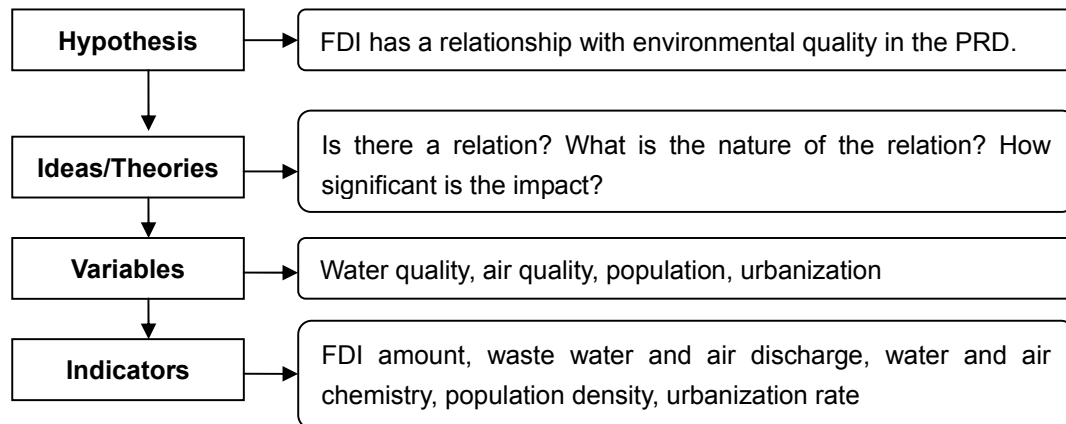


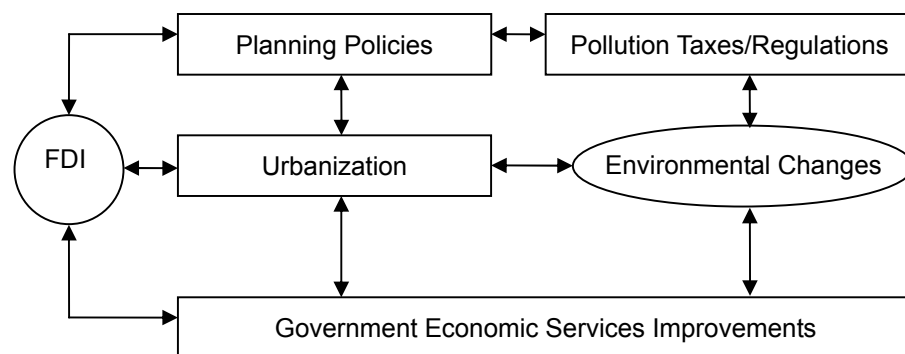
The Pearl River Delta not only has experienced a rapid economic growth rate since 1978, the area also has gone through an extremely rapid urbanization process. Many factors, probably including foreign direct investment, have contributed to the deterioration of the region's natural environment.

Lin's model in the previous chapter identifies important factors in the PRD's economic development and spatial transformation process. It indicates that the changes by global forces have direct impacts on transportation and rural industrialization in the PRD. I have expanded his model to include the environment, the focus of this research, and also one of the three Es in sustainability in addition to economy and equity (Dyck and Huang, 2001). Environment, economy and social equity are interrelated with each other, so that changes in any one of them activate a series of chain reactions to the others.

The purpose of the research is to examine the role of FDI in these changes. The process of my analysis can be summarized in the diagram as follows:

Figure 5.1**Preliminary Research Model**

The following diagram hypothesizes the interactions among the variables and will lead to discussion concerning the relative importance of the variables:

Figure 5.2**Interaction between FDI, Environment, Urbanization, and Government Policy in the PRD**

In turn, Fig. 5.2 can be redrawn into the Jones's model, as described in Chapter 4 to better articulate the structure of the FDI-Environment linkage. The difference here is that FDI

substitutes as the outside force to the system instead of globalization. Planning policies and pollution regulations are shown as environmental policies in Jones's model. Government economic services improvements in the above model indicate the changes in economic policies. The changes are shown in Fig. 5.3. below:

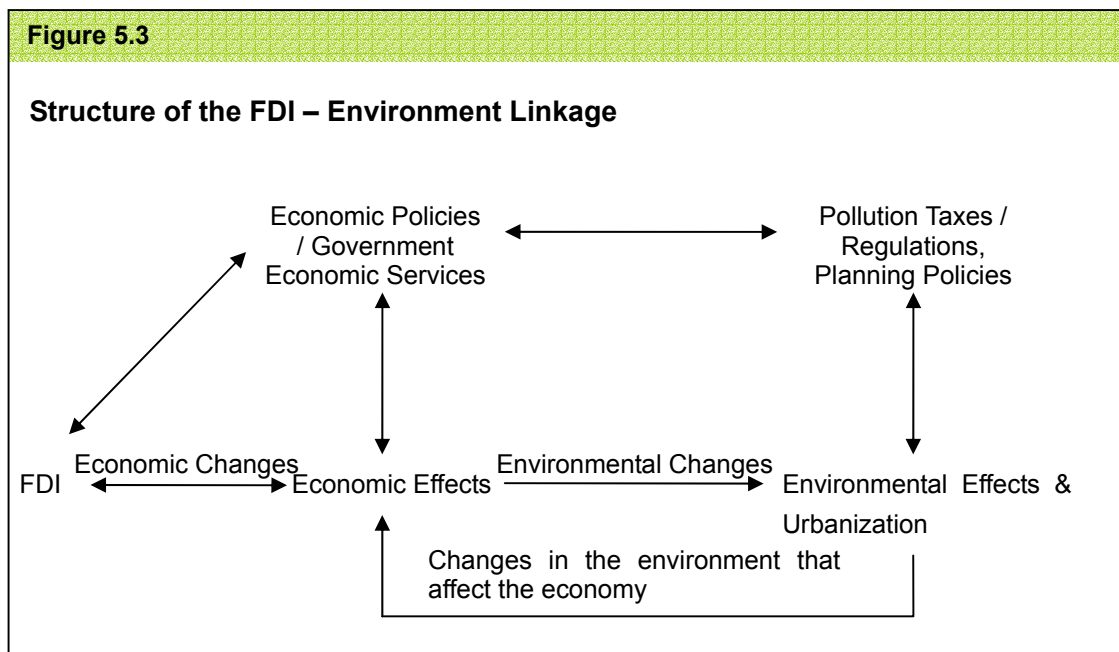


Fig. 5.3 is different from Jones's model in three ways. First, the arrow between FDI and economic effects is double-headed. The local economic effects resulting from economic policies affect foreign investors' behavior in choosing a location, thus altering the local industrial pattern. Secondly, urbanization has been added to environmental effects based on its relation with other factors in the framework. Third, the interactions between FDI and government policies are shown by two double-headed arrows, since economic and environmental policies affect each other and they also affect FDI directly. The chart will be used as a basis for examination of both

Guangdong Province and the two case study cities in the PRD.

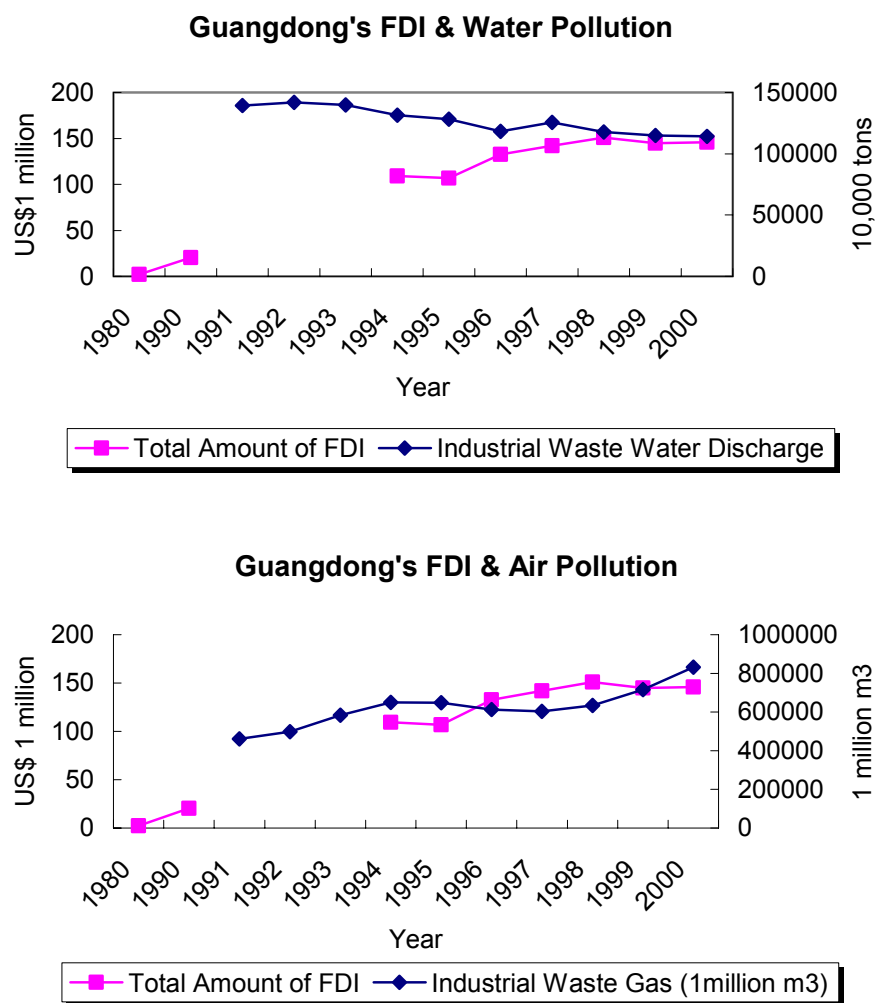
While interactive relationships are recognized in both models, the relative importance of the relationships are not presented. For example, how important is the FDI factor to the decision makers of local/regional urban planning policies? In the past, governmental planning considerations drove FDI which had usually been immune to local/regional decisions. During the planned economy period before 1978, the government was the only owner of land. After the economic reforms, foreign investors could purchase the right of use of the land, and could even sell it to a third party. All these activities have to go through a complicated application process in different government agencies depending on which industry the land is used for. The real ownership still belongs to the government, which ensures the absolute authority of the government over not only land use, but also the economic decision such as the type of the industry that is established there (www.invest.gov.cn, 2001).

In recent years, foreign investors have been more aggressively involved in the local/regional policy decision-making process. The competition among cities and regions also compels the local governments to invite more foreign investors to participate at all levels of the decision-making process. The PRD has been under tremendous pressure to improve its environment and government services since the mid-90s, because FDI has tended to move from the PRD to the Yangtze River Delta, which has better urban comprehensive plans and training programs (Chen, Zhen, Interviews, June 2001).

Impacts of FDI on Environment in Guangdong

To attain an overall impression of the PRD, it is critical to understand what has occurred in the entire province. Fig.5.4 provides evidence that industrial waste water and air pollution in Guangdong did not have a linear relationship with FDI's growth over the past 20 years.

Figure 5.4



Source: Guangdong Yearbook, 2000; www.stats.gov.cn, 2001; Guangdong EPA, 1996, 2001.

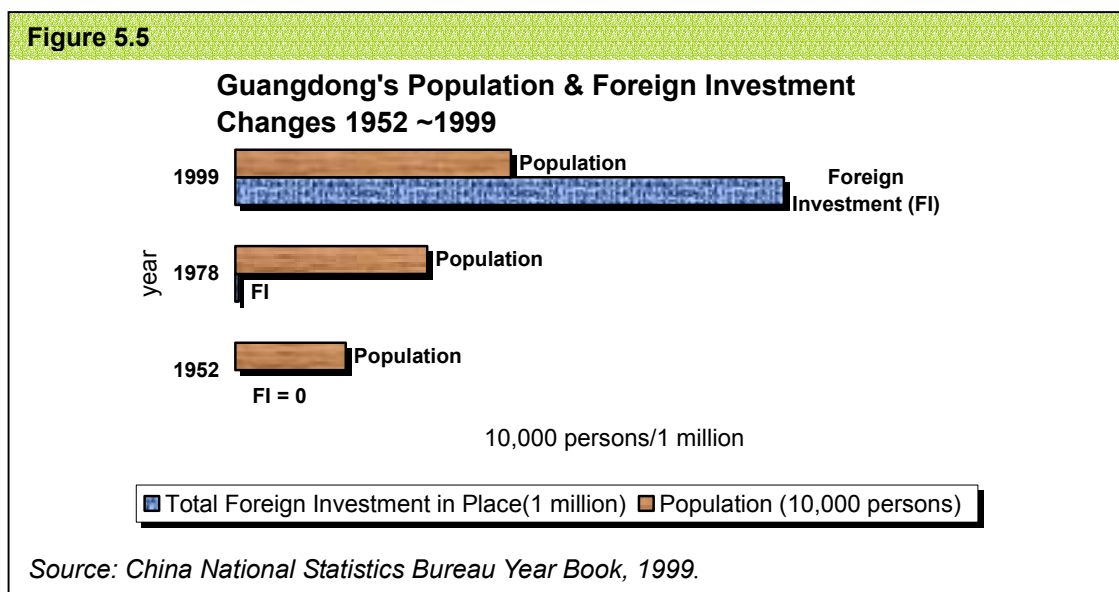
However, industrial waste indicators may not give a correct impression of the

environment since environment quality can be defined in so many different ways. For example, automobile exhaust significantly affects the urban air quality, but industrial waste air has no direct connection with the number of automobiles. Although most FDI has been invested in the private industrial sector, industrialization is not the only factor that affects natural environment. Industrialization may have caused the region's rapid population growth, urbanization, and technology changes, but the policy makers did not necessarily alter their perspectives on sustainable development as swiftly as the changes occurred. Nonetheless, FDI accelerates changes in environmental and economic regulations. Foreign investors, especially large investors, have introduced not only advanced technology but also new requirements for work force training and government service quality, as well as social order (Chen, Interview, June 2001).

According to Copeland, there is some evidence that pollution will rise with global economic growth. There is also evidence that the pollution intensity related to exports from lower-income countries with relatively weak enforcement of environmental standards has increased over time. This suggests that trade may well be contributing to an increase in global pollution, while there is little convincing evidence that differences in environmental policies have a significant influence on trade patterns (Copeland, 1996, p.388).

Urbanization is another important factor in my model. It is as crucial as FDI in affecting the environment in the PRD. Arguably the urbanization in the PRD is the result of the FDI influx. Based on the equations in Chapter 2 that China uses to evaluate its urbanization level – the more

urban population, the higher urbanization level - and the observations that immigration to Guangdong has been mainly from rural to urban, population growth likely causes a major part of the growth in urbanization. The total population of the Guangdong has not grown as rapidly as FDI, shown in the graph below.



Thus, neither environmental policies nor urbanization affects the local environment as directly and influentially as the economic factor. In the PRD, FDI has been a major economic growth catalyst. How it affects the local economy may lead to significant changes in the environment. The trends in Guangdong must be similar to those of the PRD because the PRD accounts for 80% of Guangdong's FDI. Its highly urbanized character with dense industrial development determine that the PRD will only have higher pollution density. The studies on the selected cities in the PRD, below, will explore the interaction between FDI and environment more fully.

Impacts of FDI in Selected Cities

To examine the validity of the above statement in a large and dense area like the PRD, more evidence needs to be drawn from quantifiable economic and environmental indicators of specific urban regions. Guangzhou as the provincial capital and Dongguan as a medium-sized rural area turned big city provide two representative case studies of the large cities in the PRD. Being the third largest city in the entire country, Guangzhou has drawn much attention from large foreign investors, especially major lenders. Dongguan has just recently grown to become one of the delta's largest cities. Its economic success has been established on the basis of collaboration between small investors, mainly from HK and Taiwan, and the accommodating local government, as well as low land and labor costs.

Case Studies

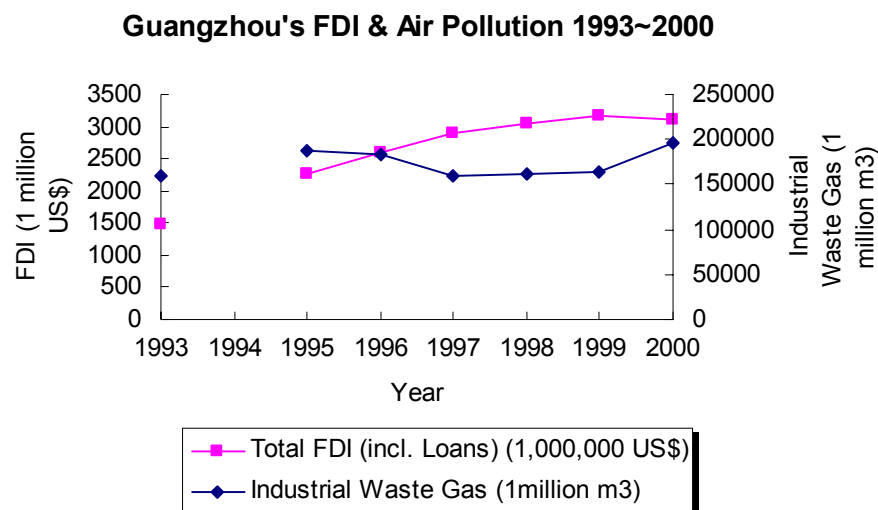
Guangzhou

The factors that account for Guangzhou's significance among all the cities in the PRD are its political status as the provincial capital and its rich economic history of thousands of years. Guangzhou became a well established industrial center after the Communist regime took over. Due to the limited land within and around the city, and the artificial constraints on political boundaries, Guangzhou now has very little space to expand. Its highly centralized land use pattern has contributed to intense urban pollution. Its complicated street pattern and transportation system make large-scale rezoning and reconstruction very difficult. In 1999,

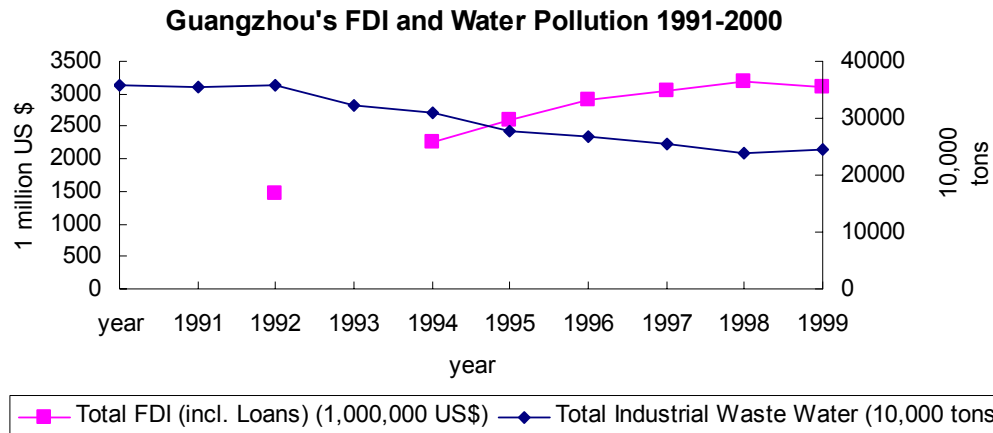
Guangzhou's total area equaled 7434.4 square kilometers with 6.85 million people (Guangdong Statistical Yearbook, 1999). Both figures have increased in the intervening years due to efforts of the Guangdong government to stretch Guangzhou spatially. Guangzhou's urbanization level in 1998 was 82.48%, which was the highest in Guangdong. The level was projected to reach 88.18% in 2005 and 90.00% in 2010 (Guangdong Construction Agency, 2000).

The change of industrial structure of Guangzhou has distinct characteristics of being pushed by both demand and supply. With the economic growth and the increase of income, the regularity of supply and demand changes from survival to development, namely, the focus of demand and supply is gradually transferring from the lower layer of basic demand and supply to guarantee survival to the higher layer of development of individuality. With the increase of average income, the change of demand and supply structure of consumption of Guangzhou residents has been obviously accelerated. At the beginning of 80s, aimed mainly at satisfying basic demands, the living income and expenses of the residents were almost balanced. But in the 90s, the expense structure of the residents gradually changed from food and clothing to housing, transportation and other daily necessities, including social services. This stimulated overall development and structural change of industries that produced the means of consumption; it promoted textile, household appliances, clothing and household chemical industries. It also pushed related industries to change in total numbers and structures, thus promoting the change of industrial structure of Guangzhou (Guo, 2001) in the direction of service industry.

Over the 1990s, foreign products or products of foreign capital enterprises had occupied absolute advantage in the markets of communication facilities and carbonated drinks in Guangzhou. Foreign businesses not only seized and controlled disadvantageous fields like microelectronic industry and new materials, but also traditional advantageous industries like clothing, food, and cold drink industry. FDI in Guangzhou has exceeded 30 billion per year since 1999. Guangzhou's industrial waste water amount accounts for 18.26%; its industrial waste air for 20.66% of that of the entire Guangdong Province during the 1990 to 1995 period (Government data, 1995). Its size, population density, and long industrial history put it at the top of the list of most polluted cities in the PRD region. However, Guangzhou's industrial waste water discharge actually decreased while FDI continued to grow in the 90s, as will be seen in the next section, which would seem contradict the experience of Dongguan.

Figure 5.6

Source: *Guangzhou Statistics Yearbook, 2000; Guangdong EPA, 1996, 2000.*

Figure 5.7

Source: *Guangzhou Statistics Yearbook, 2000; Guangdong EPA, 1996, 2000.*

This interesting finding prompts more questions about the effects of FDI. Despite the similar high growth rate in population in Guangzhou and Dongguan, the types of foreign invested industries in Guangzhou have shifted from pollution-intensive to service-oriented. Guangzhou also has a different long-term development strategy as the capital of the province. These may account for the drop in both Guangzhou's industrial waste water and waste air.

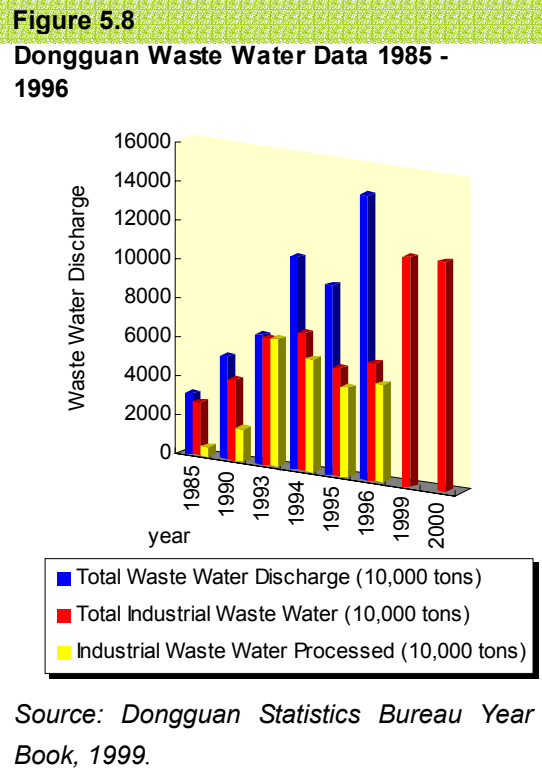
The Guangzhou government has been trying to move both domestic invested and foreign invested industries out of the center of the city. Guided by this strategy, the Guangzhou Special Economic Technology Development Zone (GSETDZ) was established at the south east edge of Guangzhou in 1985. This 9.6129 square kilometer area was designed to accommodate high-tech foreign invested industries whose products were aimed for exports. By September 1999, 55 of the top 500 companies of the magazine *Fortune* had launched their factories in the zone. One

hundred and sixty enterprises have invested more than US\$ 10 million since 1985. The Development Zone has maintained a GDP growth rate of more than 10% since the early 1990s (GSETDZ Environmental Assessment Report, 2000). The most attractive feature of the Zone to the foreign investors is its well-planned environmental infrastructure. In fact, according to Huang Zhimin (Interview, June 2001), a senior environmental expert, the Zone's waste water processing facility (which was built exclusively for the Zone in 1991) is so advanced that the entire waste water of the Zone in 2001 took less than 50% of its processing capacity. FDI, the local economy, and environmental quality are interrelated and appear to benefit one another in this case.

Dongguan

In contrast to Guangzhou, Dongguan grew from a typical rural town to a nationally recognized industrial base only after the economic reforms began in 1978. Dongguan is situated in the northeast of the Pearl River Delta and in the south central region of Guangdong Province. Dongguan City was set up in 1985 instead of Dongguan County and then changed into a prefecture-level city in 1988, administrating 32 towns and districts. Its 2460 square kilometers accommodated 1.5 million registered citizens in 1999 (www.gd.gov.cn, 2001). According to Lin (1997, p.100), it had the highest annual growth rate of temporary population in China at 74.67% during the period 1982 to 1990. In the census of 2000, immigrants in Dongguan were about five times more than its registered residents (Wu, 2001, pp. 15). Many of these immigrants were working in certain types of foreign invested factories at much lower salaries than registered citizens. Dongguan's urbanization level in 1998 was 33.60%, which was projected to increase to

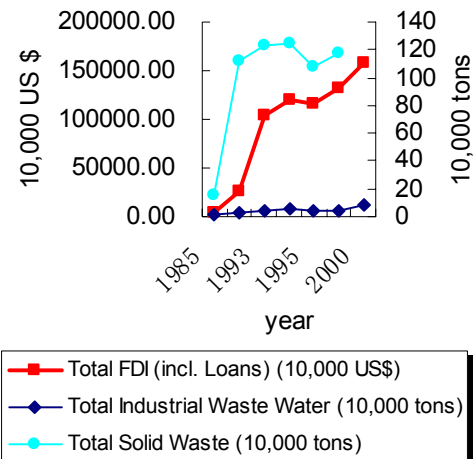
56.71% in 2005 and 76.70% in 2010 (Guangdong Construction Agency, 2000). This once rural town is expected to urbanize at a rate of approximately 3% every year.



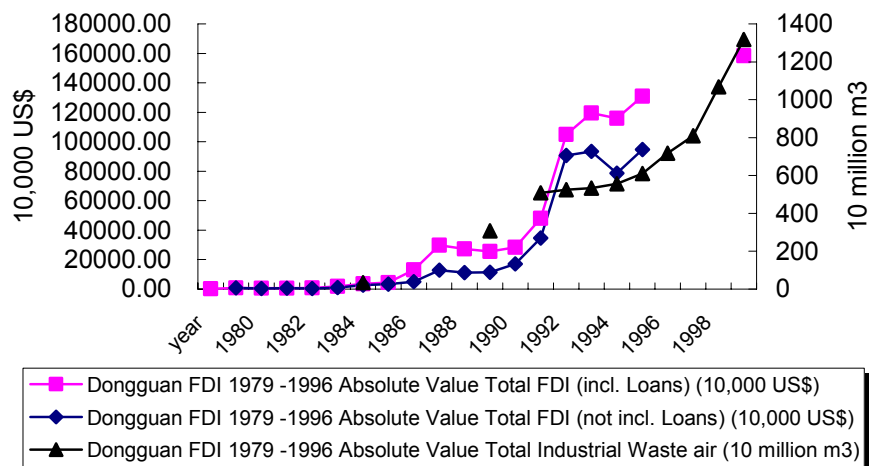
Since 1989, Dongguan has attracted \$9.6 billion in foreign investment. Giant industrial blocks have sprung up with money from Hong Kong (garments), Taiwan (paper mills) and Japan (electronics) (Ng, 1999). Dongguan's environment has paid a heavy price for its rapid economic growth. Twenty-five percent of its farmland disappeared during 1987 to 1999, and thousands of former peasants

turned to the factories which occupied the farms they used to work on. Wastewater discharge soared because of labor-intensive and pollution-intensive industries. Fig. 5.8 shows a considerable increase in industrial waste water from 1985 to 2000 (data on total waste water and waste water processed for the year 1999 and 2000 are not available). Dongguan also faces severe air pollution and solid waste problems. The nation's largest coal burning power plant, located in Dongguan, contributes to its worsening air quality along with its growing automobile population. In 1999, Dongguan's acid rain occurrence rate was above 56.1% (Wu, 2001, pp. 15).

Meanwhile, since 1997, Dongguan's export volume has been ranked the third highest for three subsequent years in China, following Shenzhen, another major city in the PRD, and Shanghai (www.gdnet.com.cn, 2001). A different wastewater and waste air – FDI pattern from Guangzhou is seen in Fig. 5.9 and Fig. 5.10.

Figure 5.9**Dongguan's FDI and Pollution 1985-2000**

Source: Dongguan Statistics Bureau Year Book, 1999.

Figure 5.10**Dongguan's FDI & Industrial Waste Air**

Source: Dongguan Statistics Bureau Yearbook, 1999; Guangdong EPA, 1996.

The pollution indicators tend to have a parallel relationship with FDI, that is, the amount rises when FDI increases, and vice versa.

SYNTHESIS

Only two case studies are not sufficient to describe holistically the complex relationship between FDI and the environment in the PRD. However, these two different cities do present some evidence in understanding the local situation, which contribute to an holistic view of this region. In Guangzhou, strict government policies regulating the market and the environment limit the influence of urbanization, industrialization, and FDI. As a politically and historically important city in South China, Guangzhou has more options for development diversity. But in Dongguan, where the focus of development is to attract outside investment to increase income, the local government has not been as responsive to environment problems as to economic needs. The rapid change at Dongguan's periphery areas adds to the difficulty of balancing economic and environmental development.

In general, based on this limited analysis, FDI has more significant environmental impact in large to medium cities in the PRD, such as Dongguan, where the planning and environmental regulations are less compulsory and less policy consistency, the economic policies are more flexible, and the urbanization is almost entirely market-oriented. FDI emerges as the major economic factor in influencing the local environment.