

# Advisory Committee on the Quality of Water Supplies

## Report on Visit to the Dongjiang Water Supply System

### (29-30 August 2000)

## THE VISIT – OBSERVATIONS, BRIEFINGS, DISCUSSIONS AND SPEECHES

### DAY ONE

#### 1. Huizhou Meihu Sewage Treatment Works (惠州市梅湖水質淨化中心)

1.1 The delegation visited the site of the Huizhou Meihu Sewage Treatment Works under construction at **(Photo 1)**. Mr HUANG Chaoqing<sup>1</sup> (黃超清) explained the design of the plant and its treatment process comprising a series of screening, nutrient reduction and disinfecting processes **(Photos 2 and 3)**. He expected that the plant would be commissioned in October 2000 after completion of the installation work. An information paper in Chinese on the sewage treatment works is attached in **Annex 4**.

1.2 Ms LI Yihui<sup>2</sup> (李伊惠) also advised that:

- i. When phase 1 of the treatment works is completed, it will be able to treat 100,000 tonnes of sewage per day. The designed capacities of the Stage 2 and 3 works are 200,000 and 300,000 tonnes per day respectively.
- ii. The treatment works will treat domestic sewage collected at Huizhou (惠州) before discharging to Dongjiang (東江).
- iii. Huizhou is located at the middle course of Dongjiang and its source of water is Xizhijiang (西支江), not Dongjiang. The purpose of constructing the treatment works in Huizhou is to treat its domestic sewage before discharging to Dongjiang. This in turn aims at meeting the requirements of the environmental protection legislation in order to protect the quality of water in Dongjiang which is the source of water for cities and towns downstream of Huizhou. Similar sewage treatment works are also required at Boluo (博羅), Heyuan (河源), etc.

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<sup>1</sup> Engineer of Huizhou Environmental Protection Bureau of Guangdong Province and Office for Co-ordinating the Construction of Huizhou Meihu Sewage Treatment Works (惠州市環境保護局工程師及惠州市梅湖水質淨化中心籌建辦)

<sup>2</sup> Vice Director of Environmental Protection Bureau of Guangdong Province (廣東省環境保護局副局長)

- iv. In Huizhou, industrial effluents containing heavy metal have to be separately treated by the factories to reach the required standards before discharge.

1.3 Mr Huang added that at the moment, Huizhou had a population of about 500,000 including 100,000 migrants and developed areas of 23 square kilometres. He advised that upon commissioning of the sewage treatment works, Huizhou would be able to meet the requirement of the environmental protection legislation that 50% of domestic sewage should be treated before discharge.

## **2. Xinfengjiang (新豐江)**

2.1 The delegation had a boat tour of the reservoir (**Photos 4 and 5**) followed by an inspection of the main dam. Mr GU Minsheng<sup>3</sup> (古敏生) gave a brief description of the reservoir and the local government's measures to protect the water resource and the environment as detailed in their information paper in Chinese attached in **Annex 5** and summarized below.

### **2.1.1 Background**

Xinfengjiang is one of the largest reservoirs in Southern China. The environment and ecology system in the reservoir zone are well protected. The qualities of air and water in the area meet the highest standards of the nation. Heyuan has contributed to the protection of Xinfengjiang significantly and in this connection, has sacrificed some economic and industrial development opportunities.

### **2.1.2 Measures to Protect Xinfengjiang**

In view of the importance of Xinfengjiang, the water source of cities and towns downstream including Shenzhen (深圳) and Hong Kong, Heyuan has implemented a number of measures to protect Xinfengjiang as detailed below:

- i. Forestry conservation and development
- ii. Development control
  - a. Require developers to carry out environmental impact assessments for development proposals.

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<sup>3</sup> Standing Committee Member of Dongyuan County Communist Party Committee and Secretary of Party Committee of Forestry Administration of Xinfengjiang (中共東源縣委常委及新豐江林管局黨委書記)

- b. Require that development proposals have to be approved by the environmental protection authorities.
  - c. Shut down a cement plant.
  - d. Banned six recreational items that pollute the environment.
- iii. Publicity and education on environmental protection
  - a. Involve all tourist guides in education and promotion.
  - b. Install signage on environmental protection in prominent locations and establish an environmental protection gallery in the ferry pier.
  - c. Recruit volunteers to clean the reservoir.
  - d. Organize a “Planting Campaign” in collaboration with the Conservancy Association of Hong Kong.
  - e. Develop environmental education in primary and secondary schools.
- iv. Infrastructures
  - a. Construct sewage treatment plants and landfill.
  - b. Implement miscellaneous environmental protection measures such as upgrading toilet facilities, grassing, etc.
  - c. Use boats that consume gaseous fuel.
- v. Management and inspection
  - a. Establish environmental protection rules and regulations.
  - b. Develop a workforce to manage and inspect the reservoir zone.

**2.1.3 *Establish the nation’s first “Ecology Model Zone (生態示範區)” and strive for sustainable development of Xinfengjiang***

- i. The development of Xinfengjiang is necessary to resolve the poverty problem in the reservoir areas. At the same time, the Heyuan government is keen to ensure that the ecosystem will not be disturbed and the Dongjiang water quality will be protected for the benefit of Heyuan and the downstream areas of Dongjiang. In this connection, the Heyuan government adopted three major policies in 1999:
  - a. Close down all business items prone to pollute the reservoir.
  - b. Support and promote sightseeing business items like “reservoir tours” and “mountain tours”.
  - c. Develop Xinfengjiang into an “Ecology Model Zone”.
- ii. The purpose of the “Ecology Model Zone” is to enhance social awareness of the importance of environmental protection and nature conservation through education and direct participation; to protect the quality of Dongjiang water; and to enhance the economic growth of Heyuan. In the long run, this will support the sustainable development of the reservoir and downstream areas. The various measures being taken/to be implemented include:

- a. Make full use of the excellent ecological environment of the reservoir area to develop tourism related to ecological and environmental protection, and to build an ecological garden and an environmental protection museum.
- b. Expand the total area of the forestry around the reservoir to 1,360,000 mu and improve forestry development and management skills with a view to protecting the forests and water resources and creating revenue. The planting of bamboo that produced bamboo shoots to create revenue was cited as an example.
- c. Develop fish hatching business in the 430,000 mu reservoir lake area. The government forecasted the production of “silver fish (銀魚)” would increase from the present 30 tonnes a year to 1,000 tonnes by 2002. The merits of the silver fish hatcheries are that the fish consumes microbes in the water and helps to purify the water. The sale of fish will also yield economic returns.
- d. Develop ecological agriculture, targeting at planting 100,000 mu bamboo shoot, 30,000 mu tea, 103,000 mu orchids and 10,000 mu Chinese herbs in the next 10 years, and provide nurseries for the production of peach, chicken-bone weed and fungus for consumption.
- e. Plan to produce bottled reservoir water for sale in the Pearl River Delta (珠江三角洲) including Hong Kong.

2.2 At the main dam, the delegates were briefed how the dam was operated to maintain water supply downstream (**Photo 6**). Normally in the wet season, the reservoir will store rainwater collected whereas in the dry season, water will be released to Dongjiang to maintain adequate water flow for water supply to the downstream areas and for sustaining optimal conditions of ecology, soil conservation, navigation, etc. The operation of the hydroelectric power plant (**Photo 7**) is restricted by the aforesaid operation rule.

### 3. Wah Gar Wastewater Treatment Works (華嘉污水處理廠) at Heyuan

3.1 The delegates visited Wah Gar Wastewater Treatment Works constructed to treat both industrial and domestic wastewater from an industrial park comprising mainly dyeing and printing factories (**Photo 8**). These factories are only allowed to operate on the condition of satisfactory treatment of their wastewater. Accompanied by Mr ZHANG Yuwen<sup>4</sup> (張育文), the delegates inspected various treatment processes of

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<sup>4</sup> Vice Mayor of Municipal People's Government of Heyuan of Guangdong Province (廣東省河源市人民政府副市長)

the plant including:

- i. Primary treatment by screening methods.
- ii. Secondary treatment by bio-chemical treatment methods.
- iii. Wetland (**Photo 9**) and oxidation ponds.
- iv. Effluent Discharge (**Photo 10**).

3.2 The treatment works, commissioned in October 1998, has a capacity of treating about 25,000 tonnes of wastewater per day. The present inflow to the treatment works is only about 6,000 tonnes per day. The treatment processes appeared to be very effective, e.g. the BOD<sub>5</sub> of the treated effluent was only about 36 ppm, well below the limit set in the effluent discharge standard.

#### **4. Heyuan Environmental Monitoring Station (河源市環境監測站)**

The delegates visited the Heyuan Environmental Monitoring Station located downstream of Wah Gar Wastewater Treatment Works. Mr XU Zhimin<sup>5</sup> (徐智敏) introduced the automatic water quality monitoring system installed in the station and its role in monitoring the water quality of Dongjiang and demonstrated the retrieval of water quality data from a desktop computer (**Photo 11**). The system was simple and concise, and required minimum maintenance. Mr Xu advised that there were three stations of the kind located at different sections of Dongjiang and the other two were in Huizhou and Dongan (東岸) near Taiyuan; the water quality data collected were transmitted via telemetry for monitoring and control. The total cost for all three stations was about RMB 7 Million.

#### **5. Dinner at Heyuan**

5.1 During dinner time, Mr ZHU Zhaohua<sup>6</sup> (朱兆華) welcomed the delegation and gave a speech as detailed in Chinese in **Annex 6** and summarized below.

- i. He hoped that, after this visit, the delegation would have a better understanding of Dongjiang water supply system including its water source at Xinfengjiang, the water supply requirements, installations, etc.

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<sup>5</sup> Head of Heyuan Environmental Monitoring Station and Principal of Heyuan Environmental Science Research Institute (河源市環境監測站站長及河源市環境科學研究所所長)

<sup>6</sup> Vice Director of Water Resources Department of Guangdong Province (廣東省水利廳副廳長)

- ii. He emphasized that Dongjiang was a very important water resource to both Hong Kong and Guangdong (廣東) and the population of Guangdong relying on Dongjiang water was much greater than the population of Hong Kong. He advised that all levels of the provincial government were highly concerned with the quality of Dongjiang water and had accorded high priority to the protection of Dongjiang.
- iii. He noticed that people in Hong Kong were also very concerned with the quality of Dongjiang water and he was grateful for their concern. However he criticized that some news reports were incorrect. He wished the delegation would learn through this visit the real picture of the Dongshen Water Supply Scheme (東深供水工程) and the efforts of the provincial and local governments on the protection of Dongjiang.
- iv. He went on to explain that Dongjiang was an important source of water to many cities and towns, etc. In order to protect the water resource against pollution, he advised that the provincial government in collaboration with the local governments had made tremendous effort to improve the water quality in the upper courses of Dongjiang. He cited examples like the various development restrictions at Xinfenjiang and Heyuan.
- v. He admitted that bitter lessons had been learnt in the past for ignoring of environmental protection in Dongguang, making them more determined than before to protect the environment and the precious water resource, citing again Heyuan's sacrifice of many development opportunities.
- vi. In conclusion, he welcomed the continuous joint efforts of Guangdong and Hong Kong to monitor and safeguard the quality of Dongjiang water to ensure a healthy and sustainable development for the benefit of both sides.

5.2 The Chairman of the Advisory Committee, Mr FANG Hung presented souvenirs to Mr Zhu, Ms Li and Mr Zhang (**Photos 12 to 14**).

5.3 After the presentation of souvenirs, Mr Zhang also gave a speech as detailed in Chinese in **Annex 7**. He emphasized that Heyuan had made tremendous effort and had sacrificed many development opportunities to protect Dongjiang water for the benefit of Guangdong and Hong Kong.

## DAY TWO

### 6. Taiyuan Pumping Station (太園抽水站)

#### 6.1 *Introduction in front of a Model*

6.1.1 The delegates visited the Taiyuan Pumping Station in the morning of the second day of the visit. Mr RU Jianhui<sup>7</sup> (茹建輝) briefed the delegates (**Photo 15**), with the aid of a model, on the operation of the pumping station that:

- i. The pumping station is used to pump water from Dongjiang to the Dongshen Water Supply Scheme.
- ii. Phase 3 of the pumping station was built on Dongjiang on the upstream side of Shima River (石馬河). Its intake is situated at 350 metres upstream of the interception point of Shima River. This arrangement ensures that polluted water from Shima River do not enter the Dongshen Water Supply Scheme.

6.1.2 The followings about the pumping station were discussed:

- i. Effect of Shima River in the vicinity  
Mr Ru explained how water from Shima River in the vicinity was sufficiently isolated to prevent the Dongjiang water from being polluted. There were two scenarios of pollution. The first one was that polluted water from Shima River could be pushed upstream by seawater intrusion during periods of high tide and low river flow in Dongjiang. It would then be easily sucked into the intake of the Phase 3 pumping station that was 350m upstream of the interception point of Shima River. He assured the delegates that the 350m separation had been carefully tested through hydraulic modelling. With various operation controls, the arrangement was confirmed to be effective in avoiding any backup of the discharge from Shima River to reach the pumping station. The tests covered different tidal effects, flow rates, riverbed profiles, consumption requirements of the Dongshen Water Supply Scheme, etc. The operational controls included riverbed management and the discharge adjustments at Xinfengjiang for power generation and flow regulation along Dongjiang. He also mentioned that the provincial government also implemented various measures to tighten control over Dongjiang including:

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<sup>7</sup> Chief Engineer of Water Resources Department of Guangdong Province (廣東省水利廳總工程師)

- a. Centralized control of the distribution of Dongjiang water for consumption by local inhabitants and developments in order to ensure water supply to southern Guangdong, especially Hong Kong, would not be affected.
- b. Control of dredging for sand along Dongjiang.
- c. Control of developments and hence discharges to Dongjiang.
- d. Operation of the dam at Xinfengjiang to maintain adequate water flow for water supply to the downstream areas and for sustaining optimal conditions of ecology, soil conservation, navigation, etc.

The second location where pollution was guarded against was in the Dongshen Water Supply Scheme section from the pumping station on one side of Shima River to the open aqueduct on the opposite side. He explained that water extracted from Taiyuan would not be mixed with the water in the adjacent Shima River as the pumped water would be diverted via an underpass below Shima River to the open aqueduct on the opposite side. Since the open aqueduct was at a much higher level, it was impossible for any overflow from Shima River to enter the aqueduct.

ii. Effects of siltation and tidal water

In response to questions on the possibility of either the deposits at the bottom of Dongjiang or tidal water from Pearl River entering the pumping station via the intake, Mr Zhu, Mr Ru and Mr ZHOU Zhijian<sup>8</sup> (周志堅) explained that the following considerations had been made in choosing the intake level at Taiyuan Pumping Station:

- a. The intake level was low enough to guarantee adequate pumping even when the hydraulic profile of Dongjiang was extremely low, e.g. in times of a drought.
- b. The intake level was high enough to avoid pumping of any deposits.
- c. The river levels of Dongjiang had been checked against the historical high tide of Pearl River to ensure that there would be no tidal effect on the intake and no backup of saline water.
- d. Water level in Dongjiang could be regulated by operation of the Xinfengjiang dam.
- e. Dredging in a controlled manner was desirable to prevent build-up of silt in the riverbed of Dongjiang. However, dredging for sand along Dongjiang without permit, particularly in the vicinity of the pumping station, would be prohibited.

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<sup>8</sup> Vice Director of the Dongshen Water Supply Engineering Administration Bureau (東深供水工程管理局副局長)

iii. Water quality monitoring in the vicinity

Mr. LIU Jiazhao<sup>9</sup> (劉嘉焯) advised that the water quality of Dongjiang were monitored by three different authorities, viz. the provincial government, the local authorities and Dongshen Water Supply Engineering Administration Bureau (東深供水工程管理局), as detailed below:

- a. Three automatic water quality monitoring stations at different sections of Dongjiang to monitor water quality round the clock.
- b. Local routine monitoring tests (19 parameters) carried out twice everyday at various locations and levels.
- c. Random tests (29 parameters) carried out once a month near the water intake of the pumping station.

6.1.3 An information paper in Chinese on the protection of Dongjiang water quality is attached in **Annex 8**. Monitoring results of the quality of water obtained at the three automatic water quality monitoring stations and at the intake of Taiyuan Pumping Station are given in **Annex 9**.

## **6.2 Further Briefing at Meeting Room**

6.2.1 In the meeting room, Mr Zhou gave a broad picture of Dongjiang and its significance to the developments along Dongjiang from Heyuan at the upstream end to Xintang (新塘), Guangzhou (廣州) near the downstream end. Because of its importance to a large region of the Pearl River Delta, Mr Zhou acknowledged that the river should be properly managed to the satisfaction of the government at all levels, including the Government of the Hong Kong Special Administrative Region. He conceded that the recent rapid economic developments in the river delta had led to some pollution and water quality problems but a lot of work had been done to avert the trend. While the various improvement works were being implemented, he expected that the water quality problem should gradually be resolved in the next few years. He advised the delegates that the provincial government would make every effort to ensure that the quality of water supply to Hong Kong meeting the agreed standards.

6.2.2 Mr Ru went on to introduce the six major items under the “Dongshen Water Supply Improvement Works (東深供水改造工程)” being undertaken by the provincial government to protect the Dongshen Water Supply Scheme (**Photo 16**) as detailed below:

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<sup>9</sup> Vice Director of the Office of the Leading Group of Dongshen Water Quality Protection of the People's Government of Guangdong Province (廣東省人民政府東深水質保護領導小組辦公室副主任)

- i. Taiyuan Pumping Station – Expansion to meet the increase in water demand.
- ii. Dongjiang to Qiling (旗嶺) – Reconstruction of the existing open aqueduct which would be partly replaced by a closed aqueduct to avoid pollution; demolition of the existing Sima Pumping Station (司馬抽水站); construction of two new pumping stations in Linhu (蓮湖) and Qiling.
- iii. Qiling to Tangxia (塘廈) – Construction of a closed aqueduct with a small open section to avoid pollution and construction of a new Tangxia Jinhu Pumping Station (塘廈金湖抽水站) to lift the hydraulic profile.
- iv. Tangxia to Shangpu (上埔) – Construction of a closed aqueduct to avoid pollution.
- v. Bio-nitrification Plant (源水生物硝化站) – An installation already in operation will be maintained to control the level of ammonia content in the water.
- vi. Desilting of Shenzhen Reservoir (深圳水庫) – Removal of reservoir deposits containing largely undesirable substances, by means of a specially designed barge which would not stir up the deposits from the reservoir bed.

6.2.3 He advised that the estimate of the project was RMB 4.7 billion and added that the project also included an item to deliver water to Dongguang.

6.2.4 A Chinese information paper on the Dongshen Water Supply Scheme is attached in **Annex 10**.

### 6.3 *Visit in Taiyuan Pumping Station*

The delegation proceeded to visit the intake channel, an adjacent section of Dongjiang, the control room and the outlet channel of the pumping station (**Photos 17 to 20**).

## 7. **Open Aqueduct downstream of Taiyuan Pumping Station**

7.1 After leaving the Taiyuan Pumping Station, the delegates visited an open aqueduct on the opposite bank of Shima River forming part of the Dongshen Water Supply Scheme and bringing water from Taiyuan Pumping Station to Linhu Pumping Station. Mr Zhou explained to the delegates the relative positions of Taiyuan Pumping Station, Dongjiang and Shima River, and how water from Taiyuan Pumping Station passed under the Shima River to the open aqueduct.

7.2 The delegates proceeded to the location of the nearby Tonghu (潼湖) open drainage channel (**Photo 21**). Mr Zhou advised that similar to the open aqueduct, this open drainage channel was also came from the opposite bank of Shima River collecting wastewater from Tonghu and Qiaotou (橋頭) for discharge in Pearl River via Dongguan (東莞). He added that the open aqueduct passed under the open drainage channel somewhere downstream of the channel. Mr Zhou highlighted that many reporters from Hong Kong had often mistaken the open drainage channel as part of the Dongshen Water Supply Scheme.

7.3 In front of a section of open aqueduct further downstream (**Photo 22**), Mr Zhou emphasised that the open aqueduct was at least one metre above the Shima River and this was sufficient to prevent any water from Shima River to enter the open aqueduct.

## **8. Sima (司馬) Artificial Channel**

Delegates visited a section of the Sima artificial channel bringing water to Sima Pumping Station. Mr Zhou advised that this channel would be abandoned and replaced by a section of closed aqueduct forming part of the Dongshen Water Supply Improvement Works.

## **9. Section of Shima River in Qiling**

Delegates visited the Qiling Barrage (旗嶺閘壩) (**Photo 23**) and the adjoining section of Shima River. Mr Zhou explained the function of the barrage to block and reverse the natural flow of the upstream of Shima River at Qiling. The barrage forms a watershed line of Shima River. Dongjiang water entering the original upstream section will flow upstream to Shenzhen Reservoir.

## **10. Quanlang River (觀瀾河)**

Mr Zhou led the delegates to inspect a section of Quanlang River (**Photo 24**) and revealed that, in terms of water quality, this infamous river used to account for about one third of the total quantity of pollutants discharged into the Dongshen Water Supply Scheme. However, he also advised the delegates that they had taken various steps to improve the water quality of Quanlang River and the situation had been improved. The most important step was the recent removal of pig farms in the vicinity

that would be equivalent to the removal of about one million people in terms of production of wastewater. He also emphasised that the discharge from Quanlang River contributed to a very small portion of the flow in the Dongshen Water Supply Scheme and the pollutants were diluted significantly when they entered the system.

## **11. Bio-nitrification Plant at Shenzhen**

Delegates were advised that the new plant operated since December 1998 was capable of treating 4 million tonnes of water per day and it was the largest installation of its kind in the world. The plant manager introduced the plant layout and operation of the plant in front of a curved screen (**Photo 25**) and Mr Zhou explained the principle of bio-nitrification. The delegates were advised the following:

- i. The purpose of the plant is to remove ammonia present in the incoming water by the bacteria present in the water. No chemical is required in the treatment process.
- ii. The plant increases dissolved oxygen content in the water through aeration. This creates an environment that facilitates bacteria growth.
- iii. Specially designed bacteria holding tanks are provided to house and facilitate the rapid growth of bacteria in a controlled environment (**Photo 26**).
- iv. The bacteria consume ammonia in the water by converting ammonia compounds into nitrates and nitrites.
- v. As more and more bacteria are cultivated, more and more ammonia will be removed.
- vi. With the residual oxygen remaining in the water leaving the plant and further aeration downstream of Shenzhen Reservoir, water will be further purified before crossing the border to Hong Kong.
- vii. Through the process, about 60-70% of ammonia in the water can be removed. The ammonia content of water entering the plant, leaving the plant and crossing the border to Hong Kong are about 3, 1 and 0.5 ppm respectively.

## **12. Desilting of Shenzhen Reservoir**

The delegates had a distant view of the desilting work being undertaken in the Shenzhen Reservoir. Mr. Ru explained that deposits, containing largely undesirable substances, on the reservoir bed were removed by a specially designed barge, which dredged and sucked the deposits simultaneously to minimize disturbance to the reservoir bed. Deposits were then pumped via a suction pipe (**Photo 27**) to an adjacent lagoon (**Photo 28**) where they would settle.

### **13. Briefings inside the Coach**

During the journey, Mr Liu gave short briefings inside the coach to delegates on the roles, duties and achievements of his Office. The main points are summarized below:

- i. The People's Congress of Guangdong Province (廣東省人民代表大會) and the Guangdong Provincial Government (廣東省政府) pay particular attention to the water quality of the Dongshen Water Supply Scheme. Since 1991, five regulations on the protection of drinking water sources in the Dongshen Water Supply Scheme have been issued and include "Water Quality Protection Rules for Dongjiang System in Guangdong (廣東省東江水系水質保護條例)" and "Stipulations of Water Quality Protection of Drinking Water Sources in Dongshen Water Supply Scheme (東深供水工程飲用水源水質保護規定)".
- ii. In order to strengthen the leadership for water quality protection in the Dongshen Water Supply Scheme and to strengthen the establishment of the environmental protection agency and its executing team, the Leading Group of Dongshen Water Quality Protection (東深水質保護領導小組) was set up in 1994. The Vice Secretary General of the Guangdong Provincial Government (廣東省政府副秘書長) was appointed as the Director of the Group. The persons in charge of Environmental Protection Bureau of Guangdong Province (廣東省環境保護局) and Water Resources Department of Guangdong Province (廣東省水利廳) were appointed as the Deputy Directors of the Group. An office was established under the Group to take charge of the routine work of water quality protection in the Dongshen Water Supply Scheme. Ms Li and Mr Liu are the present Director and Vice Director of the Office respectively.
- iii. Under the provincial government structure, there are 14 administration sections dealing with different aspects of water protection ranging from environment protection, laboratory testing, local administrations, public security, etc. The total number of people directly involved in the administration of the 85 kilometres long supply route of the Dongshen Water Supply Scheme is above 200.
- iv. Pursuant to the provisions of "Water Quality Protection Rules for Dongjiang System in Guangdong" and "Stipulations of Water Quality Protection of Drinking Water Sources in Dongshen Water Supply Scheme", three classes of protection zones along the river have been established. They are the River Zone, the Inland Class 1 Zone and the Inland Class 2 Zone.

- v. The total area of the protection zones is about 1,300 square kilometres within which some industries are prohibited, viz. winery, chemical, dyeing, electroplating and galvanizing industries. Indeed, all these industries had been relocated or closed down since 1995.
- vi. Mr. Liu informed that the removal of pig farms away from the protection zones was another major step in containing water pollution. He estimated that the effect on waste discharge of such a move was equivalent to the effect of removing about one million people.
- vii. Sewage treatment facilities are constructed along the Dongshen Water Supply Scheme, for example:
  - a. There are three large sewage treatment works situated at Tangxia, Yantian (雁田) and Pinghu (平湖). Their design and construction are similar to that of the Huizhou Meihu Sewage Treatment Works. Their treatment capacities are 15,000, 15,000 and 50,000 tonnes per day respectively.
  - b. There are also some smaller municipal facilities that can treat between a few hundred to a few thousand tonnes of domestic sewage per day.
  - c. An environmentally friendly artificial wetland system has also been constructed at Bainikeng (白泥坑) for physical and biological treatment of sewage in Bainikeng.
  - d. Based on the principle of “the polluters pay”, enterprises like large factories, hotels, caterers, etc. are required to treat their effluents to conform to national effluent discharge standards before discharge.
- viii. Mr Liu estimated that 30% of the sewage were treated prior to discharge into Dongjiang.
- ix. He also noted that people were usually confused with the three water quality standards, viz. the effluent discharge standard, the surface water standard and the drinking water standard. He explained that:
  - a. Any direct discharge to Dongjiang must conform to the national effluent discharge standard for protecting the river from pollution.
  - b. The surface water standard and the drinking water standard are different. People should understand that raw water must undergo treatment before being distributed for drinking purposes.
  - c. Notwithstanding that Dongjiang water is raw water, some media in Hong Kong have wrongly used the drinking water standard to criticize the quality of Dongjiang water.