

Economic development and its impact on the environment in east coastal zone of China*

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Abstract—This paper discusses briefly the elementary characteristics of the east China economic developing zone, and analyses the condition of urban atmospheric pollution, water pollution and ecological damage in this zone at present. It was brought forward that we must pay great attention to the environmental factors, and make the environmental impact assessment and environmental planning in the process of economic development in this zone.

Keywords: east coastal zone; ecological environment; environmental impact assessment; environmental planning.

INTRODUCTION

The east coastal zone of China includes twelve provinces and municipalities. It covers one seventh of the total territory of China, hosts forty-one percent over one billion population and produces fifty-seven percent of the gross national production (GNP) of industry and agriculture output of China. High population density, long history and high intensity of economic development, high energy consumption, and shortage of water resources have contributed to the heavy air and water pollution and ecological destruction. With new government policies emphasizing economic growth of this region, rapid development will exert ever growing pressure on its already seriously deteriorated environment. Therefore, environmental protection should assume a two-faced goal of preventing environmental pollution from new development and bringing existing environmental problems under control. As such some strategic measures may be necessary. First, environmental objectives should be incorporated into the development policy formulation process. Second, environmental management should be so designed as to guide industrial structural change towards sustainable development. Finally, special environment projects should be formulated to restore environmental quality. Environmental impact assessment and planning at the regional as well as project level may have an important role to play.

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THE CONDITIONS OF ECONOMIC DEVELOPMENT IN EAST COASTAL ZONE OF CHINA

Since the implementation of the economical reform and open policy in China, many open economic districts have been identified in east coastal zone of China. This zone covers of nine coastal provinces and three municipalities directly under the central government; Liaoning Province, Hebei Province, Beijing, Tianjin, Shandong Province, Jiangsu Province, Shanghai, Zhejiang Province, Fujian Province, Guangdong Province, Guangxi Zhuang Autonomous Region and Hainan Province. It has an area of 1.29 million square kilometers, being about one-seventh of the total land area of China, and a population of about 430 million, accounting for 41.2 percent of the population of China. This is the most densely-populated area with an ample supply of labour resource.

The east coastal zone is the main industrial area of China and has a long history of commercial development. Nowadays, some economic districts in this zone are taking shape and opened up. Such economic districts are as follows:

1. The southern part of Liaoning Province

Such cities as Shenyang, Dalian and Anshan, are situated in this district with solid basis of heavy industry. The major problem is the lack of energy and water resources.

2. Jing-Jin-Tang area

This area consists of Beijing, Tianjin and Tangshan. It has a solid basis of economy, a wide range of industrial sectors and developed traffic facilities. The main problem is the severe water shortage and the over-concentration of industry so as to worsen the environmental quality in some parts of this district.

3. Shandong Peninsula

It includes such cities as Qingdao, Yantai and Weifang. The main problem is the shortage of fresh water and the pollution in cities.

4. The Delta of the Yangtze River

This area includes Shanghai, Nanjing, Hangzhou, Ningbo and so on. It is the biggest economic district in China, with solid basis of industrial technology, and a full range of industrial sectors. At present, the problem that lies in this district is the shortage of energy resources, the over-concentration of urban industries, the high density of population, the great demand for using land area and the severe environmental pollution.

5. The southern coastal zone of Fujian

This district consists of Xiamen, Zhangzhou and Quanzhou, with favorable geographical position which gives benefit to the development of economy open to the outside.

6. Zhujiang Delta

It includes the cities such as Guangzhou, Foshan, Zhuhai and so on, with a wide range of

industrial sectors, rather good basis of technology and convenient traffic. The present problem in this district is also the shortage of energy resources.

7. The Hainan Island

It is rich in tropical resources and favorable natural conditions. The restrictive factors are the shortage of energy resources and the inconvenience of traffic.

In the east coastal zone, there are twelve cities with each more than one million people, covering about half of the twenty-two cities with each more than one million in population in China. There are total about 31 million people in these cities, covering 65 percent of the total population of the twenty-two cities. In 1985, the twelve provinces and cities in the east coastal zone of China had 55 percent of the fixed assets in the whole country, 57 percent of the gross output value of industry and agriculture, and 61.2 percent of the gross value of industrial output. The per capita GNP in this zone is as high as 138 percent of that in the whole country. On this one-seventh land area of the whole country, there are more than half of both the fixed assets and output value, and forty percent of the population in the whole country. So it can be considered a highly developed economic open area. During the opening-up of this zone, attention must be paid to the impact on the environmental quality which is one of the important conditions ensuring the economic development.

ENVIRONMENTAL PROBLEMS AND THEIR ASSESSMENT IN EAST COASTAL ZONE OF CHINA

1. Environmental pollution problems

Environmental pollution problems in east coastal zone of China include mainly the air pollution and the river pollution downstream the cities.

(1) urban atmospheric pollution

It is mainly the type of smoke pollution caused by burning coal, with particulate matter and sulphur dioxide as main pollutants. The levels of both pollutants in most cities are not in compliance with the national standards of atmospheric environmental quality (the daily average TSP is 0.5 mg/m^3 , and the annual daily average sulphur dioxide is 10 mg/m^3). This phenomenon has been resulted from the present structure of energy consumption in which coal is a dominant component. In 1985, coal occupied 75.85 percent of the total energy consumption in China, and was up to 90 percent in Jinan, Tangshan and so on. In some cities, high population and industrial density as well as backward burning mode greatly increase the consumption of coal (even more than 69 thousand tons per square kilometer) which in turn aggravate the atmospheric pollution. Therefore, it will be more effective to improve the atmospheric quality in this zone by increasing the efficiency and changing the mode of burning coal rather than by treating flue gas only.

(2) Water pollution in urban rivers and their downstreams

The statistical data based on cities in this zone show that the total discharge of waste water from these cities makes up 52 percent of that from 75 cities in China. Of the waste water, sewage amounts for 22.5 percent, and industrial waste water 77.5 percent in which only 15 percent have been treated before discharge. The urban sewage is a serious pressure on the water quality. In the north China, almost all water bodies downstream from large cities are polluted seriously that impacts water supply, causing shortage of water resources, and eventually prevents economy from development. The pollutants such as COD and $\text{NH}_3\text{-N}$ are the common pollutants in most urban streams. Just because water resources shortage in this zone, so a reasonable overall control plan should be made for the entire water resource conservation system.

2. Ecological environmental problems

(1) Urban ecological problems

The urban pollution increases rapidly due to the increase in both resident and floating populations which has led to resources, energy resources and living materials consumed, at a rate higher than the rate of urban construction and waste treatment facilities, and the urban environmental quality degraded. Therefore, it is important to make a good planning to control the urban pollution in the development of coastal open zone. Economic development, population growth and urban extension will occupy the productive cultivated land which in turn will disturb the agricultural development. Ground water in many cities is over traced and thus the water table gets lower, and water quality becomes worse. The thermal power stations are set up very quickly with the convenience to get cool water in coastal zone. This is accompanied by increase in coal consumption. All these results in atmospheric pollution, thermal pollution and coal dust pollution.

(2) The impact of township enterprises on ecological system

In recent years, there arise township enterprises in China. They bring about ecological problems mainly including environmental pollution and resource destruction. The impact produced by township enterprises is water pollution. Water in many streams and lakes is not safe for drinking and even can not be used for fish farming and other aquaculture. All the problems as mentioned above should be solved through formulating an environmentally sound economic development planning in this zone.

THE STRATEGY FOR THE ECONOMIC DEVELOPMENT AND THE ENVIRONMENTAL PROTECTION IN EAST COASTAL ZONE OF CHINA

As required by the general economic development in China and based on the natural resources and the economic conditions in the eastern coastal zone, the economy in this zone has to be developed continuously at quite a high speed. It can be predicted that this area will be one of the most advanced economic areas in the Asian-Pacific Region. Therefore, in order that

the economic development will not spoil the environmental quality so much as to obstruct the economic development, strategic measures must be developed and taken by carrying out the environmental impact assessment of the economic development to work out the environmental planning which is determined by the development of economy but will direct and constrain the economic development.

As mentioned above, the environmental pollution and ecological destruction in some cities and towns in this zone have been serious, and the pressure exerted by the density of population has been great. Accordingly, further development of economy in this zone has to take into account the security of environmental quality so that it will not get to be worsened, and instead, it should be improved by the economical development. Therefore, any great construction project and development programs have to be in harmony with the environmental planning so as to achieve the best balance between the economic benefit and the environmental benefit, as well as to ensure the sustainable development of economy. The economic development should also be coordinated with the environmental tackling so that the former can promote the latter. Based on this rule, there are several strategies. First, the further development of economy in east coastal zone should orientate the structure of industry and production in the way of low consumption of raw materials and energy, low pollution, low occupation of land but high benefit.

As to the scale of development, it should be adjusted by the concrete environmental quality standards and the targets of economic development. Second, the old enterprises in this area have to be reformed according to the rule of less consumption, less pollution, and high benefit. If this is done, the water environmental quality in this area can be better off on the one hand, and the environmental capacity can be provided for the wastes discharged by the newly-formed enterprises on the other hand. The conditions of pollution by the existing enterprises determine that this way is the only feasible one, while the method to treat the waste at discharge points is not satisfactory. Third, in order to solve the problems of environmental pollution and poor urban ecological quality in this area, research works should be conducted on the ecological environment of some old cities; and the major functions and their rational allocation should be considered in the light of both economic development and environmental protection. Thus, the old cities have to be shaped and developed according to the rule of improving the environmental quality. Although this type of research work had begun in the early 1980s, the quality and of the work are not enough. So this type of work has to be continued as one of the major tasks on the study of environmental impact assessment. Fourth, the township enterprises in this area to be further directed and adjusted, among which the enterprises that cause much pollution, or spoil the resources or consume a lot of materials and energy, should be confined in their development. These enterprises can be directed to the way of labour-intensive enterprises. Great attention

should be paid to this problem, otherwise it will cause great damage to the future environment. Fifth, the serious problem in east coastal zone of China is that caused by burning coal. The total energy consumed in 1985 is equivalent to 760 million tons of standardized coal, of which 75 percent is coal, equal to 570 million tons of standardized burning coal. According to the ratio of the local population and gross product to those of the national total, the annual consumption of standardized coal amounts to 320 million tons, of which 80 percent (about 260 million tons) were chiefly estimated in these cities and caused the above mentioned pollution. In the course of economic development, by the year 2000, the value of the gross national product per capita will reach 1000 U. S. dollars and the minimum annual consumption of energy per capita will reach 1.5 tons of standardized coal, which is two times that in 1985. It follows that, in terms of the relation between the increases in the energy consumption and the environmental pollution in this region, if the problems with energy-consumption, energy kind and the technology of burning coal are not thoroughly solved, atmospheric pollution threat in this region will increase greatly the development of atomic energy. As for the utilization of coals, techniques to improve heat efficiency such as gasification of coal should be developed. This is a problem of the integrated system of environmental and energy planning. Long term strategy should be made as soon as possible to handle it. It is necessary to reexamine from environmental point of view the proposal to construct some large-scale thermal power stations in coastal cities using convenient condition of sea water cooling and the low expenses of naval transportation of coal to solve the problem of shortage in this area. Lastly, the rivers in this zone are heavily polluted while the areas are often short in water. Therefore, the combination of waste water control with the rational reuse of water resources is the best way to develop both economy and environment. Otherwise, the expected results can not be reached. So conducting a systematic study of the comprehensive use of water resources is indispensable in the work of water resources evaluation.

CONCLUSIONS

It is obvious that not only does a higher rate exist in the economic development, but also is serious the condition of ecological damage and environmental pollution in the east China coastal economic developing zone. In order to maintain ecological balance, prevent environmental pollution, and ensure sustainable economic development in this zone, we must pay more attention to the environmental protection, and do better in the work of environmental impact assessment and environmental planning.