

Kitakyushu Initiative for a Clean Environment: Successful and Transferable Practices
Rongcheng (China): Unique models for water management based on local resources

Policy Research Centre for Environment and Economy¹

Target Area: Water management

Time Period: 1988-

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¹ State Environmental Protection Administration (SEPA), People's Republic of China

1. Background: Rongcheng's achievements in integrating environment and economy

Rongcheng City, with an area of 1392km² and a population of 683,000, is located at the end of the East Shandong Peninsula. It is one of the first open port cities approved by the State Council in the early stage of the carry-out of Chinese reform and open policy, and also one of the eight national experimental cities which are undergoing the urbanization from the rural area. Even in the early stage of the carry-out of reform and open policy, Rongcheng set its strategic goal for city development as building an eco-coastal-city. In particular after the year of 1988 when Rongcheng was elevated as municipality from a county, this strategy was more clarified and confirmed. Since that time, therefore, Rongcheng has always made an effort to develop the city with the coordination between the economic construction and environment protection. The past experiences prove that Jiangying' efforts have obtained remarkable achievements (table 3-1).

Table 3- 1 Rongcheng's Achievements and Events in Integrating Environment and Economy

Achievements of Economic Development	Achievement of Ecological Environment Protection
<ul style="list-style-type: none"> ● Listed as the twelfth of the 100 economically prosperous counties nationwide in 1992. ● Listed as the first of the 100 powerful agricultural counties nationwide in 1997. ● Listed as the first county in Shandong Province in terms of comprehensive economic power in past few years. ● In 2001, GDP per capita was 2,9000 Chinese Yuan (in 3,523US\$ around, 1US\$=8.23Yuan), and the local living standard is in the transition from well-off to rich. 	<ul style="list-style-type: none"> ● Nominated as a sanitary city of Shangdong Province in 1989 and a national sanitary city in 1998. ● Listed as one of the 100 best national counties for planting trees and greening in 1998 ● Won the title of national model city for environmental protection in 1998. ● Won the title of garden city of Shandong Province in 2001

2. Two unique modes of water environment management

Rongcheng is coastal city, rich in the marine resources, and the marine economy shares a crucial position in the whole economy of the city. Since the city was set up in 1988, it has aimed at building an eco-coastal-city and has insisted on making a development through harmonizing economic construction and environmental protection. But on the other hand, nearly 90% of its industrial enterprises are scattered along the coast and the rivers running into the sea. The main threat to the inshore water environment comes from industrial sewage, domestic sewage and marine economic activities. For these reasons, Rongcheng gives its environmental management priority to the protection of e marine environment. And moreover, Rongcheng has developed two unique models in water environmental management based on its own advantages of natural resources: marine (inshore) environment management model and the model of using the wetland system to treat city's sewage.

3. Marine (inshore) environment management model

The strategies for the (inshore) marine environment management in Rongcheng includes four parts: division of the (inshore) sea area according to its functions; establishment of supervision and management systems; construction of the marine ecologic environment and control of the inland

pollution.

Divide the (inshore) sea area according to its function and make a rational use of the marine resources for development of marine economy

An improper use of marine resources will do damages to the inshore environment. The Rongcheng Government recognized this point in its early stage of development. As early as the year of 1988, the scholars of The Qingdao Ocean University were invited to make a division of the inshore sea area according to its function. And 14 functional areas such as cultivation, seaside resort, and port, etc, were divided, and at the same time the index of water quality control were also set for each functional area. In June 1989, the National Conference on the Experimental Division of Sea Functional Area was held in Rongcheng. It provided a good chance for Rongcheng to perfect its division of sea area. In 1997, the division of the whole inshore area of Rongcheng was integrated into the mater planning for the inshore area of Weihai City (Rongcheng is under the jurisdiction of Weihai City), and through re-adjustment the Rongcheng's functional divisions became more scientific and more rational. In the following year—1998, Rongcheng made a program for establishment of demonstration area of marine ecology. All above has provided Rongcheng with scientific orders of marine economic activities, rational development of marine resources, and integration of marine economy with marine environmental protection. In other words, any activities of social and economic development in Rongcheng have been carried out in accordance with the functional division of its sea area.

Set up supervising and monitoring systems for marine environmental management

In 1988, in order to strengthen the supervision of marine environmental management, Rongcheng Environment Protection Bureau set up a Supervising and Monitoring Station of Marine Environment. The Station installed 10 monitoring spots to make a regular examination for water quality. The Station also formulated several rules for inspection of inshore environmental management. For example, all shipyards, processing factories, docks and ports, and oil depots, which were situated along the shore and directly discharged the wastewater into the sea, were registered and filed. In addition, the Station sometimes made a sudden inspection on those registered and filed enterprises, and punished those which relevant regulations and management were not in place or caused pollution accidents, according to relevant laws and regulations. As a result, recovery devices for used oil and the sewage containers have been installed without exception in more than 30 shipyards, 70 docks and ports and 30 oil depots, which are situated along the seashore.

In order to strengthen the control of the wastes poured into the sea by the fishing vessels, the city government established a Fishing Port Supervising Station under the Marine and Aquatic Bureau. The Station has a mandate to supervise and manag all ports and docks, and can make heavy punishments to the ships that violate the relevant regulations. At the same time, the inland pollution has been also well prevented and controlled. Consequently, an integrated strategy for marine environmental management, covering both inshore and inland, has been in place. The water quality in main bays of Rongcheng has all along been better than the Grade II (good) of the National Standards for Seawater. The sea in Rongcheng, accordingly, becomes one of the cleanest sea of inshore area in China.

Strengthen the construction of the marine ecologic environment

Diversified bays, peculiar climate, and fine natural and geographic conditions make Rongcheng's shore to be an ideal dwelling place for swans. In order to protect swans there, the Rongcheng government designated Mashan Port as a natural conservation area in 1985, and established the Association for Wild Animal Protection. And then the Government issued a public notice of protection of the rare wild animals and launched an extensively campaigns through with the mass media. It resulted in an evidently increase in local citizen's consciousness of protecting the swans. The environment of the swan dwelling place has been improved significantly. Rongcheng, therefore, now can see more than 10,000 swans in the winter, a big leap from 3,000 in the 1980s. The place has become well-known not only at home but also abroad as a dwelling place for the swans.

Inland pollution control

Rongcheng attacked its inland pollution problems through two measures: prevention and control of industrial wastewater, and treatment of municipal domestic sewage.

(1) The prevention and control of industrial wastewater

In industrial pollution control, the Rongcheng government has totally followed the national relevant policies, programs and measures, and has strictly enforced them.

- During the Ninth Five-year Plan period (1995-2000), 8 small-sized factories and mills including paper-making, chemical, and electroplate, and 17 small manufactures of fish meals were shut down in accordance with a relevant decision made by the State Council. It reduced many pollution loads on seawater. Normally, the shut-down factories and mills are with heavy pollution but without any treatment facilities.
- And also in the Ninth Five-year Plan period, two events provided opportunities for Rongcheng to take intensive actions to control pollution from all industrial sources. One was that Rongcheng voluntarily applied for creation of national model city of environment protection in 1998. And the other was that the national government enforced the Program of Total Volume Control of 12 Main Industrial Pollutants and the Program of "Double-meet-the-Standards" that required all industries to reach the national pollution discharge standards and key cities to reach the national environmental quality standards by functional areas. Through Rongcheng's intensive actions, most of 33 enterprises with pollution over the relevant standards installed wastewater treatment facilities and pollution discharge thereby reach the standards. For those enterprises with light pollution, they discharged wastewater into sewage pipe system to centralized treatment plants of the city after pre-treatment. Differentiating from enterprises above, some other enterprises reached the relevant pollution discharge standards through technical transform of production process, change of compositions of the raw materials, and recycling wastewater. By different means and approaches, the industrial wastewater discharges in Rongcheng dramatically reduced from 7.326 million tons to 2.38 million tons. The amount COD dropped by 1,395 tons each year, and the percentage of the industrial wastewater discharges under the relevant standards to the total discharges increased from 81.56% in 1998 to 99.2% in 1999. Since December of 1999, all 37 industries in Rongcheng have met the standards of wastewater discharge.

- The government has taken a series of consolidating measures to further lessen the industrial sewage pollution, consolidate the achievements of making the environmental function area meet the standard and improve the quality of the environment constantly. The measures are:
 - a. To forbid the sale and use of phosphorus-bearing detergent and to spread the use of the detergent containing no phosphorus so as to reduce the quantity of phosphorus pollution.
 - b. In 2001, the government again implemented a project of further improving the management of the pollution and listed in the responsibility contract of the mayor for environmental protection the project of further improving the control of the discharge of the 10 main industrial enterprises' sewage.

In a summary, Rongcheng achieved a success in industrial pollution control last five years through the intensive actions to strictly enforcement of the national programs and the voluntary campaign for creation of national model city for environmental protection. Consequently, the industrial pollution burden on seawater was evidently mitigated (table3- 2).

Table 3- 2 Changes in Industrial Wastewater Discharge and the Total COD Discharges

Year	Industrial wastewater (10,000t/y)	COD (t/y)
1997	685	2130
1998	677	1368
1999	380	517
2000	198	304

2) In municipal sewage treatment, Rongcheng has also got a big progress, and in particular developed a unique treatment system (detail in section 4).

4. The model of the disposal of the city's domestic sewage: wetland treatment system

Taking advantage of the natural purifying ability of the wetland located in the urban area, Rongcheng has developed a unique sewage treatment system. Compared to normal treatment plant, the system there save a lot of costs for the same purpose and target.

In Rongcheng, two rivers ----Yatou River and Sanggan River—run through the urban area. There is a 3,000Mu (15Mu in 1 hectare) of reed wetland at the lower reaches of Yatou River. From 1992, several investigations and studies showed that it is feasible to make use of the reed wetland for treatment of municipal sewage. Then in May 1994, the Municipal Government adopted the expert's suggestions and channeled sewage's ways from the Yatou River to the wetland (municipal sewage directly discharged in the River) and from the wetland to the River (after naturally purification), and started its wetland treatment system for naturally purifying sewage. To heighten the treatment effectiveness, the Government enlarged the area where sewage flows by for extending the time of sewage stay there. The monitoring results show that this unique treatment system works well (table3-3).

In order to increase the volume and effectiveness of the wetland treatment system, some auxiliary facilities with investments of 4.5 million Chinese Yuan were built in two-year period of 1997 and

1998, such as axial-flow pump station and stabilization basin. And treatment capacity expanded to 20,000 tons a day. The ratio of treated municipal sewage raised evidently (fig.3-1).

While maintaining the wetland treatment system, Rongcheng also invested 18 million Yuan in renovation of Yatou River and Sanggan River from 1998. After renovation, Yatou River became a sightseeing and entertainment river in the city, on the one hand. And on the other hand, a network of sewage pipe system was built, which made the sewage directly flow into the wetland treatment system, instead of discharge to the river first and then to the wetland. As a result, the treatment capacity of the Wetland system raised significantly (fig.3-1).

In 1999, the government made a maintenance and transform to the wetland treatment system again, with investments of 160,000yuan. After maintenance and transform, the daily capacity of sewage treatment increased from 20,000 tons to 57,600 tons. Moreover, the wetland treatment system installed monitoring instruments and equipment. The water qualities at inlet and outlet of the wetland have been monitored and recorded each day. The results show that the water at the outlet of the wetland treatment system meet the national relevant standards. At present, The wetland system treats more than 60% of the municipal sewage in Rongcheng.

Table 3- 3 Sewage Treatment Effectiveness of the Wetland System (1995-1997)

Unit: mg/Liter (except for PH)

Year	Pollutants	Inlet of the Wetland Treatment System	Outlet of the Reedy Wetland	Outlet of Xiaohai Ecological Basin
1995	CODcr	387	165	135
	SS	153	45	35
	Sulfide	0.91	0.060	0.032
	volatile phenol	0.045	0.005	0.001
	PH	7.45	7.37	7.97
1996	CODcr	368	158	131
	SS	148	42	29
	Sulfide	0.762	0.048	0.022
	volatile phenol	0.047	0.006	0.001
	NH ₃ -N	8.84	1.4	0.918
	PH	7.41	7.41	8.04
1997	CODcr	373	161	134
	SS	166	51	36
	Sulfide	0.830	0.064	0.028
	Volatile phenol	0.053	0.007	0.002
	NH ₃ -N	9.2	1.5	1.023
	PH	7.44	7.39	8.02

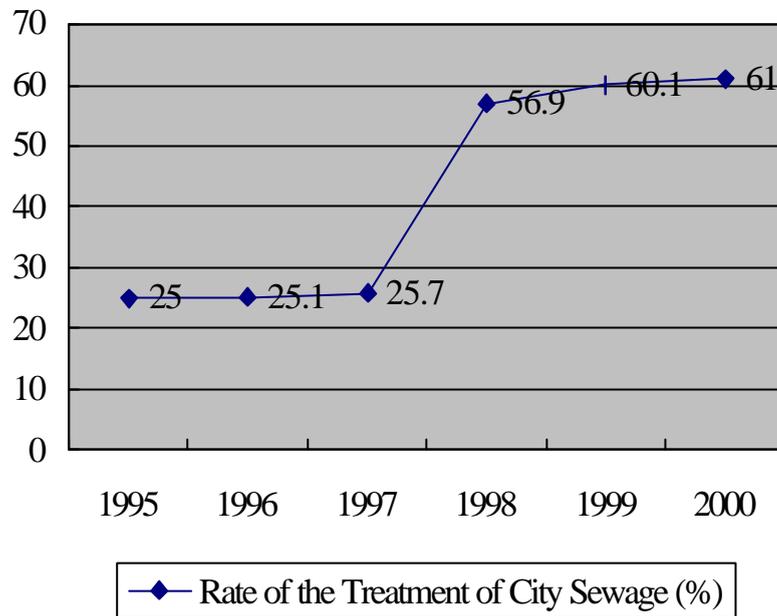


Figure 3- 1 Changes in the Treatment Rate of Municipal Sewage

5. Rongcheng’s experiences in water environment management and its strategic implications

Rongcheng is a small city developed from a town of county-level in the course of China’s rapid growth of economy. Its successful experiences in water environment management have good relevance to those towns in China and even in other Asian developing countries, which are sprawling towards cities. Two strategic implications may be identified under Rongcheng’s experiences.

First, Taking advantage of a “later-comer”, a city can/shall establish a strategy of sustainable development based on its resource superiority in the early stage of development. To ensure implementation of the strategy, a scientific planning is crucial.

The government of Rongcheng understood its city quite well at the very early stage of development. Rongcheng targets at marine economy based on marine resources, but marine environment needs to be well protected. This understanding constitutes the philosophy and essence of Rongcheng’s strategies for social development. That is reasons why Rongcheng highlighted marine planning and marine environmental protection and construction as early as the first half of the 1980s when the city started to move into the fast track of development. Generally, Rongcheng did not follow the pattern of “pollution first and then clean up” which many cities did or still are experiencing. Therefore, Rongcheng’s experiences are applicable to the towns, which are sprawling towards cities, and to cities, which are still in the early stage of development, in particular.

Second, two unique models in Rongcheng - marine environmental management system and wetland treatment system for municipal sewage - suggest that city needs develop its own and effective models in environmental management, which rely on and are adaptable to local conditions and advantages. In doing so, local active initiatives are very much important.