefei city with more sub-urban centers" (Figure 7.2). Hefei city core will be expanded in eastern, northern and southwestern directions. Learning from the lessons of its richer neighbor provinces, the municipal government attaches great importance to the overall physical planning in which TVEs industrial zone construction is integrated with small town development so that the economic and environmental cost will be minimized.

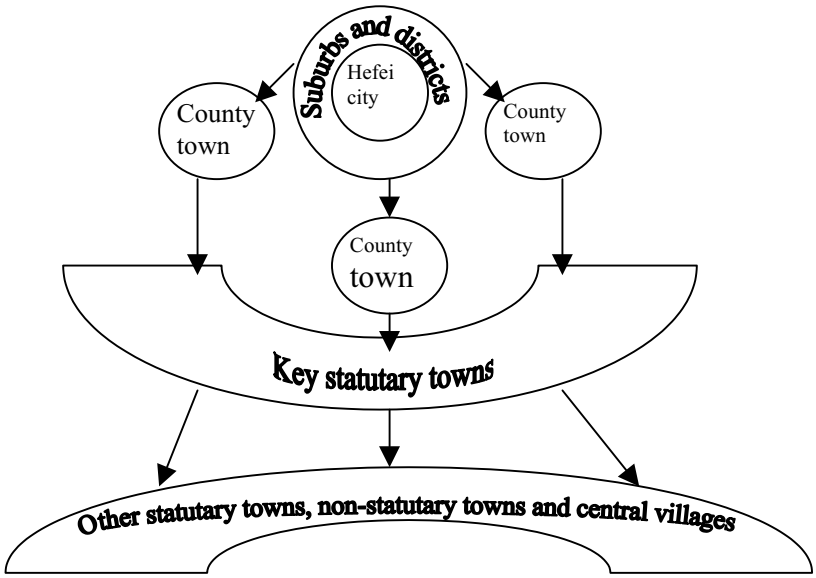

Figure 7.2 The urban system plan of Hefei municipality

Source: adapted by the author according to a Municipal governmental report on *The Urbanization of the Rural Areas in Hefei*, In: www.hefei.gov.cn/, July 22 of 2001.

It is worthwhile to mention the Hefei TVEs Productivity Promotion Center, which is affiliated to the Hefei TVEs Administration Bureau. Its mission is to provide to TVEs a variety of training, consultancy, market information, technological support, international co-operation, etc. This is an attempt to adjust the functions of the TVEs bureau to the changes of TVEs and their external environment.

According to the *Hefei Environmental Statement 2000* (Hefei EPB, 2001), its air quality met the state standard of Class II. But the water in the Chao lake and two major rivers flowing through the city suffered from severe eutrophication. According to the annual quantitative assessments of the environmental performance of the country's 46 major cities (Urban Environmental Quantitative Examination System (UEQES), see chapter 5), Hefei ranked number 29 in 1997 and climbed to number 8 in 1999. However, this high rank was in part achieved by shifting polluting activities, enterprises and production sites to towns and villages outside of the city area. Environmental management in surrounding Small Towns remains a weak point.

7.5.2 Hefei suburban district

The city core of Hefei is embraced by its suburban district. This district covers 332.1 square kilometers. There are 8 towns, 3 townships and 134 villages in this district. About 240,000 people live there, of which 184,300 are rural.

The local economy is heavily based on TVEs. During the past nine years, TVEs output values ranked number one in Anhui. In 2000, the total GDP of the district reached 2.11 billion RMB and had increased by 8.2% compared to 1999. The net income per farmer was 3,570 in the same year. Its main industries include printing and packaging, furniture making, building material, textile and clothes making. There are also 19 specialized wholesale markets and 44 industrial zones. At the time of field research in 1999, these zones had attracted more than 500 enterprises. This suburban district is important for dissemination of information, technologies and products from the city to rural areas. Technological advancement contributed to 50% and 45% of the growth of agricultural and industrial output values, respectively. For its outstanding work in promoting technological advancement, the Ministry of Science and Technology awarded this district 'The Advanced District for TVEs and Technological Development' of China in 1999[190].

Town construction in the past focused on individual buildings or renovation of part of the old towns. An overall spatial planning was absent for a long time. Only in recent years, a more systematic approach has been adopted.

Being an urban-rural mixed area, this district is the most polluted area of Hefei municipality, largely due to the pollution from the city enterprises. However, no environmental data are available, partly because of the lack of resources of the district EPB (9 staff) for environmental monitoring. But, "this is also because these data can be very sensitive for the public. The air pollution and its impact on human health, for instance"[191]. It is difficult for the district government officials to complain to the municipal government leaders about the polluting industries that are owned by the municipal government. In fact, the environmental data are deliberately reported in rather vague terms, and at the present time, the annual environmental quality statement of Hefei has been based on data from only four monitoring points in the city area. These data are used for the evaluation under the UEQES. Not surprisingly, it is not in the interest of the municipal EPB and the

[190] In the web site of Hefei Government: www.hefei.gov.cn/qxzf.htm, August 20, 2001.
[191] Interview with the district governor, June 8 1999.

municipal government to collect data from the suburban district, which will lower the score of the urban area and affect the municipality's environmental image and promotional opportunities. Only recently, the district EPB expanded, hiring five professionally trained staff members to join the EPB and purchasing basic monitoring equipment. The town government expects that the situation will improve in the future.

7.5.3 Daxing town

Socio-economic development

Daxing is a very small town, only 5 kilometers east of Hefei city. It has a total area of 13.73 square kilometers, of which 6,000 *mu* are for agricultural purposes. The built-up area is only 1 square kilometer. It has a total population of about 14,000 people, of which about 8,000 are rural. Daxing became a statutory town in 1986, and counts seven villages under its administration.

Daxing used to be a local center for trading activities, and it has seen industrial development only since the early 1980s. At present, the industrial sector is responsible for over 60% of its economy. There are four main industrial branches: papermaking, building materials, construction and foundries. Agriculture mainly supplies Hefei city with vegetables. In 1998, Daxing's GDP reached 160 million RMB, and the net income per farmer increased to 3,200 RMB. About 80% of farmers' income came from TVEs[192].

In 2000, there were more than 100 TVEs in Daxing, of which 48 were TVIEs[193]. They were either collectively owned, share-holding companies or private enterprises. More than 8,000 employees worked in these TVEs.

Being aware of the inefficiency of the collective ownership arrangements of TVEs, the town government has a very positive attitude to the establishment of modern enterprise institutions. In 1997, the town government issued *Several Decisions on Enterprises Institutional Reforms*[194] and passed these down to the enterprises. In June 1997, Jinzhong Paper Products Company Limited became the first share-holding company formed from a formerly village-owned enterprise in Anhui. This change in ownership structure increased the efficiency of the company significantly, and many other TVEs quickly followed its example. By early 2001, 90% of the formerly collectively owned TVIEs had split their businesses from the town government.

The town government itself has also encouraged and supported the development of private businesses. In 1998, they issued a policy paper *Regarding the Promotion of Private Economy*[195]. A first group of ten major private enterprises received special support and services from the town government for upscaling. By 1999, the town had attracted 29 private firms. The surplus of rural laborers was not a problem in Daxing.

[192] Written material provided by Daxing Town Government, June 8th, 1999.
[193] *Introduction of Daxing Town,* provided by Daxing town government, 2000.
[194] Written material provided by Daxing Town Government, June 8th, 1999.
[195] Written material provided by Daxing Town Government, June 8th, 1999.

The district government adopted a separated taxation system, based on clear division of rights and responsibilities between the town government and the district government. Taking the revenue of 1997 as the base line, the amount of tax the town government should submit to the district government was fixed for three years. This system provides some incentives to the town government, but "it also gives us more pressure to fulfil the targets"[196].

According to its *Overall Plan 1996-2010*, Daxing town plans to develop itself as an inner-ring suburb to the East of Hefei city. It sees its function as providing products and services for the eastern industrial area of Hefei. Of its total area of 13.73 square kilometers, 11.41 square kilometers are planned for construction. Function-based zoning is the main approach for land use planning. Two industrial zones are planned, one is called Xinyougchong Industrial Zone, in the central part of the town, and the other Fulong Industrial Zone, in the eastern part of the town Xinyougchong industrial zone covers 45 *ha* and is mainly for papermaking and fine machine manufacturing; Fulong occupies 20 *ha* (Map 7.2) and is mainly for vegetable processing, electronics and machinery manufacturing industries.

Environmental situation and management

Daxing is at the same time the dirtiest area of Hefei. Heavily polluting industries that are not appropriate within the city core found places in this suburb, for example, the state-owned Hefei Steel Plant and Hefei Chemical Plant. These large polluters generate about 20% of the industrial wastewater of Hefei municipality, not to mention their severe air pollution. However, since these plants are owned by the municipal government, they are beyond the control of the town government, and anything to do with their relations to environment falls under the jurisdiction of the municipal government. Although town representatives raise the issue of environmental pollution every year during the Municipal People's Congress, no final solution has been made yet because of fears about the social and economic consequences. For instance, Hefei Chemical Plant has about 4,000 employees and Hefei Steel Plant has about 30,000 employees. Due to low efficiency and economic losses they suffer under their traditional management. These plants can not afford investing large amounts of money for pollution treatment. Farmers have to bear an economic loss of more than one million RMB per year caused by pollution damage to their activities[197]. "We know it is unfair, but this is the situation and it has to be solved in Chinese way"[198]. Obviously, this "Chinese way" will not be simply closing these factories, according to official environmental regulations. It has more to do with cautious reforms on the ownership structures of the plants, upgrading technologies and equipment, development of new products and markets, creating new job opportunities, establishing good social security systems for the laid-off workers. However, most of these decisions are beyond the power of the town and district governments. Unless Hefei municipal government takes real actions to clean up these large state-owned polluters, Daxing will remain the most polluted area in Hefei.

[196] Interview with Mr. Peng, the vice-mayor of Daxing, on June 8th, 1999.
[197] Interviews with the district governor and the town mayor, June 8th, 1999.
[198] Interview with the district governor on June 8th, 1999.

Not surprisingly, the Nanfei river, which flows along the southern boarder of Daxing, functions as a sewer. It carries a huge amount of industrial and household wastewater all the way to Chao lake. The water quality of the river belongs to Class V of the state standards for surface water quality. The low environmental quality has made Daxing unattractive to foreign investors, and up to the present, there are no foreign-funded enterprises or joint-ventures in Daxing[199].

This last fact puts Daxing town in a difficult situation. The town leaders have taken more or less a 'wait and see' attitude towards environmental protection. They feel that they can not do much unless the municipal government resolves to clean up these large polluters. Therefore, they have not made any extra effort nor taken any new initiatives for local environmental protection except the basic routine maintenance work. Since 1996, the town Enterprises Administration Office (EAO) is, among its other tasks, in charge of the town's environmental work. One person out of four staff in the office functions as the environmental assistant. This environmental assistant is in direct communication with the district EPB, but falls under the jurisdiction of the town government.

There is no specific and guaranteed budget for environmental work. The town government covers some basic costs, such as travelling or preparation of publicity materials. The environmental assistant has regular meetings with the district EPB to exchange information. The assistant also receives training on environmental laws, regulations, standards and policies and basic environmental monitoring skills. The assistant establishes relationships with TVIEs mainly by paying on-site visits; according to him he is able to visit each factory, on average, three times per year. During these visits, the assistant communicates with the factory managers and judges the environmental performance of the factory. The environmental assistant feels that the current state enforcement of environmental regulations is useful in terms of awareness raising, but sometimes difficult to enforce because of lack of funds. "It is not our intention to shut down the factories, but to help them to comply with the environmental standards. Some special bank loans should be available for this purpose"[200]. He observed minimal difference in TVIEs' environmental performance before and after the ownership restructuring, but thinks that the reformed TVIEs are more efficient and competitive in the market. However, he feels that the market has not created sufficient environmental pressure on TVIEs.

The idea to add environmental tasks to the EAO is meant to better integrate environmental considerations into the overall planning and management of TVEs. However, successful integration depends on priority-setting within the EAO. Although environmental targets are set in the town socio-economic plan by the town government each year, there are no concrete environmental indicators for the personnel evaluations of the town governmental officials. Not surprisingly, these officials will choose first to fulfil the economic targets if they do not feel sufficient pressure from the community or the upper level government. Consequently, the policy and governance system gives consistent priority to economic concerns, and de-emphasize the importance of environment.

[199] Interview with the mayor of Daxing town, June 8th, 1999.
[200] Interview with Daxing town environmental assistant, June 8th, 1999.

7.5.4 Win-win strategy of Jinzhong Paper Products Company Limited

Jinzhong Paper Products Company Limited has grown from a small village-owned plant to the second largest paper mill in Anhui. Jinzhong was first established in 1978 in Zhongyoufang village, close to the Hefei-Wuhu highway. It now has total assets of 121 million RMB. About one third of the industrial output value of Daxing town is generated by Jinzhong company. It has 11 paper production lines and six pulp production lines. The annual production capacity is 65,000 ton. It uses waste paper as the main raw material, together with some wood pulp. The major products include boxboard and toilet paper. These products are well received in the neighboring provinces and there are more than 300 permanent industrial clients. All surplus laborers in the village have been absorbed by this plant, and some laid-off workers from the state-owned enterprises have even found jobs there. Jinzhong has 1,060 employees in total, and 85% of them have received professional training. The company has established its own research institute for papermaking and invites engineers and professors from other provinces to work as consultants[201].

In 1997, Jinzhong company was restructured from a village-owned collective enterprise into a share-holding company, separating governmental decision making from business management. A fixed annual salary system has been applied to senior management staff and the salaries of the workers have been closely associated with individual efficiency. This has provided major incentives to increase labor productivity. In 1998, Jinzhong ranked number 2 in the paper-making sector in Anhui and became one of the 15 big companies of Hefei municipality to receive a priority for governmental support.

When the company started almost from scratch in the end of 1970s, pollution treatment was of no concern. Like many other TVIEs, Jinzhong grew gradually, based on its own accumulation of capital, making it financially impossible to invest heavily in pollution treatment facilities. The plant was also not motivated or forced to do so, as environmental regulation was weak. As a consequence, Jinzhong developed in the 1980s and 1990s into a heavily polluting plant. The production process generated 1.8-2 million tons of wastewater every year. In the 1990s, when the environmental fee system was implemented and environmental regulation became more stringent, Jinzhong had to pay about 300,000 RMB annually for pollution discharges, of which 70% percent was returned to Jinzhong for environmental protection. In 1998, it was listed as one of the 48 major polluters of Hefei city who were ordered to treat the pollution before a set deadline. Jinzhong was also on the list of the provincial EPB and the Chao Lake Administration Bureau as one of the key targets for cleanup during the 'zero hour' campaign in 1998[202].

Given the socio-economic significance of Jinzhong, no one had the heart to shut down this plant. The district EPB officers, the town leader and the company managers finally sat together to seek solutions. The district EPB officers made it clear that the only way to survive this closing campaign was to treat its wastewater properly. It was no longer possible to allow Jinzhong to do 'business as usual' because Jinzhong was under direct supervision of the provincial EPB by this time. The town government came up with a proposal to support Jinzhong to apply for funds from the provincial and municipal Planning Commissions and also from the Development Bank of China by providing credit

[201] Written material provided by Jinzhong Company and interview with Mr. Zhong, the general manager, June 8th, 1999.
[202] Interviews with Mr. Zhong, the general manager of Jinzhong, and the environmental assistant of Daxing, June 8th, 1999.

guarantees. In order to avoid being shut down, Jinzhong decided to make large investments to upgrade the production process on the one hand, and to install wastewater treatment facilities on the other hand. The plant invested about 49 million RMB to change the production lines to produce new and less polluting products. The new technologies significantly reduced water and electricity consumption and the pollution load declined. In 1998, a wastewater treatment station, which cost 2.2 million RMB and was able to treat 6,000 ton wastewater per day, was put into operation. With these facilities, Jinzhong succeeded complying with the state wastewater discharge standards before the "zero hour" deadline. The operational costs of the treatment system could be recovered from the savings in water and electricity consumption. The plant invested another 5 million RMB for the installation of other pollution control facilities in the production processes. In 1999, Jinzhong applied to the province, the municipal Planning Commissions and the Development Bank of China for a total investment/loan of 99 million RMB for both a comprehensive wastewater treatment project and an expansion of the production of plate board to 50,000 tons per year. With this project, they aim to further close the water circulation loop within the plant to achieve 'zero emissions'. They also applied for ISO 9002 certification, which they obtained at the end of 1999. Following this experience, the plant "will consider to obtain ISO 14001 certification in the future"[203].

7.5.5 An alternative solution?

The Caochong wholesale market, specializing in sugar and alcohol, is located along eastern Changjiang road of Hefei city. It is easily accessible by road and is a perfect place to develop business. The Caochong wholesale market belongs to Caochong village of Daxing town. Before 1996, this place was neither suitable for living nor for farming due to industrial pollution from 17 TVIEs, especially chemical industries[204]. Farmers complained during the local People's Congress every year, but not much changed in the companies' environmental behavior. In general these TVIEs were not able to afford large investments for pollution treatment. But even though it was too expensive to clean up these TVIEs, it was too risky to continue polluting business-as-usual.

To find an alternative solution, the town government and Caochong village decided to use the land for a completely different purpose: a wholesale market. The proposed project was discussed among the village leaders, town leaders, firm managers and farmers' representatives. Based on feasibility studies, an agreement was made among the parties involved under the condition that they all would be share-holders based on investments. The village-owned TVIEs were shut down and the collective land was provided as investment in kind. Apart from the capital investments from the town government, bank loans, the village collective funds, funds were also raised among farmers.

The first phase of the project involved a total investment of 20 million RMB. The construction started in June 1996 and finished in August 1997. The total constructed area is 24,600 square meters. Roads, shops, office buildings and other facilities were constructed. Since its establishment, the advantageous location and good services have attracted many

[203] Interviews with Mr. Zhong, the general manager of Jinzhong, and the environmental assistant of Daxing, June 8th, 1999. Interview with Mr. Xu, division director of Anhui Provincial Planning Commission, March 22, 2001.
[204] Interview with the director of the Caochong Market Administration Committee, June 8th, 1999.

well-known companies to locate their wholesale offices in this area. The total trade volume in the first year was above 1.8 billion RMB.

To meet increasing demand, the second and the third construction phases were completed in 1999 and 2000, respectively. At present, the Caochong market covers a total area of about 100 *mu*, and hosts about 1,000 shops. More than 600 wholesale dealers have their businesses there. The annual trade volume reached 5 billion RMB. At the same time, the market generates about 350 job opportunities for local farmers and laid-off workers from the city. It is now the biggest wholesale market for sugar and alcohol in the entire eastern region of China.

This case proves that there are alternative solutions to TVIE pollution and it is acceptable to the town government and the local residents to shut down the polluting firms as long as there are other ways of making money. However, it is not always as simple as this. For Caochong, its advantageous location provides a good business location, which might not be the case for many other towns. There are also other important factors, such as business planning skills, management capability and investment ability. In addition, this shift is not automatically pollution-free. The construction may have buried, and thereby masked, severe soil pollution by the old chemical plants, and this was not checked by EPB when the market was being constructed. Furthermore, one needs to be sure that this change of land use will not violate the law that protects arable land. As long as all these aspects are well dealt with, a shift to less polluting businesses can be an alternative solution to TVIE pollution problem.

8

Comparative Analysis of Small Town Environmental Reform and Ways Forward

8.1 Introduction

This dissertation touches upon a major environmental problem China faces: high levels of pollution caused by numerous TVIEs in Small Towns. Both TVIEs and Small Towns have been playing critical roles in the industrialization and urbanization of rural China, and they have been designated by the Chinese Government as crucial elements in a 'grand strategy' to fulfill the nation's modernization goals. However, this 'grand strategy' may be putting the nation at larger ecological/environmental risk if TVIEs and Small Towns continue to grow unchecked in the context of the institutional weaknesses of the current formal environmental regulatory system in China. Many TVIEs-based Small Towns are suffering from a variety of environmental problems, which, in turn, have been threatening their economic development and causing social conflicts. The Chinese environmental management system is institutionally fragmented and politically vulnerable, and can barely safeguard the environmental quality in the vast rural areas where TVIEs and Small Towns are located.

Given the complexity of the problems, the limited capacities and political weaknesses of the Environmental Protection Bureaus (EPBs) and local governments, and the socio-economic conditions in rural China, any policies that attempt to deal with TVIE environmental pollution face a dilemma. Neither the conventional command-and-control (CAC) approaches nor the forceful closing campaigns are proving capable of reconciling economic and environmental objectives. This raises questions about the effectiveness of current environmental management strategies and approaches towards TVIEs and calls for new perspectives and breakthroughs.

This dissertation focuses on this central topic: how can Small Towns combine continuous TVIE economic development with safeguarding the sustenance base? Instead of approaching TVIEs on an individual basis or as an isolated sector, we have recognized the interdependent relations between TVIEs and town governments, and regarded this relationship as a key alliance in the environmental regulation triangles.

In developing strategies for environmental improvement of these contemporary TVIEs-Town Government alliances, the focus of the analysis is on institutional innovations, rather than on technological or cultural aspects. The institutional analyses and evaluations of environmental practices and reforms in five selected Small Towns help us to understand

the context for behaviors and decisions of the relevant actors towards environmental reform. They also clarify blockages, and suggest possible solutions to overcome such barriers. Although any generalization of successes and failures in environmental management from these five cases should be taken with great caution, the value of these selective case studies lies in widening our view and understanding of the universe of possibilities to control TVIE pollution and the necessary conditions for such success. These case studies also trigger reflections on necessary institutional reforms at higher levels, beyond Small Towns.

This analytic chapter compares the five Small Towns on the basis of some basic indicators and descriptions from the former two chapters (8.2). Subsequently, a more theory-informed comparative analysis uses the regulatory triangle model to look into the dynamics of ecologizing industrialization by analyzing the relations between the Small Town/TVIE alliances on the one hand and state, markets and communities on the other (8.3). The understanding we gain from this analysis is finally used to develop five ideal typical strategies for further ecological reform in Small Towns.

8.2 Comparing five Small Towns

The empirical data presented in chapter 6 and 7 provides the basis for a comparative analysis between the five Small Towns in terms of the environmental capacity of the TVIE-Town Government alliances. To be able to assess the differences in environmental management capacity, the analysis will be conducted along a number of relevant dimensions, which are grouped into four categories:

1. population and location characteristics;
2. economic data;
3. environmental problems;
4. environmental management capacities and styles.

8.2.1 Population and location characteristics

All five Small Towns are non-county-level statutory towns. According to the 1997 survey of Small Towns, Small Towns with a population ranging from 10,000 to 50,000 form the bulk of the statutory towns: 33.29% in number and 60.82% in real population (Yu, 2001). The five selected Small Towns belong to this main group (Table 8.1). Analysis based on the same survey concludes that towns with a population between 10,000 to 30,000 are in a relatively stable state, while towns with a population between 30,000 to 50,000 have a more efficient economy of scale in terms of social structure, economic efficiency, human resource development, environmental quality, living conditions, social security and public security[205]. This is also one of the reasons behind the provincial initiative to scale up Small Towns by merging neighboring towns in Anhui and Jiangsu provinces. In fact, both Hengshanqi town in Jiangsu and Daxing town in Anhui merged with their neighboring towns during the research period[206]. In addition, these five towns are examples of different

[205] Twenty-eight indicators in 7 categories are used to evaluate the scale effects of Small Towns (Yu, 2001: 150). See Appendix IV.

[206] Daxing town became part of Yaohai district of Hefei municipality in 2002 according to *the State Council approval No. 10 of 2002* and *Anhui Provincial Government document No. 13 of 2000* (available online: http://www.hefei.gov.cn/xzqh/,

types of towns in terms of geographic locations: two are outside of the rim of cities but serve as the urban center of their rural area, one is a satellite town of the regional city, and two are towns under the administrative control of the urban center.

Table 8.1 Population and location characteristics of five Small Towns

Name of the Small Town	Hengshanqiao	Luzhi	Digang	Guandou	Daxing
Area (km^2)	25.1 (2.8*)	50 (6*)	47.6 (3.5*)	56 (10*)	13.7(1*)
Population	23,000 plus 13,000**	40,000 plus 50,000**	44,000 plus 5,000**	50,000 plus 3,000**	14,000
Location	Central town of the rural area	Satellite town of large city	Central town of the rural area	Within the suburb of city	Within the suburb of city

Source: compiled by the author based on 1998 data provided by the town/county governments
* The built-up town area or the urban center of the town.
** Temporary population from other towns.

8.2.2 Economic data

With regard to economic strength, the difference between the towns in Anhui and the towns in Jiangsu is obvious (Table 8.2). Farmer's income per capita in both Hengshanqiao and Luzhi of Jiangsu are above 5,000 RMB, while it is above 3,000 RMB in towns of Anhui. The same applies to their per capita GDP. It should be noted that the three towns in Anhui are among the top 100 towns of the province in economic terms, while Luzhi and Hengshanqiao represent more average level towns in Jiangsu.

In all these five towns, non-agricultural economic activities dominate. They all have adopted a strategy to increase their industrial and service sectors. Although they are at different levels of economic and technological development, towns in Anhui have caught up with Jiangsu regarding internal reforms of collective TVEs. The percentages of reformed collective TVEs have increased from 15% in 1998 to 85% in 2001 in Guandou and from 75% to 90% over the same period in Daxing. The latest data for Digang are not available yet, but the reform of TVEs has been on the top of the government agenda since 1998[207]. While the impact of these reforms on environmental management is still unclear, their positive impact on the economic efficiency of these TVEs has been widely reported.

June 2, 2002). Hengshanqiao town merged Xinan town in 1999 (see footnote 100).
[207] According to the follow-up questionnaire interviews to the three towns in 2001.

Table 8.2 Economic data of five Small Towns (1998)

Name of the Small Town	Hengshanqiao	Luzhi	Digang	Guandou	Daxing
Farmers income per capita (RMB)	5,860	5,295	3002	3,405	3,200
Contribution of the non-agricultural economy to the town GDP	97%	Over 90%	Over 99%	About 85%	80%
Major TVIE sectors	Chemical, textile, machinery, manufacturing, electronic, construction, metallurgy.	Textile including printing and dyeing,	Cement, metallurgy, machinery, chemical, textile, ship making.	Paper mills, automobile, construction,	Paper mills, Electro-plating, chemical, steel
Percentage of the reformed collective TVIEs	About 95%	Above 99%	3%	15%	75%
Technical level of TVIEs	above average	average	average	Average	average
Local economic strength: GDP (RMB)	723 million	1.1 billion	570 million	120 million	116 million

Source: compiled by the author based on 1998 data provided by the town/county governments

8.2.3 Environmental profile of five Small Towns

The TVEs-based economic growth models of these five towns have caused various environmental problems, described in detail in chapters 6 and 7 and presented in Table 8.3. Air and water pollution have negative effects on further economic development and on people's health. Important factors both causing environmental problems and improving local environmental quality are obsolete technologies or inappropriate spatial locations of TVIEs at the physical level, and the political commitment to environmental protection, the leadership styles and the management capacities at the institutional level.

Table 8.3 Environmental profiles of five Small Towns

Name of the Small Town	Hengshanqiao	Luzhi	Digang	Guandou	Daxing
Major environmental problems	Water pollution mainly from chemical industries	Water pollution mainly from dyeing and printing industries	Sever air pollution from cement plants	Water pollution from paper mills	Severe water and air pollution from steel mills

Source: compiled by the author based on 1998 data provided by the town/county governments

8.2.4 Environmental management style and capacity

To grasp the environmental management capacities in the Small Towns and the prevailing environmental policy styles various criteria have been used. The criteria indicative of each the Small Town's environmental policy style include: the relation with upper level governments (political); the participation of residents (social) and the leadership style of the town governments (institutional/organizational). A town's environmental management capacity depends on the attitude of the town leaders towards environmental protection; the willingness of local leaders and TVE managers to invest in environmental improvement; the TVE's relations with the upper level governments and EPBs; the presence or absence of intervention from outside; and the financial and human resources available for environmental reform. However, long-term environmental improvement requires more: capital investment, coordination capability and management skills. Towns in Jiangsu have in general a larger environmental management capacity and a more cooperative governance style in managing environmental problems than their counterparts in Anhui (see Table 8.4).

Table 8.4 Environmental management style and capacity of five Small Towns

Name of the Small Town	Hengshanqiao	Luzhi	Digang	Guandou	Daxing
Attitude towards environmental problems	Attach importance to the problems	Attach importance to the problems	As a promotion strategy	Not a big problem (in denial)	Wait and see
Relation with the upper level governments and EPBs	Cooperative	Cooperative	Cooperative	adaptive	Reactive
Participation of the local residents	Limited	Limited	Very limited	Very limited	Limited
Leadership and governance style	negotiative, cooperative and democratic	negotiative, cooperative and democratic	Unstable, passive, , short-sighted	Patriarchal, lack of participation , benefit-driven	Incapable of coordinating , lack of initiatives
Willingness to pay for environment	Yes	Yes	Yes	No	No
Intervention of outsiders	MOST	SEPA	UNDP, CTRD	No	No
Financial and human resources available	Available	Available	Not sufficient	Not sufficient	Not sufficient
Environmental management capacity of the alliance	Strong	Very strong	Less strong	Poor	Poor

Source: assembled by the author based on 1998 data provided by the town/county governments.

8.3 Relations at work in ecologizing industrialization

In providing a better understanding how these differences and similarities between the five case study Small Towns influence daily practices in ecologizing industrialization, this section analyses four types of relations within the environmental regulatory triangle presented in chapter 3. The relationship between TVIEs and the town government/leadership forms the basis for analyzing the relationship between the alliances and the state, the alliance and market actors, and the alliance and community/civil society.

8.3.1 Characteristics of the alliances

The TVIE-Town Government alliance is at the core of our analytical model. Regarding the characteristics of the alliances, all these five cases have proved that TVIEs and their town governments form alliances in environmental regulation and reform. None of the town officials appeared to act against TVIEs because of the latter's pollution problems. However, the reactions of town officials to EPB regulations vary from "protect TVIEs by helping them to clean up" to "protect TVIEs by ignoring/resisting environmental regulations".

These differences in the reactions of alliances to environmental problems can be partly explained by the differences in some of their characteristics: the leadership and their governance styles of the town governments, the ownership structures of TVIEs, the environmental managerial capacity of TVIEs and the financial capacity of town governments and TVIEs.

In all the five cases, the town leaders play vital roles in environmental decision making, but the outcomes depend heavily on the way the leaders fulfil their roles. The leaders of towns differ along a number of parameters: (1) whether they have a strong sense of responsibility for local development; (2) whether or not the leaders focus on the interest of the local communities instead of merely focusing on their personal promotion in political hierarchy; and (3) whether or not the leaders make decisions based on broader participation of the citizens. More responsible leaders tend to represent the interest of the local people and are more willing to institutionalize democratic decision making processes. More committed leaders tend to assign more capable personnel to be government (environmental) staff or TVIE managers.

When TVIE managers are capable of operating firms, TVIEs are more profitable and the managers have more bargaining power in influencing local government. Thus, these TVIEs are less dependent on the town government, at least for purposes of business decision-making. This means that these TVIEs do not have to rely on the town leaders for technologies, bank loans and market access. In effect, the town leaders are able or are forced to delegate (part of) their power to TVIE managers and focus more on the overall planning, coordinating and facilitating of industrialization processes. The ongoing internal reforms within TVIEs, which aim to clarify property rights and decision-making power, have contributed to increased independence and efficiency of TVIEs and have reduced conflicts between the town governments and TVIE managers.

Leaders in both Jiangsu towns, Hengshanqiao and Luzhi, are more open-minded than leaders in the Anhui towns. They are more confident when they exchange information and

ideas with officers from upper-level government institutions. They are well informed about various policies and they like to express their comments on those policies. Interestingly, they rarely act openly against official policies even when they find the policies do not fit their local situations. Instead, they tend to be discretionary and to interpret the policies for the local benefit. Often, their innovative practices develop into a bottom-up force to adjust and adapt policies at various levels.

These leaders have more support from their staff and the staff-members are encouraged to come up with their own initiatives in their work. In addition, a more colleagual and less hierarchical relationship is observed between the town leaders and the TVIE managers. As soon as questions arise about the operation of TVIEs, the floor is given to the TVIE managers or the enterprise staff in charge. The town leaders treat the TVIEs as separate institutional entities, and forbear to interrupt the work of TVIE managers at will, even when the TVIEs remain in town ownership. This cooperative and more equal relationship contributes to the business successes of TVIEs, which, in turn, contributes to the local development and the success of town leaders.

In contrast, town leaders in Anhui province have more patriarchal behavior toward their TVIEs. They tend not to recognize nor appreciate the value of participatory or democratic decision-making. When their personal promotions are based on how they cooperate with the upper level authorities to fulfill various targets, they are more motivated to garner the favor of authorities one level up. Consequently, they may ignore the direct or long-term interests of the local community when these do not match with - or even conflict with - their motives for personal advancement. They tend to select cronies for environmental or TVIE management positions whom they can rely on to follow their orders. This gives them excessive influence over TVIE operations and exacerbates their tendency to want to interfere in business decision-making. Digang town is a typical example in this regard. Its communist party secretary seems to know everything about the cement plants. During the UNDP project period (1997-2000), the town governor was changed three times due to the promotion of the former ones. The frequent changes of town leaders have caused difficulties for the continuity of the UNDP project.

The alliances respond to the enforcement of state environmental regulations differently (see Table 8.5). When living standards raise to a certain level, town leaders and residents/farmers generally become more concerned about environmental quality. Increasing environmental awareness in the population affects public attitudes towards environmental problems and willingness to pay for environment, which, in turn, influences decision-making. Thus attitudes, together with the leadership/governance styles, the composition of the TVE sectors, the technical level of TVIEs, the TVIEs' ownership structures, the relation with upper level governments and EPBs and economic/financial factors lead to changes in environmental management capacities of the alliances.

Environmental management capacity is reflected in the position/functions of the town Environmental Protection Offices (EPOs), the number of town environmental staff, the relation with county EPB and local residents, the influence of environmental staff in the decision making of town affairs and their access to environmental information and finances. The overall variable of environmental management capacity ranks from 'very poor' to 'very strong' (cf. Table 8.4), illustrating the differences between the case study Small Towns.

Table 8.5 Different types of alliances and their attitudes towards environmental protection

Name of the Small Town	Hengshanqiao	Luzhi	Digang	Guandou	Daxing
Attitude of the alliance	Cooperate for environmental protection	Cooperate for environmental protection	Motivated only by economic incentives	Try to satisfy minimum environmental requirements	Focus on economic development first

Source: compiled by the author based on 1998 data provided by the town/county governments.

In Hengshanqiao town and Luzhi town (Jiangsu province), the levels of environmental awareness and the financial resources are comparatively higher than in towns in Anhui province. Environmental regulation in terms of standards and norms is more stringent in Jiangsu towns than in Anhui. In order to improve the local environmental quality in the Jiangsu case study Small Towns and to protect their TVIEs from being shut down by the EPBs, specific environmental workers have been appointed to liaise with and assist the county EPBs. The two town governments have made overall environmental plans. One vice governor is made responsible for environmental protection activities in each town.

Hengshanqiao government has chosen to invest in individual TVIEs by installing pollution treatment facilities or upgrading the technological level to comply with environmental regulations. Luzhi government prioritized the construction of a centralized wastewater treatment plant and to relocate/build TVIEs in a shared site. In both cases, town governments have formed a kind of partnership with their TVIEs, in which TVIEs comply with the town's overall planning and the town governments serve and support TVIEs with information and finance. This type of cooperative alliance results in environmental improvement and mutual benefit.

All the three towns in Anhui province are among the 'top 100 towns of Anhui' in terms of their economic strength, but do not have similar financial revenues compared to towns in Jiangsu. Town officials and TVIEs managers in these towns subscribe to the concept of 'development first!'. Town governments are therefore less motivated to facilitate environmental compromises with their TVIEs, especially when it has significant financial implications or threatens the closing of the plants. With scarce inspectors and limited environmental funds, the alliances tend to give only lip service to environmental regulators. In Digang town, for example, the alliance is motivated to cooperate with pollution control efforts only when external incentives are in place, when compliance with environmental regulations will bring the town obvious economic benefit, or when improved environmental quality is associated with personal promotion of the town and/or TVIE leaders. In Digang the TVIEs are more dependent on their town governments, and poor environmental performance even increased their dependency, since under environmental threat, they seek protection from the town leaders against higher-level state control. In Guandou, where both incentives and pressure for pollution control are mostly absent, the town leaders focus on economic growth and wait to see how 'signals' from the upper level authorities change over time. In Daxing town, pollution has become so severe that the

polluted environment now deters the entry of foreign investments and depresses local economic development; only this kind of pressure, in the context of economic and market incentives, stimulates the town government to take environmental action.

8.3.2 Alliance-state relationship

Although the county level EPBs are at the frontiers of the battle against TVIE pollution in Small Towns, the capacities and commitments at the provincial, regional and even national environmental levels are equally important in understanding the relations between county EPBs and Small Town-TVIE alliances. This section analyses the alliance-state relationship in a broader state perspective, starting at the county level and ending at the national level.

Alliance-county EPBs relationship

County level EPB workers operate at the environmental frontier, as they work directly with polluting enterprises on a daily basis. The effectiveness of their activities is dependent on the resources they can mobilize, their position in the local power hierarchy, and the capability of the leadership. Besides the alliance characteristics, the status and capacity of EPBs and the commitments of the county governments for environmental protection are decisive factors affecting the alliance-state relationship.

There is about four times more environmental staff at both county and Small Town levels in Jiangsu province EPBs than in Anhui, and their skills and training are stronger. The status of the Jiangsu EPBs is also higher: in both Wujin and Wuxian EPBs are so-called first tier organizations, of the same rank as other governmental departments at that level. Visits to their offices and interviews with the officials leave the impression that they are among the most powerful bureaus/departments at the county level. They have their own independent office buildings and complete functional divisions, especially the environmental monitoring stations and environmental supervision and management teams, which are essential for the enforcement of environmental regulations. They both have more than 50 employees. Both the Wuxian and the Wujin EPBs are endowed with veto power over new and expansion projects, similar to the veto power of the local Planning Commission and the Industry and Commerce Administrative Bureau. Any projects that can not pass the examination of the EPB based on several criteria will have no chance of approval[208].

The findings in this study are in line with Schwartz's (2000) conclusion that the local environmental officials in Jiangsu have more knowledge on the situation of the local environment, on the current environmental policies and regulations and on the policy processes by which those regulations are disseminated and enforced than those in Anhui. Interestingly, whenever the Jiangsu EPB officials found that the countrywide policies and standards did not fit their situations, they chose to act at their discretion. Compared to the Anhui EPB officials they are more committed to their work and are active in solving (environmental) problems instead of complaining on the higher echelons or waiting.

[208] EPB examines the new and expansion projects on their conformity with the state environmental policies, local environmental regulations, local industrial policies, on the rationality of the proposed location and the cleanness of the production processes. Interview with the vice-director of Wujin EPB, May 31, 1999.

Even so, these Jiangsu county/district EPBs feel incapable of dealing with the numerous and scattered small TVIEs, as they are already fully occupied with controlling larger state-owned enterprises. Thus, they adopt a strategy of extending their management networks down to the firm level and delegating some tasks to other governmental departments. Since the late 1980s, in Wuxian and Wujin, all Small Towns have been required to establish Environmental Protection Offices (EPOs). At least one town environmental assistant must be put in this EPO and the town government has to pay this staff member. Similarly, all the major polluting TVIEs are required to appoint specific staff for environmental care. In this situation of extending networks, these two EPBs both focus increasingly on environmental training, education and lobbying activities to various target groups, including the participants in Communist Party School; primary and middle school students; town governors who are in charge of environmental work; town environmental assistants; TVIE managers in charge of environmental protection and their environmental workers for daily operations. They also cooperate with different governmental departments so that environmental concerns become integrated into these departments, for instance as part of the target responsibility system. The official performances of governmental officials are evaluated annually based on measurable indicators, now also including reaching environmental targets, and are associated with penalties and rewards. This system has made the environmental integration into other governmental works more successful in Jiangsu than in Anhui.

Since these EPBs need good cooperation with the town governments to fulfill their annual environmental targets (which is important for the status of their organizations and for drawing attention of the municipal leaders), the EPBs are motivated to establish cooperative relationships with town governments and town environmental staff. By the same token, the town governments and TVIEs also need to communicate and cooperate with the EPBs to avoid negative comments from the EPBs on their environmental work, especially as their political promotions and salaries are increasingly linked to the fulfillment of the environmental targets that are set in the annual agreements between the county governors, town governors and TVIE managers. An important factor in shaping this relationship is whether or not the EPBs are able to monitor the pollution emission of TVIEs and to enforce environmental regulations in case of malpractice. Of course, the political determination of the town leaders and the financial capability of TVIEs are equally decisive for real environmental achievements.

The county/district EPBs in Anhui province suffer from limited power and financial resources. With about 10 permanent staff on average, they can hardly do more than collect pollution discharge fees, which the EPB needs in order to survive, and perform some environmental publicity via local radio and television. For example, even after the recent local institutional restructuring, the Fanchang county EPB remains as a second tier agency: not an independent agency but an affiliation to the Fanchang Rural and Urban Construction Committee. It only has liaison persons in 7 out of the 20 Small Towns in Fanchang. Digang is one of these seven. However, apart from working contacts with the Digang environmental assistant, the county EPB has no influence on environmental decision making in Digang town. The idea of “development first and clean up later” still prevails among the local decision-makers and the EPB is unable to change that. The evaluations and promotions of local officials are based on their economic achievements – ‘hard

criteria' as they call them – and not on 'soft criteria', such as spirit civilization development (jingshen wenmin jianshe) or environmental protection.

Not surprisingly, the county level EPBs in Anhui province experience less cooperation with town governments and TVIEs. The low status of EPBs in the bureaucratic ranking results in limited abilities to mobilize resources for environmental protection. With limited staff in each EPB, poor monitoring equipment and restricted finances, it is almost impossible for them to fulfill all the required tasks. Therefore, they all concentrate their efforts on environmental publicity and training activities and the collection of pollution discharge fees. Since they often are not able to advise TVIEs/town government on pollution control measures or additional funds raising, town leaders and TVIEs do not regard these EPBs as useful partners. Therefore, the enforcement of closing policy, EIA and 'three simultaneous practices' through the EPBs are viewed by town governments and TVIE managers more as barriers for the local economic growth then helpful assistance.

Mirroring the organizational layout of the county level EPBs, there are no independent EPOs in the three case study towns in Anhui. The town environmental staff members are part of the town Construction Commission, the Economic Commission or the Enterprises Administration Office. Sometimes, these environmental liaison officers are given other tasks apart from environmental work. In Daxing town for example, some staff members of the Enterprises Administration Office have to take care not only of environmental protection, but also of other economic tasks. Under such circumstances, the possibilities of assisting the EPBs to make TVIEs comply with environmental regulations depends entirely on the environmental awareness of the director and staff, their individual motivation, the availability of resources and the bureaucratic incentive structure. When the town leaders are not convinced about the urgency of environmental protection, the environmental staff often chooses to focus on economic objectives only. Obviously, awareness-raising, capacity building and organizational restructuring at county and town levels is badly needed in these less prosperous areas. But it is not by accident that this is rare.

Have the ongoing reforms on the ownership of TVIEs brought any changes to the alliance-state relationship as far as environmental management is concerned, or will they do so in the future? In the Small Towns where cooperative relations exist between the alliances and the county EPBs, no significant change in the relationship has been felt by the county EPBs before and after the transformation of the collective ownership into other forms of ownership. This fact supports the argument that the interdependent relations of the alliances remain while the transformation of the ownership helps to increase the efficiency of TVIEs, so that restructuring does not have to affect the interdependent relations of the alliances with respect to environmental management. This fact also proves that the more fundamental solutions to the town environmental problems are in the hands of the alliances themselves and not so much in the ownership structure alone. Strong ties between TVIEs and the town governments can be an advantage for the implementation of overall environmental plans that require the strong coordination power of the town governments. This does not mean that less strong ties or a more independent relation between town government and TVIEs can not reach similar levels of environmental management.

Provincial environmental capacity

China's reforms in the last two decades have resulted in a more decentralized power structure. Provincial political institutions have been given greater authority, also with respects to environmental policy (Beach, 2002). The provincial EPBs, together with provincial governments and other departments, are now assuming greater responsibility in setting environmental standards and implementing measures for environmental protection (Bohm et al., 2000). Considering the so-called 'structural weakness' of China's environmental regulatory framework, which has been analyzed in chapter 5, these decentralization processes have created room for the provincial authorities to interpret and enforce unified national environmental policies. There are, however, clear differences between the various provinces in how they fulfil their environmental responsibilities, partly related to the priorities of the provinces, the economic possibilities and the environmental problems encountered. This becomes evident if we compare Jiangsu and Anhui on economic indicators, environmental quality and environmental management capacity. Similar to the five case study Small Towns, environmental management capacities of Jiangsu and Anhui are also positively correlated with their socio-economic levels, but negatively correlated with their environmental qualities.

(1) Socio-economic conditions

Jiangsu and Anhui provinces are comparable in terms of area and population. Anhui is slightly larger than Jiangsu but Jiangsu has a bigger population. Comparing their 1998 GDPs, Jiangsu's economy is much higher developed than that in Anhui. The relative capacity of Jiangsu and Anhui provinces for regional sustainable development has been calculated by a group of scientists in the Chinese Academy of Sciences (Chinese Academy of Sciences, 2001)[209]. According to their province-based analysis, Jiangsu's regional economic development level ranks number 5 among 31 provinces and municipalities in China, while Anhui ranks number 20. This calculation takes into account the local infrastructure, the scale of the economy, economic dynamics and the rationality of the economic structure. For the level of social development, three major indicators are used for the assessment: population development, the structure of the society and quality-of- life. The result shows that Jiangsu ranks number 6 and Anhui ranks number 20 (Table 8.6).

(2) Environmental quality

The same research of the Chinese Academy of Science has also investigated the environmental quality of the provinces. Surface water pollution and air pollution are not the only environmental problems in both regions, but they are regarded as the most urgent ones. Comparing the data on pollution emission intensities and air pollution index, Anhui seems cleaner than Jiangsu. For provincial environmental quality, Anhui ranks number 9 and Jiangsu ranks number 23 (Table 8.6). Both Jiangsu and Anhui are part of two (of the

[209] Their calculations are based on 231 measurable source indicators that fall into five basic systems: life supporting system, development supporting system, environmental supporting system, social supporting system and intelligent supporting system (see Appendix II).

six) regions for the national clean-up priority programs 'Three Rivers and Three Lakes': the Huai river and the Tai lake (see below).
(3) Environmental management capacity

Partly due to the severity of the environmental problems and partly due to the economic strength and higher level of environmental awareness, statistic data and empirical evidences from Jiangsu and Anhui show that Jiangsu's environmental management capacity is stronger than Anhui. Comparing the enforcement of EIA, 'three simultaneous practices', 'pollution control within deadlines', environmental targets responsibility system and responses to environmental complaints, Jiangsu ranks number 9 and Anhui ranks number 24 (Table 8.6).

Jiangsu is also one of the pioneers in China for environmental reform. Its reform models and practices are often followed by other provinces. For instance, in recent years the bottom level EPBs in Jiangsu have been experimenting with innovative practices. It was reported that the first EPB branch bureau was established in Chengze town. This town level EPB was authorized by the Wujiang Municipal EPB to enforce state and local environmental laws and regulations within the town territory. In another town named Zekou, each of its villages had their own environmental staff. Since 1996, the Rudong county EPB has made the administration of pollution fee collection open to the public. At the provincial level, in order to encourage public participation, a special telephone number was exclusively used for environmental reports and complaints. This telephone line was opened to the public of all cities and counties in 2001.

The provincial government attaches great importance to environmental monitoring. As proposed by the Jiangsu EPB, during the period of 2001 – 2005, an automatic environmental monitoring system will be established. In addition, in order to promote the adoption of ISO 14000 in Jiangsu, an on-the-spot meeting was organized in 2000 in Suzhou-Singapore Industrial Park, the first regional ISO 14001 certificate holder in China. By the end of 2000, two Economic Development Zones in Jiangsu and 52 enterprises obtained ISO14001 certificates and another 49 enterprises were working on it. It is worth mentioning that during the governmental institutional restructuring in 2000 Jiangsu was the only province where the provincial EPB was promoted to become an integral department of the Provincial Government. This was a clear signal from the provincial government that environmental problems were taken seriously. Interestingly, investigation in 8 major energy intensive sectors shows that, during the first half of 2001, their total output value increased by 16.28% while energy consumption increased by 6.87%[210]. Production processes and products are becoming more energy efficient in Jiangsu.

[210] According to Jiangsu Economic Information Network: http://www.js.cei.gov.cn/jseicnews/, August 13, 2001.

Table 8.6 Comparison of major indicators for regional sustainable development capacities of Jiangsu and Anhui Provinces

Province	Area (thousand km^2)	Population (million)	GDP (billion)	Economic development level	Social development level	Environmental quality	Environmental management capacity
Jiangsu	103	72	720	5*	6*	23*	9*
Anhui	139	62	281	20*	20*	9*	24*

* The figures show the ranks of Jiangsu and Anhui among 31 provinces and municipalities.
Source: adapted from *Report on China Sustainable Development Strategy 2001* (Chinese Academy of Sciences, 2001).

Regional contexts: priority regions for immediate clean up actions

In the Huai river basin and the Tai lake basin, polluting industries, including TVIEs, face more stringent environmental regulations compared to other parts of China. In 1995, *Temporary Regulations for the Huai river basin* (the first of their kind for a river basin) were issued by the State Council. This regulatory initiative adopted the *Huai River Water Pollution Prevention and Control Plan* the next year, which stated that, by the end of 1997, all factories in the basin should meet standards of discharge, and that the Huai River should be clean by 2000 (Vermeer, 1998). In 1996, the State Council ordered local authorities to close down before 30th September of 1996 all small-sized paper, leather and dyeing factories as well as chemical, electroplating, asbestos and other factories with polluting technologies (cf. Rooij, 2002). As a consequence, more than 60,000 enterprises were shut down in the basin. It was a clear signal to polluters that enterprises could choose to wipe out pollution or to be wiped out by pollution (Bai, 2000). In 2000, after six years of efforts, but specially by the 'zero hour' clean up action in 1999[211] and the 'total control, two Targets' campaign[212], pollution in the river basin was reduced to the level of 1995 (Wang, 2001). This campaign also targeted polluting enterprises in the Tai lake basin.

Although newspapers and other media reported that most provinces in these two basins met the deadline and that most of the industrial enterprises either cleaned up or closed down, many people were inclined to doubt the truthfulness of these statements and the appropriateness of the mass campaign approach. In analyzing how the newspapers made their reports, we find that most relied on information provided by the local authorities. It is very difficult to know how accurate these local figures are. It seems that local authorities would have considerable interests to provide less than 100% accurate information. As many have correctly observed (e.g. Rooij, 2002; Rock, 2002; Lieberthal, 1997), providing

[211] All the industrial polluters on the list were checked at 'zero hour' of the last day of the year. Enterprises that still failed to meet the standards should have been closed down. The campaign gained momentum in 1999 after SEPA set out a detailed work schedule for the campaign and when it became a focus of environmental protection work in China (Rooij, 2002).
[212] This was first stated in *State Council's Resolution Regarding Several Environmental Protection Issues* (State Council document No. 31, 1996). Total pollution load must be controlled via two kinds of targets: all industrial polluters must meet the national or local pollution discharge standards by 2000, and water and air qualities in key cities must satisfy function-based quality standards. These goals were further stressed in the *State Council's Comments* (September 3, 1996) on the Ninth Five-Year Plan and Long-Term Targets toward 2010 for Environmental Protection.

higher figures of success than actually achieved, makes them look good, as a law enforcer as well as an environmentally conscious government. On the other hand being lenient towards polluting enterprises is highly beneficial for the local economy. Two interviewed EPB officers in Jiangsu expressed their reluctance in enforcing this campaign. Both made two different kinds of reports on their progresses in implementing 'total control, two targets' policy, one official and one internal. In the words of one of them: "we are forced to do so if we have to satisfy everybody". In their opinion, the success of the 'zero hour' clean-up actions were overestimated to please the policy makers at the top.

Without any doubt these forceful campaigns are the environmental regulatory initiatives most keenly felt by TVIEs in the affected regions. But the failure of these campaigns to bring continuous environmental improvements raises questions about the effectiveness of such programs when they are initiated by the central government. It points to the critical importance of higher levels of involvement of the local authorities in environmental policy making and the need for a stronger focus on the environmental capacity building at the local level.

National policies pertain to Small Towns and TVIEs

National strategies such as 'Small Town, Grand Strategy', often represent little more than a political signal from the Central Government regarding the future direction of Small Towns. Little is often said on the operative dimensions at the lower government levels. Similarly, the slogan of 'second surge of TVEs development'[213] has not led to concrete accompanying measures. In addition to the TVE Law (which came into force in 1997) and a series of policy measures to guide the reform and development of TVEs, there are some tax reductions or exemptions and credit funds incentives to support small and medium-sized enterprises (SMEs), including TVEs. These TVEs are also encouraged by technological advancement, training activities, co-operations with research and education institutions and export promotion[214]. Governments above the county level are encouraged to establish TVE Foundations with similar purposes. The *TVE Law* also requires more rational zoning of TVEs and concentration in Small Towns. Local governments are allowed to deploy preferential policies regarding land use, taxation, credit, project approval, exportation, household registration and social security system to promote these concentration processes[215]. However, the enforcement of this law and related policies largely depends on the local economic strength. Apart from the 10% income tax reduction, most studied TVIEs found it difficult to obtain external funds and at the same time suffered from a heavy burden of various fees imposed on TVEs[216]. This illustrates the dependence

[213] The second surge of development refers to the development of TVEs after the decline at the mid of 1990s. This development stage is different from the previous expansion-based development stage. It should be realized through technological upgrading, restructuring and internal institutional reforms.
[214] Most of these tax incentives are offered to SMEs, including TVEs. For instance, 10% of income tax reduction for TVEs, additional income tax reduction for SMEs with annual profits below 30,000 RMB and below 100,000 RMB (Web site of TVE Association: www.chinasme.com/zhengfa/oo/htm, October 31, 2001).
[215] According to *'Opinions on Guiding the Zoning of TVEs and Speeding up the Construction of TVE Zones'* issued by the Ministry of Agriculture (Wen, 1998: 297).
[216] Heavy burden of various fees imposed on TVEs has been a big barrier for healthy development of TVEs. In order to protect the legal rights and interest of TVEs, the Central Government has taken measures to strictly forbid unreasonable fee items and gradually introduce total amount control system (CCPC policy document No. 8 of 1997).

of TVEs on the community governments for necessary 'protection' against higher state authorities.

In terms of pollution control and environmental protection, few of these preferential policies have direct positive effects on environmental strategies of either Small Town governments or TVIEs. In fact, some state financial and taxation policies, industrial and technology policies and price policies serve as barriers for the adoption of more environmentally sound management strategies in TVIEs. If the wastewater discharge is above the standard and a fine is assessed, the firm is more likely to dilute the wastewater by using clean water: this is a rational solution, as water prices are very low and standards are not always considering total loads but often only concentrations of pollutants. Low energy prices are also responsible for low energy efficiency. The Government could in theory provide incentives for environmentally sound technology (EST) development and the development of environmentally friendly markets through government purchasing, financial & tax policies, accelerated depreciation on certain equipment, etc. However, environmental considerations have not been included in these instruments in China yet.

Although China has established a rather comprehensive legal framework for environmental protection since the 1980s, most of the legislation, in particular the laws and regulations issued before 1995, proves more feasible and applicable to State-Owned Enterprises than to TVIEs. Drastic increase of pollution loads generated by TVIEs from 1989 to 1995 clearly indicates that those environmental protection laws were not well enforced in TVIEs before 1995.This changed only after 1995, with the closing and shut-down policies during which more than 70,000 TVIEs were closed or shut down following the implementation of the three regulations[217]. This policy proved successful as an emergency policy, to deal with accumulated environmental pollution crises. However, the successes differed among regions and were also accompanied by negative impacts in terms of investment and employment (Nygard and Guo, 2001).

8.3.3 Alliance-market relationship

Polluters in Small Towns hardly feel any market pull towards more environmentally friendly performances, except those who relate to customers, consumers or investors in international markets. Low levels of environmental awareness and limited access to environmental information on producers and products limit any Chinese market pull. When installation and operation of end-of-pipe facilities means increased production cost and when the "level playing field" varies from town to town due to differences in monitoring and enforcement of environmental regulations, polluting firms tend to ignore their environmental obligations. Cleaner TVIEs in the selected Small Towns complained that their efforts and environmental achievements were offset by those who continued with business as usual[218].

[217] The *Temporary Rules on Water Pollution Prevention in Huai River Basin* (State Council, 1995), the *Decision of the State Council on Several Environmental Protection Issues* (State Council, 1996), and the *Notice on Distribution of Stipulation on strengthening of Environmental Protection in TVEs* (SEPA, MOA, SPDC and STEC, 1997).
[218] Interview with Ms. Wu, environmental assistant of Hengshanqiao Town, on June 1 of 1999.

However, this 'to ignore' strategy is becoming increasingly unwise. Daxing town in Anhui province has experienced difficulties in attracting external investors due to a heavily polluted environment[219]. Up to the present, there is no single foreign funded enterprise or joint venture in Daxing. On the other hand, a positive influence of a clean environment on direct foreign investments and export orientation is observed in Luzhi town of Jiangsu province, the frontier of China's reform and open-door policy. The centralized wastewater treatment plant in Luzhi Industrial Zone became an attraction for foreign investors[220].

With the globalization trend of not only the world economy - especially after China's entry to WTO at the end of 2001 – but also the environmental requirements, environment and trade are increasingly linked. The emerging 'green trade barriers' building criteria for adequate environmental protection and public health are increasingly influencing the market. For instance, environmental taxes are imposed on some imported goods; environmental labels or ISO 14001 certificates (Environmental Management Systems) become 'green passes' in international trade; international conventions cover more and more environmental issues of products and production processes. Given the gap between TVIEs and their foreign counterparts in terms of cleanness, these 'green trade barriers' have put these Chinese SMEs in a disadvantageous position. However, evidences from the studied Small Towns support the argument that, without denying the negative environmental consequences of economic globalization, there are positive effects of globalization on the environmental capacity building of governments and enterprises (Weidner, 2002; Mol et al., 2001). 'Globalization' has also enabled and stimulated environmental innovation.

One powerful market influence is related to ISO 14001, the environmental management standard which is encouraged by the World Trade Organization as the "level playing field" (CSBTS/TC 207, 1996). Although the number of ISO 14001 certified enterprises in China jumped from 32 in June 1998 to 510 early in 2001, this growth can largely be attributed to certification of multinationals operating in China. The reality of ISO14001 certification in China is that the country still lags far behind the developed countries. As correctly observed by Di (1999), China is experiencing many obstacles in getting Chinese businesses certified with ISO 14001. These include: costs involved for certification; the bigger steps that are necessary; the non-tariff trade barriers (or 'green trade barriers') imposed on Chinese enterprises; difficulties caused by low environmental awareness; lack of incentives and excessive government intervention.

Nevertheless, as I have argued elsewhere (Zhang, 2001), ISO 14001 has great potential to improve environmental management in Chinese Small Towns. Following experiences of SME group certification in other countries (Ammenberg, 2000) and regional ISO 14001 certifications in several cities and Economic Development Zones in China, regional ISO 14001 certification for Industrial Zones is on the agenda of Luzhi Government. In the words of the general manager of Luzhi Central Wastewater Treatment Plant, "this is not only to remain a pioneer in Small Town environmental protection in China, but also to protect our enterprises from international competition." Wuxian EPB is sensitive and quick in promoting ISO 14001 among their target groups. In autumn 2000, two training seminars on ISO 14001 for firm managers were conducted and around 20 enterprises were preparing

[219] Interview with Mr. Peng Yongfeng, governor of Daxing Town, on June 8 of 1999.
[220] Interview with Mr. Xu, the general manager of the Central Wastewater Treatment Plant of Luzhi Town, on November 28, 2000.

for certification. Small Towns and TVIEs in Anhui province are more poorly informed and less active in this regard.

Market relations and condition have become important in TVIE development during the transition from a centrally planned economy to a more market-based model. Although at present the market has not been brought into full play for environmental protection, we can expect quick responses from TVIEs to environmental signals through the market. The ongoing reforms within TVIEs and reforms aiming to enhance the governance capacity of Small Towns will gradually push TVIEs to follow the established market rules.

8.3.4 Alliance-community relationship

Abundant evidence from Asia, Latin America, and North America shows that neighboring communities can strongly influence factories' environmental performance in cases where formal regulators are present or absent (see World Bank Development Research Group, 1999; Phuong, 2002). This does not appear to be the case in the TVIEs in the studied Small Towns, partially because the interdependent relations between TVIEs and their neighboring communities result in both the Small Town Governments and the town residents tending to protect their TVIEs instead of imposing pressure on them. In addition, environmental movements are rather underdeveloped in China and public environmental awareness remains rather low, although new political factors are changing this. For example, chapter 2 discusses the ambiguity of the state policy on social groups/organizations and increasing environmental threats have given raise of various social groups and individual actors working to protect the environment in recent years. The government has recognized the potential power of these groups and individuals and welcomes their efforts in promoting better environment and functioning as complementary monitoring 'devices' provided that they do not attempt to threaten the power and interest of the governments. However, in practice, attitudes and reactions towards environmental groups and individuals vary from province to province, from department to department, and from the central to the local governments. Therefore, the functions of these groups and individuals have been limited to environmental publicity/education, community environmental projects and wild life reservations. The government considers them helpful in raising environmental awareness, disseminating/collecting environmental information, supervising and monitoring enterprises and promoting environmentally friendly activities. However, up to the present these environmental groups are mainly active in urban areas. In Small Towns, there hardly exist any environmental groups.

Although the overall level of environmental awareness is still low in China as concluded by a sample survey jointly conducted by China Environmental Protection Foundation and China People's University in 1995 (Hong, 1997) and the public is generally ill-informed, this situation is improving rapidly. Dasgupta and Wheeler (1996) point out that China's provincial and local regulators respond annually to more than 100,000 citizen complaints. Plaintiffs visited provincial and local regulators over 79,000 times per year and sent more than 53,000 letters. However, the power of public environmental complaints varies from region to region. In Jiangsu province, at provincial and county/district levels, public participation in the form of reporting, complaining or giving suggestions has been much more institutionalized compared to Anhui. Its greater economic strength allows Jiangsu Government to reward successful complainers with money. In 1998, the Wujin EPB

responded to 479 complaining letters and visits[221], while Digang town in Anhui, which is deadly polluted with dust from cement factories, reported that they received not one complaint of this kind[222]. However, to satisfy active citizens by remediating pollution is not easy due to lack of manpower, finances, political complications and other technical constraints[223].

While town citizens do not play a major role as informal regulator in the regulatory game, the EPBs in Jiangsu and Anhui succeed, to a certain extent, in raising overall environmental awareness via training, education, publicity and use of the mass media, successfully creating a more favorable social environment in which they can collaborate with governmental officials, citizens and firm managers. All the interviewed EPB officials and environmental workers in Small Towns felt that they experienced much less resistance in their work nowadays compared with several years ago. By the same token, the indivisible relations between government, TVIEs and citizens in a Small Town can also be an advantage. Once the actors in a Small Town are convinced and determined to protect their environment, they can act more quickly due to better 'self-regulation'. Hengshanqiao Town and Luzhi Town in Jiangsu are good examples in this regard.

8.4 Diverse environmental reform models in Small Towns

The comparative analysis of the five case study Small Towns has provided a detailed understanding of the complexity of successes and failures of environmental reforms, especially as far are the institutional conditions and interactions are concerned. The analysis only confirms the starting point of this study: that an analysis of isolated governmental or enterprise units will fail to raise any in-depth understanding of the complexities of successes and failures, or progress and stagnation, in ecologizing TVE industrialization in Small Towns.

But apart form a better understanding of the current environmental reform practices this analysis has contributed also to the formulation and design of potentially successful strategies to further ecologize industries in Small Towns. From the analysis on TVIE-Small Towns complexes we can identify five ideal-typical environmental strategies that these complex alliances apply - often only in *status nascendi* - in their confrontation with environmental problems. In the case studies we can perceive these environmental reform models, as it were, not as full-fledged models but rather as impressionistic sketches of a conception which does not yet have full physical form. None of these strategies are cure-all solutions, and none of them are fit for all situations. Often different pieces of these strategies will be found - alone or in combination - in the various concrete towns.

[221] According to the written report on *Wuxian Public Environmental Complaints and Environmental Accidents in 1998*, provided by Wuxian EPB on October 28 of 2000.
[222] Interview with Mr. Zhang Qing, environmental assistant of Digang Town in November, 2000.
[223] Interview with Ms. Wu, environmental assistant of Hengshanqiao Town on June 1 of 1999.

8.4.1 Political modernization

Political modernization in Small Towns can be interpreted as a process in which local governments are committed to institutionalizing, democratizing and innovating the environmental policy-making process to enhance the local environmental capacity. It often involves a shift from a hierarchic command-and-control approach to more decentralized negotiative and participatory approaches that allow non-state actors to appear on stage. This process is crucial for environmental protection in Small Towns, as environmental protection requires communication and cooperation rather than only imposing pressure from above. Given the fact that the myriad of problems facing Small Towns and TVIEs have their roots in the old institutions (such as household registration system, rural land property rights, town fiscal system and financing mechanisms, which I have discussed in chapter 1 and 4) and non-governmental forces are rather underdeveloped, the town governments continue to play a decisive role in initiating and introducing institutional changes in favor of environmental protection in towns. In the studied towns progress in environmental protection entails commitment and support from the town government; setting up environmental protection offices; institutionalizing environmental considerations in decision making process; allocating funds for pollution treatment facilities; supporting the EPBs enforcement actions; evaluating the effectiveness of responsible leaders in meeting environmental targets; stricter separation of economic and political decision-making, etc. This modernization of environmental governance partly resembles the political modernization strategies in European countries, and partly follows Chinese characteristics.

The successes of Hengshanqiao and Luzhi in environmental reform are good examples of political modernization of environmental governance. Important roles of the town government/leadership can be seen in all the steps for running a central wastewater treatment plant: making decisions, raising funds, negotiating with TVIEs for the level of treatment fees, coordinating between the wastewater plant and TVIEs when payment of fee is delayed. It is also important to mention that the town leaders never interfere in the operation and management of the wastewater treatment plant, especially not in the personnel management. This is another element of Chinese political modernization: stronger separation of state and market. It is also one of the principles for the town's investment promotion: investment projects that generate wastewater beyond the treatment capacity will not be taken into consideration. In this model, the alliance has formed a partnership with the Wuxian EPB. Good public-private partnership (PPP) is a precondition for the success of this wastewater plant. This PPP approach has been promoted and experimented in China as a solution to overcome financial constraints on development of environmental infrastructure. However, one should be aware that the success of this kind of community-level model requires committed leadership and well-functioning democratic decision-making mechanisms.

Although Hengshanqiao Town has improved its environmental quality mainly through technological advancement and restructuring the composition of TVIEs instead of constructing a centralized wastewater treatment plant like Luzhi has done, the innovations in the basic relations between the actors involved are similar. And Luzhi or Hengshanqiao are not alone in this process. Some other towns and villages in Jiangsu have seen both economic and environmental benefits from similar political modernization processes. For instance, Huaxi village, the so-called number one village of China and a typical case of

Sunan Model, has been regarded as a miracle of collective economy. Its success is not only based on the unity and transparency of the leadership, but also due to the courage of the leaders to break the model that they themselves have established: reform on the ownership of TVEs and measures to create diverse financing channels for industrial projects and public facilities[224]. It is now also on the way to regional ISO 14001 certification.

8.4.2 Aid-oriented model

Aid in various forms, including aid from international donors, foreign governments, NGOs and special funds from the Chinese government, has played an important role in protecting the environment in China. Environmental improvement has developed into one of the priorities of international aid towards China (Mol, 2001). International aid is especially effective in promoting new environmental concepts, practices or technologies. For instance, from the introduction of the cleaner production concept into China in the early 1990s to the approval of the *Cleaner Production Law of PRC* in June of 2002[225], several development aid projects have been catalyzing the process. For example, the financial and technical support from the World Bank and the United Nations Environment Program (UNEP) and later on 15 bilateral or multilateral international collaborative projects that have been implemented in the area (Shi, 2003). The Japanese Green Aid Program is another example of this kind of effort.

Moreover, international aid has helped to build the institutional capacity for environmental protection. For instance, the United Nations Industrial Development Organization (UNIDO) and United Nations Environment Program (UNEP) jointly supported the then National Environmental Projection Agency (NEPA)[226] to establish a National Cleaner Production Center in 1993. The Asian Development Bank (ADB) provided technical assistance for the Ministry of Science and Technology (MOST) to set up a Center for Environmentally Sound Technology Transfer (CESTT) (Shi, 2003). The pull effect of the international aid on environmental protection is obvious.

When environmental protection is not yet on the local political agenda, or when the local environmental and financial capacities are not strong enough to launch political modernization processes, seeking external assistance can be an alternative strategy. Digang town in Anhui province succeeded in attracting assistance from UNDP and the central government to build up the towns' capacity for combating severe air pollution caused by cement production. Being a pilot town under the UNDP project, preferential policies regarding taxation system, land administration, governmental personnel administration and household registration system have been granted to Digang town by the county government. In addition, this project has given Digang town access to information, training opportunities, international technical assistance, increased environmental awareness of the leaders, firm managers and town residents and a better environmental image.

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[224] *People's Daily*, August 29, 1998, Beijing. *Science and Technology News* (Keji Ribao), May 27, 1998, Beijing.

[225] Cleaner Production Law of PRC (President Order No. 72) was approved during the 9th conference of the People's Congress on June 29th, 2002. It will be in effect since January 1st, 2003. Available online: http://www.setc.gov.cn/, July 23rd, 2002.

[226] The NEPA was upgraded to a ministerial level department and renamed the State Environmental Protection Administration (SEPA) during the central government restructuring in 1998.

Apart from other criteria, Digang town was selected by this UNDP project to pilot-test various reform measures mainly because of the willingness and commitment expressed by the town leaders in relation to pollution control. The severe air pollution and limited financial and technical support from EPB and county government has also played a role in UNDP decision making. There would be no way out if the town leaders ignored the environmental problems. It turned out to be a wise strategy to seek external assistance in the form of UNDP aid. Besides the direct benefits brought by the preferential policies, being a pilot town, Digang has drawn attention from abroad and at home. No matter what the original motivation was, the environmental awareness and management capacities have been raised during the implementation of the project. Similarly, this also happened in Hengshanqiao and Luzhi, which are respectively a demonstration town and an environmental model town.

8.4.3 Technology-based strategies

Technologies form an intermediary system between man and nature. This intermediary system is materialized into a tools system that can be used by human being to learn, to utilize and to change nature. Modern technologies have been playing an increasingly dominant role in the man-nature interaction. The solution to the risks and threats caused by modern technology lies - according to an ecological modernization perspective - in the ecological re-orientation of technologies. This is also what SENCE proposes from a more systems view. Some of such technological re-orientations can already be identified. The evolution of these new technological approaches/concepts – from cleaner production, waste minimization processes, eco-efficiency, green productivity, ecological engineering, environmentally sound technologies, to industrial ecology - form a clear reflection of the evolving importance societies attach to solving environmental problems.

A technology-based strategy has proved successful in Hengshanqiao town to a certain extent. Hengshanqiao town is a 'Sparkle'[227] technology intensive area. The town leadership has been committed to enforce the state environmental regulations, standards and policies. They work closely with their TVIEs and assist them to comply with waste discharge standards by upgrading technologies and installing pollution treatment facilities. As a demonstration town under the state 'Sparkle' program and a town concentrated with chemical industries, TVIEs in Hengshanqiao town boast higher technical levels and stronger R&D capability[228] than many other Small Towns.

Although the existing TVIEs manage to satisfy the emission discharge standards, the growing local economy will be in need of other innovative approaches and also non-technological solutions. The Hengshanqiao leaders are aware of the limits of technological solutions for individual TVIEs. Diversification of the local industries and better zoning are currently being developed.

[227] 'Sparkle' technologies are promoted and financed under the 'Sparkle Program', a technology program facilitating the restructuring of the rural economy (http://www.most.gov.cn/ , November 26,2001).
[228] Three TVIEs are approved as 'high and new technology' enterprises. Seven TVIEs have their own R&D institutes, of which Lanling Chemical Company's research institute is said the best of its kind in China.

8.4.4 Export-driven model

In a globalizing world economy, we can observe both destructive and positive environmental effects of the globalization process (Mol, 2001). Although processes of globalization often result in environmental degradation, they also can encourage policies and programs designed to arrest degradation and improve environmental quality. International trade and foreign direct investments have increasingly become important instruments for imposing environmental pressure on firms and governments.

While China's 2001 accession to the World Trade Organization (WTO) removes trade barriers, Chinese firms are facing new green barriers. It has already happened that China's exports of agricultural products to European Union dropped by 23.3%, due to environmental and health risks, for the first five months of 2002 compared with the same period of 2001[229]. This also happened to China's exportation to Japan, Hong Kong, South Korea and other Asian countries. Since about one third of China's export comes from TVEs and the number of export-oriented TVEs increased to 139,549 by the end of 2000, green barriers can make big impact on these TVEs[230]. This has forced the Chinese government to take measures to protect local firms by providing them more accurate product and market information. In fact, the Ministry of Foreign Economy and Trade has allocated special funds to support Chinese SMEs for advertising in the world market, making new business plans and obtaining internationally recognized certification. Newly established sectoral associations are called to play their due roles in this.

This opens a horizon of environmental regulation in export-oriented Small Towns. In Luzhi town, even before China's entry to WTO, environmental challenges have been transformed into motivations for environmental protection because environmental quality is highly important for Luzhi to attract tourists, to promote exports and to attract foreign investments. In order to prevent TVIEs from being closed by the EPB, Luzhi leaders decided already in 1991 to invest in a centralized wastewater treatment plant in the industrial zone. Luzhi has developed a unique mode to operate this centralized wastewater treatment plant in a self-sustained manner. The improved local environmental quality and environmentally friendly image of the town have attracted considerable foreign investment.

8.4.5 Shift –to-service industry strategy

Economic globalization and national economic policy are restructuring the economy in China. This restructuring refers to adjustment of the geographical layout and the compositions of industrial sectors and products within the same sector. During the 8th and 9th Five-Year Plan periods (1991-2000), economic restructuring, in parallel with reforms on property rights within enterprises, has been the main theme of the economic transitions in China. Restructuring in the TVE sector became the only way out since early 1990s because structural weaknesses (poor quality of products, small operation scales, fragmented locations and repeated investments in different regions) have proved the main constraint to further growth and environmental improvement (Liu, 1999). After one decade

[229] Available: http://www.sdep.cei.gov.cn/envir_sub/source/, July 24, 2002.
[230] *Review of the TVE development during the 9th Five-Year period*, available: http://www.cte.gov.cn/zw/tjxx/, July 24, 2002.

of effort, the central government has succeeded in increasing the shares of industrial and service sectors to 77.6% and 21.8% of the total value-added of TVEs, respectively[231]. Through steering industrial & technological policies and forceful environmental campaigns, the internal compositions within sectors and the technical contents of products have been largely improved. For example, by the end of 1999, in total 55,000 TVIEs that belong to '15 types of small enterprises' had been closed.

Restructuring towards less polluting industries and products in accordance with the local situations is a more fundamental path towards overall pollution abatement and environmental improvement in Small Towns. Moving to less polluting service industries proved an alternative solution for Caozhong village in Daxing Town, and to a lesser extent for Guandou Town in the same province. Both towns are located within the suburbs of big cities. The success of this strategy depends largely on how it can fit the longer-term regional planning and the functions of the towns.

Daxing town, for instance, is in the suburb of Hefei city. Its close location to Hefei city provides possibilities to develop less polluting service facilities instead of TVIEs. Caozhong village used to suffer from water pollution from TVIEs. While it was too expensive to clean up these TVIEs, it was also too risky to continue business-as-usual. A decision was made to close all the polluting plants and to use the land for constructing a wholesale market, which generates more job opportunities but much less pollution.

However, this shift is not always pollution-free unless the polluted water or soil is properly treated. Whether the land and groundwater, which have been contaminated by chemical plants in the past and are now used for market construction, are safe for the local residents remains a big question.

[231] *The statistics of TVE development 2000*, available: http://www.cte.gov.cn/zw/tjxx/, July 24, 2002.

9

Ecologizing industrialization in Small Towns:

Conclusions and recommendations

Towns are ideal models to test the tomorrow of China.
- Hema (2000)

After having analyzed and compared the ways in which industrialization paths in the five case study Small Towns are - with more and less success - reoriented into more ecologically sound directions, I am able to draw conclusions and make recommendations in this last chapter. In doing so I will at the same time answer the research questions that have motivated this research.

9.1 Integrated systems instead of isolated islands

The five environmental reform models presented in section 8.4 show that TVIE-caused environmental problems and their solutions in Small Towns are the results of the interactions between different alliances and their external social environments. The solutions to TVIE environmental problems lay in reforming and innovating the existing organizations, institutions and the roles of the government, market and community. Governments, especially the town governments, play crucial roles in initiating the process of ecologizing industrialization in rural China.

As to the first research question on the characteristics of the TVIE-Town Government alliances and the environmental models associated to them, this study concludes that town governments should be regarded as important partners of the county EPBs in local environmental regulation for two reasons. Firstly, with the current capacity of formal EPB networks, the county EPBs alone are unable to approach numerous and scattered TVIEs. Secondly, town governments/leaders have a large influence on TVIEs' operations through personnel administration, profit distribution, land administration, capital investments, etc. Although the ongoing reforms aim to separate governments from enterprises, town governments and TVIEs remain in sustainable, long-term alliances which are based on their common interests. The town governments' political will for environmental protection is critical for overall environmental improvement. The differences in the level of environmental awareness, capability to pay for environment, governance styles and the local economic strength, all have their parallels in the reactions of the alliances towards environmental regulations. Wherever the town governments cooperate with and support TVIEs for environmental protection, the alliance has better relationship with the upper

level EPBs and governments and environmental improvement can be observed. Thus, future effort should focus on raising the environmental awareness of the town leaders and TVIEs managers; involving them in environmental decision making and regulation; building up local environmental capacity; creating incentives for environmental protection; removing institutional barriers for financing environmental facilities; stimulating more effective allocation of production resources; and improving land-use planning.

TVE-driven industrialization and urbanization models have supported the project of 'socialism with Chinese characteristics'. More than one decade ago, when the designer of China's economic reforms, the former President Deng Xiaoping, first introduced the concept of 'market socialism with Chinese characteristics', he meant to remind the Chinese people not to lose the Chinese uniqueness while introducing Western values and ideas. Unfortunately, this concept has been appropriated by conservative rhetoric, which uses it to refer to any ideas and behaviors that are not in conformity with international practices. The dichotomy in China's social and economic structures is, for instance, one of the typical 'Chinese characteristics', but it should not be used to justify any policy that tend to discriminate between Small Towns and cities, between state-owned industries and TVEs. Since it is hard to say where the village stops and where the city begins in the China of the 1990s (Christiansen and Zhang, 1998), Small Towns and TVIEs are strategically important for the reunion of urban society and rural society. To tackle TVIE-caused environmental problems in Small Towns, one has to work with the 'fuzzy' system of authorities and institutions in rural China. This makes environmental problems catalyzers for groundbreaking institutional innovations. For instance, the innovative solutions often require reforms of the very institutions that have created the 'uniqueness' of Small Towns and TVEs phenomena. This is ecological modernization in its essence: institutional restructuring triggered by environmental interests and rationalities.

As correctly pointed out in a World Bank working paper (World Bank, 1999), it is impossible for China to continue to replicate the economic development of the last two decades without massive damage to the natural environment. Continued economic achievements have to be reached in other, fundamentally different ways. Future productivity gains will come from improved efficiencies, stimulated by market forces, and improved productivity of scarce water and land resources through resource conservation and the introduction of new technologies. To achieve such a transition, integrated management and planning at the regional level is a crucial mechanism to guide local development and to coordinate social, economic and environmental objectives. The next five to ten years are crucial for China to restructure its economy, both to adapt to a new international context in which it is increasingly integrated and to preserve its sustenance base for long term development. In joining the industrial restructuring at a global scale China can take the opportunity to speed up enterprises reforming and upgrading[205]. This restructuring creates opportunities for more system-oriented environmental management strategies instead of improving environmental performances at merely the firm level (Zhang, 2003).

[205] Speech by Mr. Li, the administrator of the State Economic and Trade Commission during the Working Meeting on '10th Five-Year' Industrial Restructuring, August 5, 2001.

9.2 Decentralizing environmental capacity building

To answer the second and the third research questions on the necessary conditions and policies to induce these changes, among others, cooperative alliances, public-private-partnerships, negotiative relationship between alliances and the county EPBs and affordability of environmental projects are important conditions. Or in other words, there is an urgent need for local environmental capacity building.

This study has made clear that the failures of the current environmental regulations towards TVIEs lay in the gap between limited environmental management capacity and the complexity of TVIE environmental problems. The magnitude of TVIE pollution in Small Towns underlines the urgent need for China to create and enforce effective environmental protection and conservation policies. Currently, neither TVIEs nor the local EPBs have the capacity and level of political will to effectively monitor pollution emissions and implement adequate remediation or control measures. The TVIE situation shows that decentralization without attention to rule of law, capacity building and motivational structures has had an adverse effect on the quality of local environmental conditions (Beach, 2002). TVIE pollution control in Small Towns has challenged the limited capacity of the county EPBs and the conventional Command-and-Control approaches they have adopted. Wherever the alliances are not motivated to protect the environment, the county EPBs are confronted with resistance. It is clear that simply imposing forceful regulations on TVIEs will fail to achieve continuous environmental improvement in Small Towns.

This analysis implies two directions for improvement: (1) to enhance the capacity of the EPBs and (2) to mobilize the town leaders to fulfil their environmental responsibilities. The CCPC confirmed the first recommendation. In their policy paper (No. 2, 1999), it is explicitly pointed that the EPBs must be further strengthened and that the autonomy of the local EPBs should be enhanced. During the organizational restructuring of county governments in 2001, however, some EPBs were merged with other departments. This may turn into a dangerous precedent. The provincial EPBs should play more positive roles in promoting and empowering the county EPBs in these restructuring processes.

The second point is related to the observation, in all the five case study Small Towns, that the town leaders are the most critical forces in local environmental reforms. The county EPBs should focus more on the establishment of partnerships with the town leadership through training, consulting and providing necessary technical assistance. Another wise strategy for the EPBs is to work horizontally with other governmental departments so that environmental rationality will be increasingly integrated into the activities of different sectors. In this regard, the environmental responsibility system has proved effective in linking environmental tasks with the interest of governmental officials. There are individual local power holders throughout China who possess a heightened awareness of the importance of protecting the environment and are able to effectively promote environmental goals even when facing the challenges of limited local government capacity (Beach, 2002).

While the local authorities increasingly take charge of environmental protection, it should not relieve the central regulatory agencies from other important environmental tasks: overall assessment of the environmental impacts of economic, industrial and technological policies; the integration of environmental policies with these policies; environmental

legislation and supervision; creating incentives for local governments to prioritize environmental protection; and taking care of a level playing field within China.

It is encouraging that the central government has made effort to strengthen the SEPA, also because it is a political signal to local governments, polluting industries and investors. However, strengthening central regulatory agencies should not merely impose uniform approaches on heterogeneous communities under the guise of 'administrative efficiency'. Much local variation in regulation is legitimate, and should be recognized as such (Afsah *et al.,* 1996), as long as the same environmental goals are realized. Local conditions will determine the relative importance of direct regulation, the impacts of complaints and community pressure, and the market pull in inducing pollution abatement (Dasgupta and Wheeler, 1996). Considering the traditionally close relationship between the town government, community and TVIEs, the role the county EPBs can play is setting environmental issues on the local political agenda, facilitating the negotiation between the town government as representative of the local community and the upper level authorities and providing local governments with accurate environmental information as the basis for planning, bargaining, policy-making and implementation.

9.3 Increasing the role of the market and community

The experiences in the five Small Towns illustrate that the role of community in environmental decision-making is as yet largely untapped. Although there is limited participation during the enforcement of environmental regulations, local people and firms do not yet participate in the rule-making process, or at any rate this participation has not been documented. I also observed during an international conference on sustainable Small Town development in Beijing in March 2001 that all the speakers from Western countries spoke about the role of people in sustainable Small Town programs, while none of the Chinese speakers touched upon this topic. This confirms that the ongoing reform policies pertaining to Small Towns-TVIEs development and environmental protection are still government-initiated and driven programs.

Similarly, the positive influence of the market on the environmental performance of alliances is also limited due to the overall low environmental awareness of both the production and consumption sides in China. However, this situation is expected to change after China's accession to WTO. Efforts to enhance the international competitiveness of Chinese local enterprises, and especially TVIEs, will have to include environmental dimensions.

Given the fact that, by the late 1990s, around 15 percent of total domestic investment in China was foreign direct investments (FDI) (80-90 percent of which was invested in manufacturing, real estate and construction), and the majority of FDI comes from the transnational corporations (TNCs) from OECD countries, the potential environmental influence via FDI is considerable (Mol, 2001). The WTO and the ongoing globalization processes also create valuable opportunities for the EPBs at all levels to illustrate the relevance of environmentally sound production, to raise the awareness among TVIEs on environmental issues, to penetrate environmental criteria into the work of different governmental authorities and organizations, and to gain higher ranks in the governmental power hierarchy.

The fact that market and community have as yet neither explored nor exercised their roles in environmental protection does not detract from their potential power for environmental regulation in Small Towns, nor should this be underestimated. The environmental behaviors of TVIEs and town leaders will increasingly be influenced along new lines: via pressure from the community, consumers, clients, foreign investors or TNCs.

9.4. Opportunities and barriers for environmental reforms in Small Towns

The international environment and national policies seem to develop increasingly into a favorable social environment for environmental reforms in Small Towns. However, there are some clear barriers facing Small Towns and TVIEs: (1) poor rural land tenure processes and financing mechanism for public and environmental projects; (2) lack of self-sustaining operational mechanisms for environmental facilities; (3) absence of town level environmental regulatory agencies; (4) the mismatch between administrative division and ecological division; (5) unclear rural land tenure and spatial planning not integrated with environmental planning; and (6) lack of political motivation to encourage public participation. I briefly explain these barriers below.

How to finance environmental facilities is a major problem facing most of the Small Towns. To what extent, a town government has the authority to make its budget in accordance with its annual environmental plan or to pool resources through varied channels decides the material guarantee of the organizational development of a town government and the implementation of public projects, including environmental facilities. However, the current financial system that is applied in many Small Towns leaves very limited money at the hand of the town government and the permitted financing mechanisms are very limited. The financial system needs to be reformed, to be based on clearly defined rights, responsibilities and interest, in order to give the town government more room to maneuver. It is expected that the ongoing decentralization of power will result in increased finances at the disposal of the town governments.

Second, to establish a self-sustaining operational system for public facilities has proved a challenge for Small Towns. The required incentives, price policies, personnel, managerial skills, cooperative traditions and coordination power are often either inadequate or missing entirely. Although the central government has issued policies for the public facilities in cities (e.g. the *Circular on municipal solid waste treatment fee*, issued by the State Planning Commission, Ministry of Finance, Ministry of Construction and SEPA, 2002[206]), these policies often do not fit the situations in Small Towns.

Thirdly, many Small Towns still lack environmental staff. The organizational setting of a town government should allow it to fulfill the required tasks, including environmental protection. Incentives should be given to Small Towns to set up environmental protection offices as a compulsory part of a town government. For instance, these environmental workers should be included in the pay roll of governmental civil servants. Otherwise, some Small Towns would choose to make use of the existing staff in other divisions so that it would not involve extra cost.

[206] Available: http://www.sdpc.gov.cn/a/news/200207101.htm, July 25, 2002.

Another sensitive issue is the conflict between the current administrative divisions and ecological divisions. Small Towns have developed within administrative boundaries, which often are not rational from an ecological perspective. It has happened in some areas that each province, municipality, county and even town is planning for their own economic centers. This has resulted into repetition of investments, lack of economies of scale, and disorder of the layout of Small Towns. Town planning is often based on its limited geographical area, without considering the broader natural environment. It is highly important to make regional master and environmental planning as the framework of town master and environmental planning so that a town is an integrated part of the larger – economic but especially also ecological - system.

Fifth, what is largely ignored in the Chinese approach to solving environmental questions is their relation with spatial planning. And at this point we touch on upon of China's most fundamental, yet, sensitive issues: the reform of land tenure. Most problems encountered in rural and urban China today – unsustainable land use, environmental pollution, deforestation and desertification – actually relate to unclear land property rights. I have discussed in chapter 4 that collective land ownership in rural China has contributed to the economic miracle of TVEs, but at the same time it should be held responsible for the fragmented locations of TVEs and for the operation of local protectionism. The conflicts between the state and the collectives, among the collectives themselves, and between the collectives and the farmers' households often not only result in environmentally unfriendly and economically ineffective decisions, but also cause social conflicts. Furthermore, since land use planning and environmental planning are the responsibilities of different governmental departments that seldom consult or cooperate with each other during the planning process, environmentally-focused land use planning is rather limited. Where an environmental plan in some Small Towns conflict with their land use planning, the former often remain unimplemented. There is an urgent need to clarify the property rights of different land and to integrate land use and spatial planning. Otherwise, the policy of zoning TVEs and the construction of public environmental facilities will face major difficulties.

And last but not least, the lack of political motivation to involve the community residents/the public in decision-making processes for local issues is a significant barrier in Small Towns. The mechanisms through which civic engagement and social connectedness produce better schools, faster economic development, more effective government and cleaner environment are varied and complex. The empirical evidence from the studied Small Towns have indicated that public participation and support – as unmeasurable as it is – is a magic variable that explains part of the differences in the environmental behaviors of the alliances. Governmental officials and policy makers should be aware of the importance of the local residents and should institutionalize channels for broader participation for environmental protection.

9.5. Practitioners of holistic concept of environmental policy

With all these aforementioned experiences and problems, towns are ideal models to test the institutions of the China of tomorrow. This study also supports the statement that, in one regard, the industrial countries are late comers: in reflections of a more holistic concept of

environmental policy (Weidner, 2002). In China, and in Small Towns in particular, the complexity of environmental problems is much larger compared to those of other industrial countries. This challenge does not allow the Chinese policy makers and practitioners to focus only on environmental problems and has forced them to seek alternative paths for ecologizing industrialization.

The five case study Small Towns provide some examples in developing such alternative paths. They have proved that, under current socio-economic and technical conditions, the town leaders sometimes do play critical roles in strategy building, conflict resolution, innovation and integration. Only reforms that are able to coordinate socio-economic and environmental goals have a chance of success in contemporary Small Towns. It emphasizes that ecologizing industrialization is a changing process and solutions to environmental problems should response to changes in the involved (f)actors that are identified in previous sections. The positive impact of environmental reforms on other fields of society (democratic structures and procedures or technological advancement, for instance) is encouraging as well.

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Appendices

Appendix I

The Classes of the Water Quality Standard in China

Classification	Description of class
Class I	Water resources and nationally protected bodies of water
Class II	Potable water resources class I protection areas, high value fish production areas, spawning habitats for fish and shrimps, etc.
Class III	Potable water resources, class II protection areas, general fish protection areas, swimming areas
Class IV	Water bodies for industrial and recreational use
Class V	Water bodies for agricultural and general scenic amenity

National Water Quality Standard for surface water in China (g/m^3)

Substance	Class I	Class II	Class III	Class IV	Class V
pH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-9.0
Sulphate	250	250	250	250	250
Chloride	250	250	250	250	250
Dissolved iron	0.3	0.3	0.5	0.5	1.0
Manganese	0.1	0.1	0.1	0.5	1.0
Copper	0.01	1.00 (0.01)	1.00 (0.01)	1.00	1.00
Zinc	0.05	1.00 (0.10)	1.00 (0.10)	2.00	2.00
Nitrate	10	10	20	20	25
Nitrite	0.06	0.10	0.15	1.00	1.00
Ammonium (MinWR)	0.1	0.2	1.0	2.0	8.0
Free ammonia	0.02	0.02	0.02	0.20	0.20
Kjeldahl nitrogen	0.5	0.5	1.0	2.0	2.0
Total phosphorus	0.02	0.10 (0.025)	0.10 (0.050)	0.20	0.20
COD_{Mn}	2	4	6	8	10
Dissolved oxygen	90%	6	5	3	2
COD_{Cr}	15	15	15	20	25
BOD_5	3	3	4	6	10
Fluoride	1.0	1.0	1.0	1.5	1.5
Selenium	0.01	0.01	0.01	0.02	0.02
Arsenic	0.05	0.05	0.05	0.10	0.10
Mercury	0.00005	0.00005	0.00010	0.0010	0.0010
Cadmium	0.001	0.005	0.005	0.005	0.010
Chromium	0.01	0.05	0.05	0.05	0.10
Lead	0.01	0.05	0.05	0.05	0.10
Cyanide	0.005	0.05 (0.005)	0.20 (0.005)	0.20	0.20
Phenols	0.002	0.002	0.005	0.010	0.100
Oil	0.05	0.05	0.05	0.50	1.00
Anionic detergent	0.2	0.2	0.2	0.3	0.3
Tot. coli bact./liter			10,000		
Benzo(a)pyrene	0.0025	0.0025	0.0025		

Source: *GB 12941-91*. Available in: http://www.sdein.gov/cn, August 3, 2002.

Appendix II

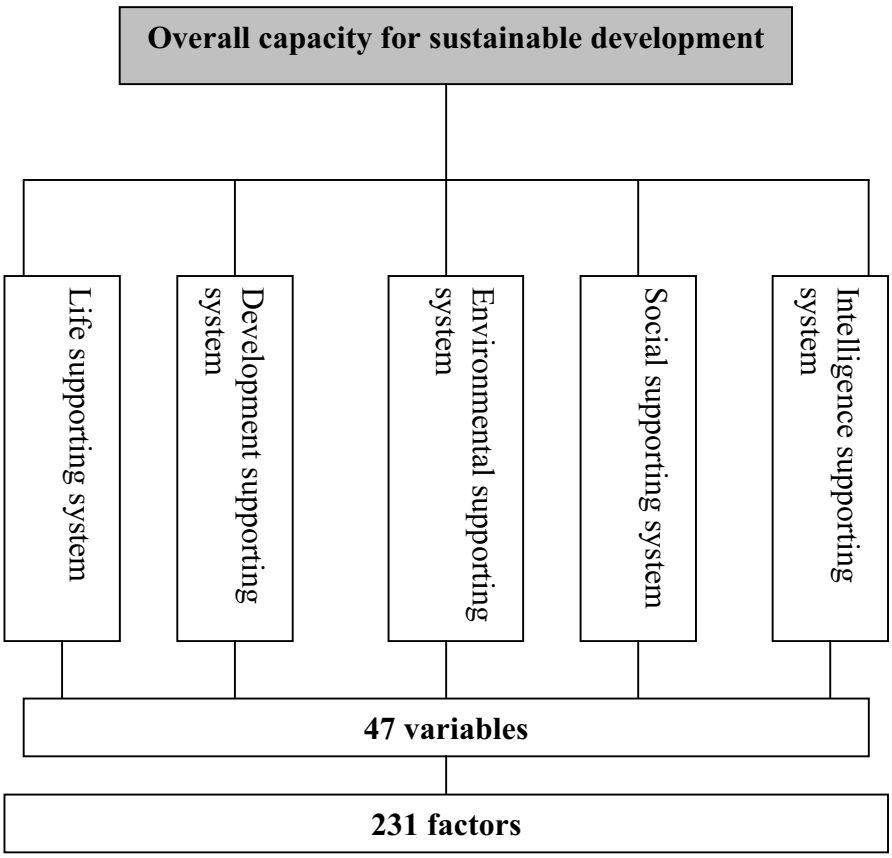
The Classes of the Air Quality Standard in China

Classification	Description of class
Class I	To protect the health of nature environment and human. No any negative effect under long time expose. For natural reserves, tourist sites, places of historic interest and scenic beauty.
Class II	To protect the health of human, other animals and plants in rural and urban areas. No any harm under long time expose. Residential areas in cities, mixed areas for commercial and residential purpose, historic relics and farming areas.
Class III	To protect human from acute and chronic toxicosis. Meet the requirement for normal growth of common animals and plants. For polluted urban areas, industrial areas, transportation hubs in cities.

Source: *GB 3095-82*. Available in: http://www.sdein.gov/cn, August 3, 2002.

Appendix III

Indicators assessing sustainable development in China



Source: adapted from *China Sustainable Development Report 2001* (Chinese Academy of Sciences, 2001).

Appendix IV

The weighted indicators assessing the efficiency of Small Town scales

1. **Societal structure (0.2)**
2. **Economic efficiency (0.2)**
3. **Qualification of the population (0.1)**
4. **Environmental quality (0.15)**
5. **Living conditions (0.15)**
6. **Social security (0.1)**
7. **Public security (0.1)**

Source: *Study on the development of Small Towns,* Yu, 2001:150.

Appendix V

List of interviewees and informants

1. Li Tie, Director of China Center for Town Reform and Development,
2. Chen Wenming, vice-director of UNIDO/UNDP China National Clearner Production Center
3. Wang Yuxiang, Editor of China Township Enterprise Daily
4. Yao Jianfu, Professor, Research Center for Rural Economy, Ministry of Agriculture
5. Shao Yilong, Associate professor, Director of TVE Pollution Control Section, Ministry of Agriculture
6. Zhao Yuelong, Director of Center of Energy & Environment Protection Technology Development, Ministry of Agriculture
7. Zhu Zhaowei, vice-director of China Certification Center of Environmental Management System, Chinese Research Academy of Environmental Sciences
8. Li Dihua, Lecturer of Beijing University, Department of Urban and Environmental Sciences
9. Liu Zongchao, post-doctor, professor, Chinese Academy of Social Sciences Institute of World Economics & Politics
10. Huang Shunji, Professor, Department of Philosophy, China People's University
11. Zhu Qingfang, Senior consultant, Chinese Academy of Personnel Management
12. Zhang Zhiqiang, Director of Huahui Advisory Service
13. Wang Guiling, Director of Township Enterprises Development Center, Ministry of Agriculture
14. Cai Li, Program officer, Industrial Guidance Division, Bureau of Township Enterprises, Ministry of Agriculture
15. Zhang Tianzhu, Professor of the Department of Environmental Science and Engineering, Tsinghua University
16. Wang Rusong, director of Department of System Ecology, Research Center for Ecological Environmental Science, Chinese Academy of Science
17. Shi Han, director of China Center for Environmentally Sound Technology Transfer
18. Wang Jianmin, senior researcher of Nanjing Environmental Research Institute
19. Hu Dan, researcher, Department of System Ecology, Research Center for Ecological Environmental Science, Chinese Academy of Science
20. Zhang Kai, director of Shangdong EPB
21. Lu Huiliang, vice-chairman of the People's Congress of Wujin
22. Zhou Xiaoxing, vice-director of Wujin Environmental Protection Bureau
23. Liu Boshun, vice-director of Wujin TVE Bureau
24. Cao, governor of Hengshanqiao Town, Wujin
25. Yang, manager of Economic & Trade Company of Hengshanqiao Town
26. Wu, assistant in charge of environmental protection of Hengshanqiao Town
27. Tang Jianyuan, Technical manager, Wujin Fine Chemical Factory
28. Tang Weihua, manager of Wujin No. 8 Wool Factory
29. Xie Xianzheng, senior engineer, Anhui EPB
30. Xu Hesheng, division director, Anhui Planning Commission

31. Tian Wenzhao, Environmental Protection Division, TVE Bureau, Anhui
32. Li Dingsong, Division for Transportation and Energy, Anhui Planning Commission
33. Zhang Zhiyuan, president of Anhui Research Institute for Environmental Science
34. Fang Qi, governor of Digang Town, Anhui
35. Zhang Qing, environmental staff of Digang Town, Anhui
36. Cao Huiling, vice-director of Wuhu EPB
37. Shi Xiangdong, section director, Wuhu Planning Commission
38. Yin Pingjiang, vice-manager, Wuhu Hualong Cement Factory
39. Zhao Men, vice-director of Wuhu Planning Commission
40. Zou Tongbao, governor of Jiujiang District, Wuhu city
41. Wang Shixiao, governor of Guandou town, Wuhu city
42. Hu Wenbing, Communist Party sectretary of Chuandou Town
43. Ding Heming, manager of Wutao Village Paper Mill, Guandou Town
44. Manager of Houwang Electrode Factory
45. Peng Yongfeng, governor of Daxing Town, Hefei city, Anhui province
46. Zhen, officer of Economic and Planning Commision of Hefei Suburban Government
47. Xu, officer of HeFei Municipal Planning Commission
48. Zhao Zhuohua, manager of Hefei Linghu Furniture Factory, private sector
49. Zhong Zhengyang, general manager of Hefei Jingzhong Paper company ltd.
50. Management staff of Caochong Wholesale Market
51. Director of Kunming EPB, Yunnan province
52. Vice-director of Kunming EPB, Yunnan province
53. Wang Sixu, Communist party secretary, Dayu town, Yunnan province
54. Tian Cunjin, Leader of villagers committee of Dayu village, Yunnan province
55. Li Chunhai, communist party secretary, Dounan village, Yunnan province
56. Zhang Shaohua, director of Chengong county EPB, Yunnan province
57. Li Xiangqun, vice-director of Guandu EPB, Yunnan province
58. Huangpu Yunsheng, vice-director of Kunming EPB, Yunan province
59. Duan Rifu, director of Xishan district EPB, Yunnan province
60. Chen Zhaoliu, director of Jinning county EPB, Yunnan privince
61. Kang Yunhai, vice-director of Yunnan Academy of Social Sciences

Summary

For historical reasons, any policies that attempt to address issues of Chinese farmers, agriculture and rural society are doomed to be facing dilemmas. One typical example is the question how to protect the rural environment during the ongoing rapid industrialization and urbanization processes in rural China, driven by Township & Village Enterprises (TVEs) and Small Towns. The economic and social achievements of TVEs and Small Towns are celebrated and are widely regarded as magic weapons to alleviate rural poverty, to mitigate population pressure on limited arable land and to narrow gaps between the urban and rural societies without causing social unrest. By the same token, however, the environmental consequences of the current development modes are deliberately put between brackets, hoping that environmental problems will be automatically solved with increased income levels and technological advancements. Unfortunately, the environmental pollution and ecological destruction one can observe in many of Township & Village Industrial Enterprises (TVIE)-dominated Small Towns have already hampered sustainable development of the local and regional economies. China has reached the moment that environmental problems in rural areas can no longer be ignored and solutions call for concerted efforts.

Responding to the many problems Small Towns face (including environmental pollution), a number of decisions and policies have been enacted by the Chinese Government to guide and facilitate the development of TVEs and Small Towns. The strategy of combining Small Town development and TVE strengthening is also stressed in the Tenth Five-Year Plan of TVEs, mainly through better zoning and restructuring. However, few studies have been done on how these policies correspond with or affect environmental strategies of Small Towns and TVEs.

This thesis deals with these dilemmas and questions by analyzing the potential and actual (f)actors in environmental regulation games in Small Town-TVIE complexes. What environmental strategies are adopted under what conditions in Small Towns to safeguard economic development via TVIEs, without jeopardizing the sustenance base by uncontrolled environmental deterioration? To this end, theoretical perspectives are needed to investigate the ways TVIEs and Small Town governments deal with environmental challenges and to understand the reasons behind their behavior. This thesis combines the holistic view of the Chinese Complex Eco-system Theory and the Western Ecological Modernization Theory to provide a new perspective towards environmental management of TVIEs in Small Towns. Based on these two theories, a theoretical framework for ecologizing industrialization in Small Towns is established.

This theoretical framework takes into consideration the complexity of environmental issues in Small Town, the potential (f)actors involved and the interactions between them on the one hand, and focuses on institutional arrangements and innovations that are necessary to catalyze ecologizing industrialization processes on the other hand. One of the features of this framework is that it regards TVIEs and Small Town Governments as alliances instead of opponents in environmental regulation. Ecologizing industrialization in the context of Small Towns has been framed as an embedded process that involves the state, the market, the TVE-Town Government

alliances and the community/public. The roles of these actors and the interrelations between them are decisive for the outcomes of the environmental triangle game. Following this line of reasoning we investigate four types of relations or networks: TVIEs-Town Government relations, (county/municipal, provincial and national) state-alliance relations, market-alliance relations and community-alliance relations.

For this, empirical studies of five Small Towns from Jiangsu and Anhui provinces are used, next to general observations and secondary literature. These five case study towns (Luzhi, Hengshanqiao, Digang, Guandou and Daxing) represent different types of Small Towns in terms of geographical locations, economic strength, governing styles, environmental problems and environmental attitudes. These cases have generated diverse environmental reform strategies that these alliances apply in their confrontation with environmental problems: political modernization; aid-oriented model; technology-based strategies; export-driven model; and shift-to-service industry strategy. Although any generalization of successes and failures in environmental management from these five cases should be taken with great caution, the value of these selective case studies lies in widening our view and understanding of the universe of possibilities to control TVE pollution and the necessary conditions for such success. These case studies also trigger reflections on necessary institutional reforms at higher levels, beyond Small Towns.

This thesis concludes that TVIE-caused environmental problems and their solutions in Small Towns are the results of the interactions between different alliances and their external social environments. The solutions to TVIE environmental problems lay in reforming and innovating the existing organizations, institutions and the roles of the government, market and community.

Secondly, this study has made clear that the failures of the current environmental regulations towards TVIEs lay in the gap between limited environmental management capacity and the complexity of TVIE environmental problems. The magnitude of TVIE pollution in Small Towns underlines the urgent need for China to create and enforce effective environmental protection and conservation policies. To this end, there is an urgent need for local capacity building.

Third, the experiences in the five Small Towns illustrate that the role of community in environmental decision-making is as yet largely untapped. This confirms that the ongoing reform policies pertaining to Small Towns-TVIEs development and environmental protection are still government-initiated and driven programs. Similarly, the positive influence of the market on the environmental performance of alliances is also limited due to the overall low environmental awareness of both the production and consumption sides in China.

Forth, the international environment and national policies seem to develop increasingly into a favorable social environment for environmental reforms in Small Towns. However, there are some clear barriers facing Small Towns and TVIEs: (1) ill-defined land property structures and poor financing mechanisms for public and environmental projects; (2) lack of self-sustaining operational mechanisms for environmental facilities; (3) absence of town level environmental regulatory agencies; (4) the mismatch between administrative division and ecological division; (5) unclear

rural land tenure and spatial planning not integrated with environmental planning; and (6) lack of political motivation to encourage public participation.

The last, with all these aforementioned experiences and problems, towns are ideal models to test the institutions of the China of tomorrow. This study also supports the statement that, in one regard, the industrial countries are late comers: in reflections of a more holistic concept of environmental policy.

Samenvatting

Elk beleid dat zich richt op problemen van Chinese boeren, landbouw of plattelandssamenleving wordt geconfronteerd met dilemma's. Een typisch voorbeeld van een dergelijk dilemma vormt het vraagstuk hoe het milieu te beschermen onder gelijktijdige snelle industrialisatie en urbanisatie - voortgedreven door Town en Village Enterprises (TVEs) en Small Towns[1] - op het Chinese platteland. De economische en sociale vooruitgang die TVEs en Small Towns hebben gebracht worden algemeen gezien als machtige wapens in armoedebestrijding, afname van de bevolkingsdruk op het beperkte landbouwareaal en het slechten van de barrières tussen stad en platteland zonder sociale onrust te veroorzaken. Tegelijkertijd worden echter de milieuconsequenties van dat ontwikkelingsmodel tussen haken geplaatst en wordt gehoopt dat deze met de stijging van de welvaart en de voortgaande technologische ontwikkeling automatisch verdwijnen. Maar milieuvervuiling en -vernietiging leiden nu al tot haperingen in de duurzame ontwikkeling van lokale en regionale economieën die op TVEs zijn gebaseerd. China heeft het moment bereikt waarop milieuvervuiling in rurale gebieden niet meer ontkend kan worden en elke aanpak noodzaakt een gemeenschappelijke inzet.

In antwoord op de vele problemen van Small Towns (waaronder milieuproblemen) heeft de Chinese regering een aantal besluiten en beleidsvoornemens opgesteld om de ontwikkeling van Small Towns en TVEs te begeleiden en faciliteren. Het Tiende Vijfjaren Plan, bijvoorbeeld, benadrukt de strategie die de ontwikkeling van Small Towns combineert met de versterking van TVEs, met name via betere zonering en herstructurering. Echter, weinig aandacht is tot op heden besteed aan de relatie van dit beleid met milieustrategieën richting Small Towns en TVEs.

Deze dissertatie richt zich op bovengenoemde dilemma's en vraagstukken en analyseert de potentiële en actuele actoren en factoren die ene rol spelen bij milieuregulering in Small Towns - TVE complexen. Welke milieustrategieën worden onder welke condities gevolgd in Small Towns, ten einde economische ontwikkeling

[1] "Town en Village Enterprises" kan niet zondermeer worden vertaald met Midden- en Kleinbedrijf. Evenmin kan "Small Town" niet worden vertaald als kleine stad of dorp. Deze begrippen hebben in de loop der geschiedenis een specifieke Chinese invulling gekregen (zie hiervoor hfd. 1 en 4). Daarom worden in deze Nederlandse

via TVEs te waarborgen zonder dat ongecontroleerde milieuvervuiling de natuurlijke bestaansbasis ondermijnt? Theoretische perspectieven zijn nodig om te onderzoeken op welke wijze TVEs en de Small Town overheden omgaan met de milieu-uitdagingen en om hun handelen te kunnen begrijpen. Deze studie combineert daartoe het holistisch perspectief van het Chinese Complex Eco-system theorie met de westerse theorie van Ecologische Modernisering, ten einde een nieuw perspectief te ontwikkelen op milieumanagement van TVEs in Small Towns. Gebaseerd op deze twee theoretische stromingen wordt een raamwerk van Ecologisering van Industrialisering ontwikkeld.

Dit theoretisch raamwerk gaat enerzijds uit van de complexiteit van milieuproblemen in Small Towns, de potentiële factoren die daarmee samengaan en de interacties tussen deze factoren, en concentreert zich anderzijds op de institutionele arrangementen en innovaties die noodzakelijk zijn als katalyse van processen van ecologische industrialisering. Centraal kenmerk van dit raamwerk is dat Town and Village Industrial Enterprises en het bestuur van de Small Towns beschouwd worden als een alliantie, in plaats van opponenten. In de context van Small Towns wordt ecologisering van industrialisering geanalyseerd als een proces dat ingebed is in de instituties en actoren van staat, markt, TVE-Small Town bestuur en de civiele samenleving. De rollen van actoren in interdependente netwerken zijn beslissend voor de uitkomst van het zogenoemde ‘milieu driehoek spel’. Dientengevolge worden vier typen netwerken geanalyseerd: TVIE-Small Town bestuur (=alliantie), staat-alliantie, markt-alliantie en civiele maatschappij-alliantie.

Empirische studies in vijf Small Towns in de provincies Anhui en Jiangsu worden hiervoor gebruikt, naast algemene informatie en secondaire analyse van bestaande studies. Deze vijf case studies (Luzhi, Hengshanqiao, Digang, Guandou en Daxing) verschillen in termen van geografische locatie, economische ontwikkeling, beleidsstijlen, milieuproblemen en milieuattitudes. Uit deze cases volgen verschillende milieuhervorming strategieën die de allianties in deze Small Towns toepassen bij hun confrontatie met milieuproblemen:

- politieke modernisering

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samenvatting de Engelse termen onverkort gebezigd.

- modellen georiënteerd op externe hulp en assistentie
- technologie-georiënteerde strategieën
- export gericht modellen
- verschuiving naar de dienstensector

Hoewel elke vorm van generalisatie van de uitkomsten van deze vijf case studies naar de overige delen van China met grote voorzichtigheid tegemoet moet worden getreden, geven deze selectieve case studies ons wel zicht op het scala aan mogelijkheden om milieuproblemen in Small Towns op te lossen. Het geeft ook duidelijkheid over de noodzakelijke randvoorwaarden die aan elk van deze strategieën ten grondslag liggen. Daarnaast brengen deze case studies de noodzakelijke institutionele hervormingen van hogere overheidslagen aan het licht.

Op basis van dit empirisch onderzoek kunnen vijf conclusies worden geformuleerd. Milieuproblemen en milieuoplossingen in Small Towns zijn het gevolg van de interacties tussen allianties en hun externe sociale omgeving. De oplossingen van TVE milieuproblemen liggen in de hervorming en vernieuwing van bestaande organisaties, instituties en rollen van overheid, markt en civiele maatschappij.

In de tweede plaats maakt deze studie duidelijk dat het falen van de huidige milieuregulering van TVIEs voorla ligt in de kloof tussen de beperkte milieucapaciteit en de complexiteit van TVIE milieuproblemen. De omvang van TVIE milieuvervuiling in Small Towns onderstreept de directe noodzaak om effectieve milieubescherming te creëren en te handhaven. Vooral de opbouw van lokale milieucapaciteit is noodzakelijk.

Ten derde komt uit de vijf case studies naar voren dat het publiek nog nauwelijks een rol speelt in milieubesluitvorming. Het hervormingbeleid richting Small Towns - TVEs ontwikkeling en milieubescherming is nog in sterke mate geïnitieerd door de overheid. De positieve invloed van de markt en marktpartijen op de milieuperformance van allianties is eveneens beperkt door het over het algemeen lage milieubewustzijn aan zowel de productie- als de consumptiezijde.

Hoewel de internationale omgeving en het nationale beleid zich in toenemende mate een gunstige situatie lijken te scheppen voor milieuhervormingen in Small Towns, zijn er nog duidelijke barrières voor Small Towns en TVEs:

1. Slecht gedefinieerde landeigendomstructuren en zwakke financiële mechanismen voor publieke en private milieuprojecten.
2. tekort aan operationele mechanismen die milieuinfrastructuur in stand houden zonder overheidsbemoeienis
3. ontbreken van milieuoverheden op de laagste administratieve niveaus (Town level)
4. het niet passen van administratieve indelingen met ecologische regio's
5. onduidelijk land eigendom en ruimtelijke planning die niet geïntegreerd is met milieuplanning
6. gebrek aan politieke wil om publieke participatie te stimuleren

Met al deze ervaringen en problemen zijn Small Towns ideale proeftuinen om de instituties van het China van morgen te testen. Deze studie toont aan dat geïndustrialiseerde landen tenminste op één terrein achter lopen: in de reflectie op meer holistische concepten van milieubeleid.

About the Author

Lei Zhang was born on 19 November 1970 in Ningxia, China. Since 1992, after obtaining a BA. degree in English Literature and Linguistics from Shanghai Normal University in Shanghai, she had worked as a teacher in Ningxia Agricultural School for 8 months before she was transferred to EU Project Office in Ningxia Agricultural Department as a project officer. She came to the Netherlands in 1996 to pursuit a master degree in Environmental Management in Wageningen University.