

**For information**

**Legislative Council Panel on Development**

**345WF – Planning and investigation study of  
desalination plant at Tseung Kwan O**

**Supplementary Information**

**PURPOSE**

This paper provides Members with supplementary information on the paper numbered as **CB(1)1514/11-12(03)**.

**SHORTAGE OF FRESH WATER RESOURCES IN PEARL RIVER DELTA REGION**

2. China is a country lacking fresh water resources. Its per capita water resource is low and the distribution of water resources in terms of both time and space is uneven. With the fast pace of economic development of cities in Guangdong (GD) Province, the demand for water resources from Dongjiang (DJ) continuously increases. In view of this, the Government of the GD Province promulgated in 2008 the “Water Resources Allocation Plan in the DJ River Basin of GD Province” (the Plan) setting out the maximum amount of water that cities in GD Province and Hong Kong can draw from DJ as tabulated below:

**Water Resources Allocation Plan in the DJ River Basin and  
Amount of Water Consumed by Areas in GD Province and HK  
(million cubic metres (mcm))**

Area	Allocated annual quantity under normal yield	Allocated annual quantity under drought	Amount of water consumed in 2010 <sup>1</sup>
Heyuan	1 763	1 706	1 868
Huizhou	2 533	2 405	2 179
Dongguan	2 095	1 944	2 108

<sup>1</sup> In 2010, 73% of Hong Kong’s raw water came from DJ. The remaining 27% came from local catchments. The information about fresh water consumption in Hong Kong is provided by the Water Supplies Department (WSD). Other information is extracted from the “2010 GD Province Water Resources Report”.

Shenzhen	1 663	1 608	1 897
Other cities (including Meizhou, Shaoguan and Guangzhou) <sup>2</sup>	1 510	1 420	12 077
Hong Kong	820 (can increase to 1 100 ultimately)	820 (can increase to 1 100 ultimately)	936
Total amount	10 664	10 183	--

3. As shown in the table above, even under normal yield condition, the water consumption of some areas in GD like Shenzhen, Dongguan, etc. has already exceeded their allocated quantities specified in the Plan. They need to supplement by importing water from the Pearl River Delta Basin or using underground water. Excessive abstraction of underground water would cause ground settlement.

4. DJ River Basin is located in a sub-tropical, monsoon and wet climate region with distinct dry and wet seasons. The long-term mean annual rainfall ranges from 1 500 mm to 2 400 mm with an average value of 1 750 mm. The long-term mean annual flow of the DJ main stream is 32 700 mcm<sup>3</sup>. The lowest rainfall recorded in recent years was 1 217 mm in 2004 and the amount of total water resources in DJ River Basin recorded in that year was 13 000 mcm, which was 40% of the long-term mean annual flow of the DJ main stream.

5. Besides, according to the “GD Province Water Resources Reports”, the amount of rainfall and total water resources in DJ River Basin from 2007 to 2010 are tabulated below:

Year	Rainfall (mm)	Total water resources (mcm)	% of long-term mean annual flow of DJ main stream (%)
2007	1 726	24 000	73
2008	2 068	29 100	89
2009	1 373	18 900	58
2010	1 787	25 000	76

<sup>2</sup> DJ is a supplementary source of water for Meizhou, Shaoguan and Guangzhou.

<sup>3</sup> The long-term mean annual flow of the DJ main stream is 32 700 mcm. In order to serve other essential functions of the river, such as navigation, ecology and power generation, usable water resources that can be extracted from DJ is only about 33% of the long-term mean annual flow of the DJ main stream, which is about 10 700 mcm

6. As reflected from the above information, both the rainfall and total water resources in DJ River Basin have fluctuated substantially in recent years.

7. Currently, GD Province still cannot guarantee the adequacy of water for agricultural purpose and in remote country areas. There is an imminent need for increase of water resources to improve people's livelihood and enhance development.

8. Under the DJ Water Supply Agreement, the Government of GD Province agrees to supply up to an ultimate annual quantity of 1 100 mcm to Hong Kong. However, when a severe drought happens, the whole region of DJ River Basin will likely face water shortage. To better prepare ourselves for water shortage arising from severe droughts, there is a genuine need to study in good time and develop new water resources to safeguard the sustainable development of Hong Kong.

## **IMPACT OF CLIMATE CHANGES ON GUANDGOND PROVINCE AND HONG KONG**

9. Climate change will bring about more frequent occurrence of extreme weather condition. According to Hong Kong Observatory's study report "Rainfall Projections for Hong Kong based on the IPCC Fourth Assessment Report" in 2008, the number of extremely dry year (i.e. annual rainfall less than 1 282 mm, equivalent to 55% of the normal annual rainfall of 2 324 mm) in the 21st century would be twice that of the last century, from 2 times to around 4 times. The report also pointed out that while there were no consecutive severe drought years in Hong Kong in the last century, such a scenario would become more likely in the this century.

10. The annual rainfall in 2011 was 1 477 mm, only 62% of the mean annual rainfall from 1971 to 2000, while the local yield collected from water gathering ground was 103 mcm, only equivalent to 35% of the long-term mean yield in Hong Kong.

11. Climate change will bring about more frequent extremely dry weather and increase the likelihood of the occurrence of consecutive droughts. This will not only affect the local yield collected in Hong Kong, but also impact on the water resources in DJ which contributes 70 - 80% of the fresh water demand in Hong Kong. For example, according to information provided by the Department of Water Resources, GD Province, the annual rainfalls in DJ River Basin in 2004 and 2009 were less than that in a normal year by 30% and 22% respectively. In 2009, the total storage of Fengshuba Reservoir, Xinfengjiang Reservoir and Baipenzhu Reservoir was less than that in a normal year by 25%. The Department of Water Resources, GD Province implemented DJ Water Flow Regulation Plan by meticulous control of draw-off from the three reservoirs for ensuring that the water supply to the cities along DJ and Hong Kong would not be affected, but at the expense of sacrificing the hydro-electric power generation. Being one of the responsible partners to other economic zones in the Pearl River Delta, Hong Kong should investigate and explore alternative water resources in order to mitigate difficulties encountered by our

neighbours in GD Province when they face a drought noting that Hong Kong would also encounter drought at that moment.

## **ADAPTIVE MEASURES TO DEAL WITH CLIMATE CHANGES**

12. To relieve the ever-increasing shortage of fresh water resources in coastal areas and on islands, General Office of the State Council of the People's Republic of China published 'Vision on Expediting Seawater Desalination Industry Development' on 13 February 2012, where it put forward a proposal to expedite the seawater desalination industry development. The target is attaining a total desalination capacity up to 2.2 - 2.6 mcm per day by 2015; and particularly on islands, with desalinated water exceeding 50% of the total additional water resources.

13. As a coastal and well-developed city with scarce fresh water resources, Hong Kong has unlimited supply of seawater from the ocean that is not affected by the acute climate changes. Building a desalination plant to provide potable water would be an appropriate solution to alleviate the shortage of our fresh water resources.

## **RISK ASSESSMENT OF FRESH WATER RESOURCES IN HONG KONG**

14. Since 2008, the WSD has been actively implementing the Total Water Management Strategy through various initiatives, including strengthening public education, publicizing water conservation and promoting the use of water saving devices. With these measures, we anticipate that there is room for reduction of the water consumption of the territory. However, due to a projected increase in population of about 700 000 from 2010 to 2020, we anticipate that the annual water consumption in 2020 will still grow by 42 mcm, after accounting for a predicted saving of 41 mcm brought about by the achievements under various water demand management initiatives.

15. In view of the above, based on the past record of the local yield collected in water gathering grounds and using a compute model, the WSD has conducted a risk assessment of the fresh water resource adequacy in Hong Kong under different adverse scenarios (e.g. DJ water supply to Hong Kong could only maintain at 820 mcm, the average long-term yield collected decreases or the occurrence of consecutive droughts). The analysis shows that due to the increase in water demand associated with the population increase, the water shortage risk after 2020 will increase with a deficit of our fresh water resources up to 39 mcm under an adverse scenario.

16. The proposed desalination plant can produce 50 mcm of fresh water each year. This is equivalent to 22% of the mean gross yield collected from water gathering grounds over the past decade or 49% of the total quantity of rainwater collected in 2011. After the expansion of the desalination plant to 90 mcm per year, this capacity will be equivalent to 40% of mean gross yield collected from water gathering grounds over the past decade or 87% of the total quantity of rainwater

collected in 2011. The proposed desalination plant would therefore be of paramount importance in supplementing our fresh water resources.

## **URGENCY OF IMPLEMENTING PLANNING AND INVESTIGATION STUDY OF DESALINATION PLANT**

17. Preliminary study is crucial to the implementation of a large scale project and it takes time to complete. Based on the predicted demand of fresh water in 2020 and the time required for delivery of a desalination plant project, it is time to commence the preliminary study, including preliminary design, environmental impact assessment and site investigation. The Consultant will also review the implementation details and programme. The proposed implementation programme is outlined below:

- |             |   |
|-------------|---|
| 2012 - 2014 | Undertake Planning and Investigation Study of Desalination Plant at Tseung Kwan O (PWP Item No.345WF).  |
| 2015 - 2017 | Seek funds from the Legislative Council to commence the detailed design of Desalination Plant at Tseung Kwan O based on the recommendations of the Planning and Investigation Study, and to complete necessary statutory procedures and invite tender for construction. |
| 2018 - 2020 | Seek funds from the Legislative Council and construct the Desalination Plant at Tseung Kwan O.  |

**Development Bureau  
Water Supplies Department  
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