

Economic Growth and the  
Potential for Port Development in the  
Western Pearl River Delta

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Hong Kong Institute of Asia-Pacific Studies

September 2003

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### Acknowledgements

This paper is partly based on a consultancy study undertaken by the Hong Kong Institute of Asia-Pacific Studies, The Chinese University of Hong Kong, for two Hong Kong-based companies, Dah Chong Hong, Ltd. and Sims Trading Company. Thanks are due to managers in various ports for their warm reception and assistance during the field survey undertaken on 16-18 December 2002.

Opinions expressed in the publications of the Shanghai-Hong Kong Development Institute and Hong Kong Institute of Asia-Pacific Studies are the authors'. They do not necessarily reflect those of the Institutes.

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ISBN 962-441-808-X

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# **Economic Growth and the Potential for Port Development in the Western Pearl River Delta**

## **1. Introduction**

Since 1978, the Pearl River Delta (PRD) in South China has experienced significant growth (Xu and Li 1990; Li 1998; Yan 1998; Yeung and Chu 1998; Shen 2002a). Hong Kong business people have played a significant part in the rapid industrialization and urbanization of the PRD as investors, coordinators, trade agents and supply chain managers (Chen and Ho 1994; Berger and Lester 1997; Eng 1997; Enright et al. 1997; Sit and Yang 1997; Yeung 1997; Yeh et al. 2002). This connection with mainland China (the so-called China factor) has also significantly benefited Hong Kong's economy. There has been limited government coordination in the past two decades. Now, in order to increase the overall competitiveness of the region in the global economy, issues of cross-border cooperation and development planning in the Greater Pearl River Delta (the GPRD includes Hong Kong, Macao and the PRD region in Guangdong province) need to be urgently addressed.

As shown in the recent policy address by the Chief Executive of the Hong Kong Special Administrative Region (HKSAR), the government of the HKSAR has recently adopted a strategy to strengthen cooperation and development with the PRD for the sustained long-term growth of the GPRD (Tung 2003:16-18). The development of the four pillar industries of financial services, logistics, tourism and producer services, depends on closer economic ties between Hong Kong and the PRD, and mainland China in general, where most of these industries are heavily regulated by the government. Fostering cooperation and avoiding excessive competition remain crucial

issues in the GPRD (Grundy-Warr et al. 1999; Chu et al. 2002; Hu and Chan 2002; Song 2002).

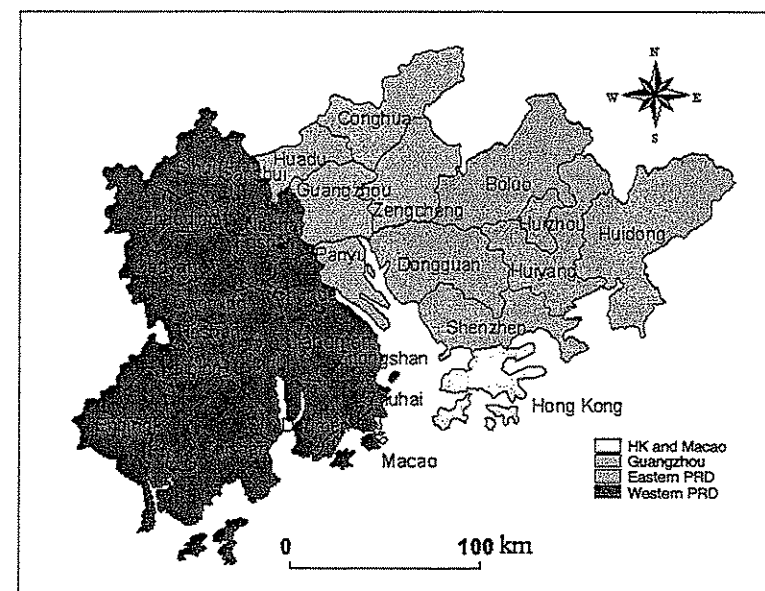
Previous studies have focused on foreign investment, urbanization and development in the PRD under the influence of Hong Kong (Lin 1997; Sit and Yang 1997; Weng 1998; Shen 2002a). Some recent studies examining issues of regional cooperation and integration between Hong Kong and the PRD have indicated that both huge potential and major challenges lie ahead (Chu et al. 2002; Hu and Chan 2002; Loh 2002; Shen 2002b; Song 2002; Enright et al. 2003).

In this paper, the PRD is divided into three parts: central, eastern and western (Figure 1). Due to its special status and location, Guangzhou is seen as the centre of the PRD. The area to the east of Guangzhou is regarded as the eastern part and the area to the west of Guangzhou as the western part of the region. Economic cooperation and Hong Kong's cross-border investment have so far concentrated in the eastern part, as seen by the rapid growth of the Shenzhen Special Economic Zone and Yantian port in Shenzhen (Wu 1999; Wang and Slack 2000; Shen and Yeung 2002; Song 2002; Seabrooke et al. 2003). The western part of the PRD has received little attention.

Economic growth and transport are closely associated (Wang and Slack 2000). With Hong Kong playing a pivotal role in fostering the PRD's growing export-oriented economy, there has been an explosive growth in freight transport in the two areas. Many roads, airports, river-ports and seaports have been constructed. Without a proper mechanism to coordinate infrastructure development and planning both among the numerous cities of the PRD and between the PRD and Hong Kong, much of infrastructure that has been built, such as airports and seaports, has been duplicated (Shen 2002a; Song 2002). In order to assess the development potential of various ports, their particular physical conditions and economic hinterlands will be examined.

The port system in the PRD has been the focus of several previous studies. Wang and Slack (2000) examined the development of a regional container port system in South China

Figure 1 Sub-regions of the PRD



up to 1997. They found that Hong Kong has become a regional loading centre for South China and that a competing deep-sea, direct-call port in the eastern part of the PRD, Shenzhen, has emerged. Such a restructuring of regional port system was caused by cost-based competition, the special relationship between Hong Kong and the mainland, globalization, container standardization, multi-modal accessibility and connectivity. Shenzhen became the eleventh busiest container port in the world in 2000, the eighth in 2001 and the fifth in 2002 (Shen 2002b; Enright et al. 2003:89).

Given the rapid expansion of the port of Shenzhen in recent years, what will be the future of the port of Hong Kong? Most people agree that the port of Hong Kong will continue to enjoy its natural, man-made, legal and institutional advantages in the future due to its comprehensive, efficient, flexible and

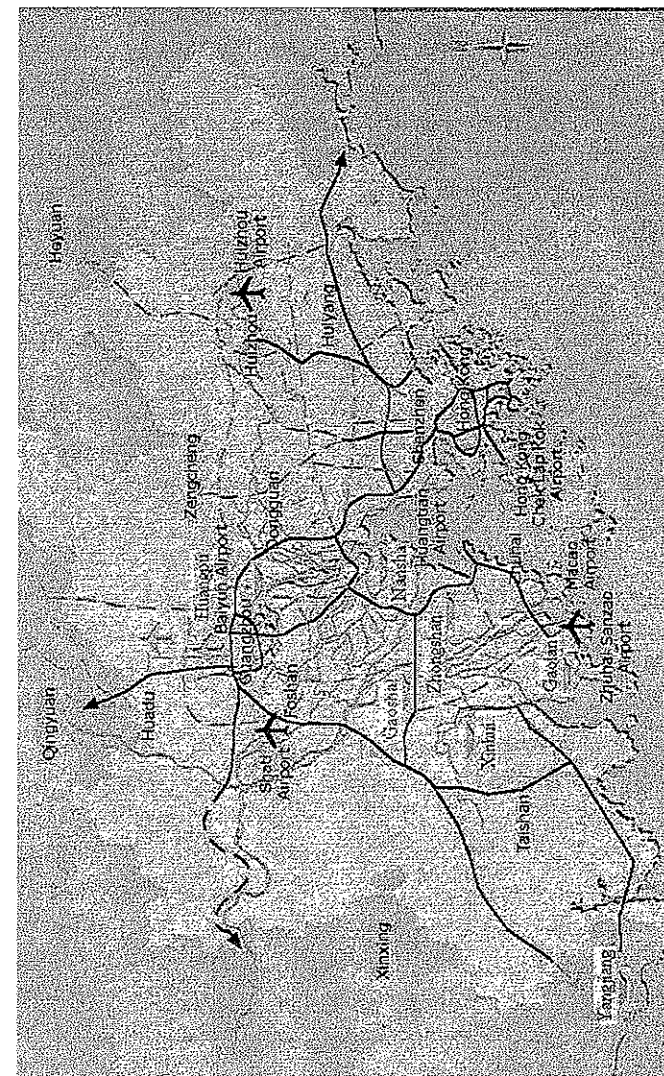
high-frequency multi-destination services (Cheng and Wong 1997). It is most likely that Hong Kong and Shenzhen will form the largest container group in the world, similar to the twin-port hub of Kobe and Osaka in Japan (Wang and Slack 2000; Seabrooke et al. 2003). Song (2002) argued that cooperation already exists between the ports of Hong Kong and Shenzhen through the ownership of Hutchison Port Holdings (Kwai Chung terminals 4, 6 and 7 in Hong Kong and Yantian port in Shenzhen), COSCO (Kwai Chung terminal 8 in Hong Kong, jointly with Hong Kong International Terminals Ltd.; and Shekou port in Shenzhen, jointly with China Merchants) and Modern Terminals Ltd. (Kwai Chung terminals 1, 2, 5 and 8 (west) in Hong Kong and Chiwan port in Shenzhen, jointly with China Merchants).

Different from the case of the eastern PRD, many small feeding ports in the western PRD use Hong Kong as a regional loading centre. They have become an increasingly important source of containers for the port of Hong Kong in recent years. The objective of this paper is to examine the economic and port development potential of the western PRD, within the context of Hong Kong as an entrepôt. Xinhui port is selected for a detailed case study. A field survey was conducted on 16-18 December 2002 to collect data and to informally interview key managers in various ports. The comparative strengths and functions of the main ports in the western PRD and surrounding areas are analysed, namely Zhongshan river-port, Gaolan seaport in Zhuhai, Yangjiang river-port, Nansha seaport in Panyu, Huangpu seaport in Guangzhou, Gaosha river-port and Xinhui river-port in Jiangmen (Figure 2). The findings of this paper have immediate implications for the western PRD and, indirectly, significant implications for Hong Kong and the PRD.

## 2. Economic and Transport Growth in Guangdong and the Western PRD

China has developed rapidly in the past 20 years and become a major player in the global economy. In 2001, the Chinese

Figure 2 Location of seven ports in the PRD



Source: Adapted from Loh (2002).

economy ranked sixth in the world in terms of gross domestic product (GDP). Development in China is now driven by the trend of globalization and a new international division of labour. With abundant labour supply and a potentially huge domestic market, China has become an attractive destination for foreign direct investment (FDI), especially the PRD and the Yangzi River Delta (YRD). With its accession to the World Trade Organization (WTO) in November 2001, China will experience even faster development in the years ahead.

Guangdong province is generally viewed in China as being "one step ahead" in the processes of market reforms and opening up to the outside world (Yeung and Chu 1998). While the "Asian Dragons" of the 1980s and 1990s, namely Hong Kong, South Korea, Taiwan and Singapore, now struggle with recession and the fallout from economic restructuring, South China has accelerated its growth with closer relationships to both the interior of China and to international markets. In 2001, Guangdong's GDP reached RMB 1,065 billion, accounting for 11.10% of China's total GDP (Table 1). In the same year, Guangdong contributed 35.85% of total national exports and received 31.73% of total foreign investment in China.

The PRD, the region of "red capitalism," contributes significantly to Guangdong's outstanding economic performance (Leung 1993; Lin 1997; Weng 1998; Yeung and Chu 1998; Shen 2002a). Total foreign investment in the PRD was US\$14.19 billion in 2001, accounting for 28.57% of China's total (Table 1). The PRD has already absorbed major manufacturing enterprises from developed countries and newly industrializing economies, where many industries are being forced to restructure. As the PRD's integration into the global production network accelerates, the region has enjoyed double-digit economic growth for over 15 years. Although its population only accounted for 1.83% of the national total, the PRD contributed 8.72% to the nation's GDP, 8.30% to its retail sales of consumer goods and 6.90% to its total capital investment. Exports from the PRD reached US\$91 billion in 2001. The region also boasts the highest standards of living in China. In 2001, the PRD's per

**Table 1** Key indicators in the PRD and Guangdong, 2001

Indicator	PRD	Share in China (%)	Guangdong	Share in China (%)
Total population (million)	23.37	1.83	75.65	5.93
GDP (RMB billion)	836.39	8.72	1,064.77	11.10
Retail sales of consumer goods (RMB billion)	312.01	8.30	451.53	12.01
Exports (US\$ billion)	90.83	34.13	95.42	35.85
Total capital investment (RMB billion)	256.68	6.90	353.64	9.50
Foreign investment (US\$ billion)	14.19	28.57	15.76	31.73
Freight (billion tonnes)	—	—	1.32	9.42
Freight traffic (billion tonnes/km)	—	—	322.15	6.77

Sources: Guangdong Statistical Bureau (2002); National Bureau of Statistics (2002).

capita GDP was 126% greater than Guangdong's and 312% greater than the nation's (Table 2).

Rapid economic growth and export expansion have generated increasing amounts of freight traffic. Systematic data are available for Guangdong as a whole (Guangdong Statistical Bureau 2002). The total volume of freight traffic in Guangdong increased from 161.87 billion tonnes/km to 322.15 billion tonnes/km in the period 1984-2001 (Figure 3). Waterways have been by far the dominant means of transportation, accounting for as much as 72.97% of total freight traffic in Guangdong in 2001. Highways only accounted for 16.23% in 2001.

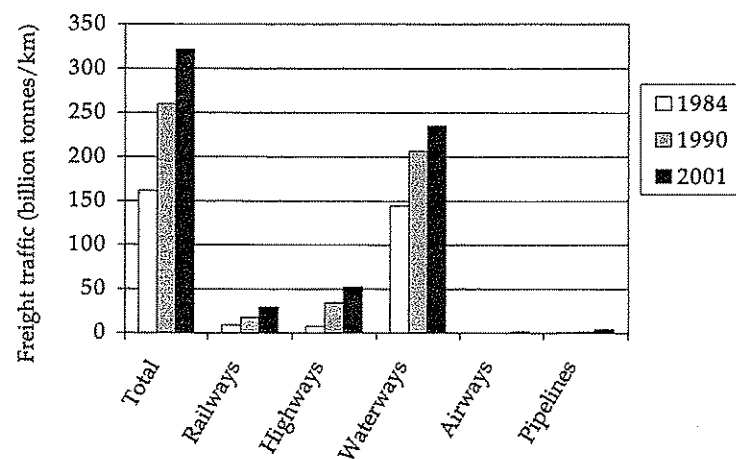
Economic development in the PRD has been closely related to Hong Kong's economy and the latter's transformation from a

**Table 2** GDP per capita in the PRD, Guangdong and China, 1980-2001

Year	PRD	Guangdong	China
1980 (RMB)	731	473	460
1985 (RMB)	1,729	982	855
1990 (RMB)	4,524	2,395	1,634
1995 (RMB)	18,242	7,973	4,854
2000 (RMB)	27,863	12,885	7,084
2001 (RMB)	31,040	13,730	7,543
2001 (US\$)	3,750	1,659	911

Note: US\$1 = RMB 8.277.

Sources: Guangdong Statistical Bureau (2002); National Bureau of Statistics (2002); Shen (2002a).

**Figure 3** Growth of freight traffic in Guangdong by mode, 1984-2001

Source: Guangdong Statistical Bureau (2002).

manufacturing centre to an advanced service economy (Enright et al. 1997; Shen 2003). Hong Kong has played an active role in the PRD's development. Since 1978, about 70% of the foreign investment in the PRD has come from Hong Kong. The further integration of the PRD and Hong Kong to form a world-class and leading region is vital to the continued development of both areas (Loh 2002).

The western PRD includes four prefectural-level cities: Zhuhai, Zhongshan, Foshan and Jiangmen, and part of Zhaoqing city. It had a registered population of 10.90 million, accounting for 46.62% of the total in the PRD in 2001 (Table 3).

Some local economies in the western PRD are extremely vibrant. For example, three of the four "Tigers of Guangdong," namely, Nanhai, Shunde and Zhongshan, are located in the western PRD. These "Tigers" have made the western PRD a strong manufacturing base and a growing source of exports. In 2001, the western PRD accounted for about 30% of total GDP, manufacturing GDP and final consumption expenditure in the PRD, not far behind the eastern PRD in all indicators (Figure 4). It received 28.94% of the total foreign investment in the PRD and accounted for 21.95% of the freight handled by river-ports and seaports in the PRD in 2001. However, exports in the western PRD lags far behind the eastern PRD, as outward processing is concentrated in the latter. The eastern PRD accounted for 70.19% of the total exports of the PRD while the western part contributed merely 16.41%.

Each city in the western PRD has its own state-level or provincial-level industrial zones, offering a wide range of preferential policies to attract foreign investment. Many foreign-invested enterprises have been established in these zones, an indication that there is potential for industrial development in the region. The major industrial zones are as follows:

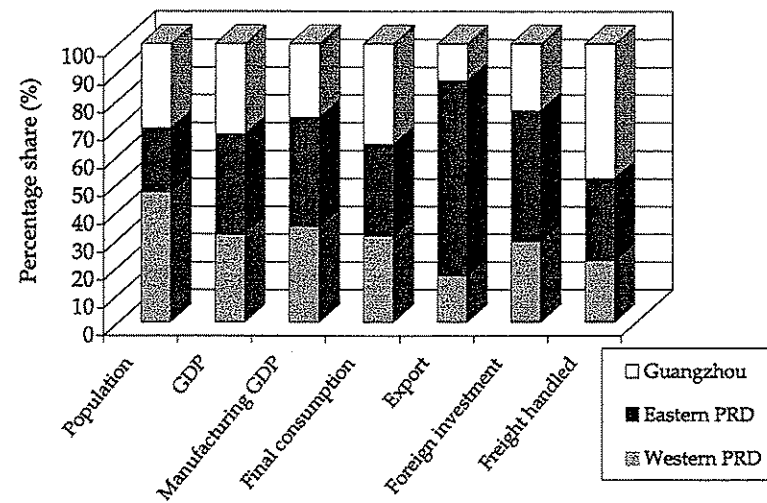
**Jiangmen High-Tech Industrial Development Zone.** This is a state-level development zone established in 2000. The zone has a total land area of 147 hectares. About 62 hectares have been occupied by foreign enterprises.

**Table 3** Comparison of main economic indicators in Guangzhou, western PRD and eastern PRD, 2001

Area	Population (million)	GDP (RMB billion)	Manufacturing GDP (RMB billion)	Final consumption expenditure (RMB billion)	Exports (US\$ billion)	Realized foreign investment (US\$ million)	Freight handled by ports (million tonnes)
Guangzhou	7.13	268.58	97.02	133.33	11.62	3,327.46	135.40
Western PRD	10.90	258.40	124.14	113.90	14.22	3,988.04	61.32
Eastern PRD	5.35	295.97	143.02	121.21	60.83	6,465.15	82.66
PRD total	23.37	822.95	364.18	368.44	86.66	13,780.65	279.38

Source: Calculated by the authors from information from the Guangdong Statistical Bureau (2002).

**Figure 4** Percentage shares of Guangzhou, western PRD and eastern PRD by main economic indicators, 2001



Source: Guangdong Statistical Bureau (2002).

**Xinhui Jinguzhou Economic Development Experimental Zone.** This provincial-level industrial zone has attracted over 70 foreign enterprises from the United States (US), United Kingdom, Switzerland, Japan, Hong Kong, Macao and other countries.

**Foshan New and High-Tech Industrial Development Zone.** This is a state-level development zone. The zone focuses on the development of electronics and information technology (IT), optic-electrical integration machinery, instruments, biotechnology, pharmaceuticals and other industries. Foreign companies such as Dupont, Sanyo, Tetra-Pack, Piaggio Veicoli and other major companies have invested in the zone.



**Zhongshan National Torch High-Tech Industrial Development Zone.** This zone was jointly set up by the Ministry of Science and Technology, the provincial government and the municipal government. It is comprised of the following national industrial bases: the Torch High-Tech Industrial Park; Electronics and IT Park; Industrial Park for Privately Owned Businesses; Health Technology Park; and the Packaging and Printing Park. All of these parks enjoy the preferential policies of a state-level high-tech industrial development zone.

**Zhuhai National High-Tech Industrial Development Zone.** This state-level zone includes Nanping Technology Park, specializing in IT, telecommunications, biotechnology and pharmaceuticals; Xinqing Technology Industrial Park, specializing in electronics and communications products; Sanzao Technology Industrial Park, specializing in electronics, biotechnology, pharmaceuticals and consumer products; Baijiao Technology Industrial Park, which is particularly focused on attracting Taiwanese investors; and Technology Innovation Coast, which is emphasizing IT, software development, network communications and photo-electromechanical integration.

In terms of accessibility to and connectivity with Hong Kong and other parts of China, the western PRD has the following features (see Figure 2). Proximity to Hong Kong and water connectivity with Hong Kong are outstanding. The round-trip from major river-ports of the western PRD to Hong Kong by water takes less than 24 hours (including container loading and unloading). The western PRD also has good road connectivity with the eastern PRD and with Southwest China. There is a huge potential for development in the western PRD as it further integrates with Hong Kong. As the western PRD is an emerging manufacturing base of the PRD and will enjoy rapid growth, a large and growing volume of cargo and containers will be generated. Trade and exports and, therefore, demand for transport and logistics services are expected to grow in the western PRD in the future.

### 3. The PRD Port System

#### 3.1 *The Hong Kong Factor: Hong Kong as an Entrepôt*

An *entrepôt* is defined as a specialized port with a great deal of re-export activities. It acts as an intermediary centre for trade between foreign countries, where goods in transit are brought for temporary storage before being re-exported. *Entrepôt* functions have been facilitated and stimulated in many cases by the creation of free ports.

Hong Kong, together with Singapore and Rotterdam, are considered the top three *entrepôts* in the world. Hong Kong's uniquely favourable geographic location in the Asia-Pacific region, excellent port conditions and status as a free port, and special political and economic relations with mainland China sustained Hong Kong's monopoly as the major gateway for imports to and exports from South China for decades. Many ports in the PRD, especially those in the western PRD, have been developed as feeders for Hong Kong.

Until the early 1990s, mainland ports did not offer international shipping services. About 95% of containers going in or out of mainland China were routed via Hong Kong. From 1986 to 1996, the port of Hong Kong recorded double-digit growth in its throughput and became the busiest container hub in the world in the 1990s. Container throughput in Hong Kong increased from 9.20 million TEUs (twenty equivalent unit) in 1993 to 19.1 million TEUs in 2002, making it the busiest container port in the world for eight years in the last decade (Hong Kong Port and Maritime Board 2002).

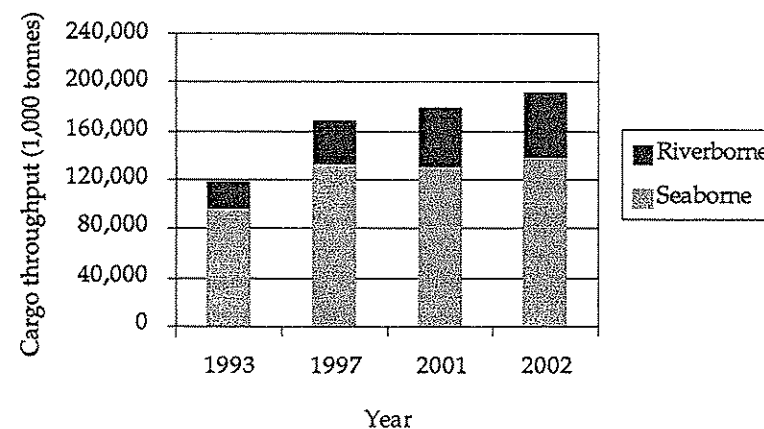
So far the port of Hong Kong and export-oriented production bases in the PRD are largely linked by trucks and river vessels. Railways play an insignificant role. In the last six years, Hong Kong's speciality as a hub in river trade cargo has been expanding (Table 4). The Tuen Mun River Trade Terminal has been in operation since 1999, collecting and consolidating cargoes brought down from smaller ports in the PRD via river trade vessels before they are exported overseas. During the

**Table 4** Container throughput of the port of Hong Kong by vessel types, 1996-2002 (1,000 TEUs)

	Kwai Chung terminals			Stream and other berths			Total
	Ocean vessel	River vessel	Sub-total	Ocean vessel	River vessel	Sub-total	
<b>Inward container throughput</b>							
1996	3,894	253	4,147	1,625	881	2,506	6,653
1997	4,312	252	4,564	1,632	984	2,616	7,181
1998	4,253	393	4,646	1,458	1,180	2,638	7,284
1999	4,419	415	4,834	1,542	1,650	3,192	8,027
2000	4,982	524	5,506	1,700	1,773	3,473	8,979
2001	4,755	621	5,376	1,669	1,788	3,457	8,833
2002	4,994	711	5,706	1,775	2,011	3,786	9,492
<b>Outward container throughput</b>							
1996	4,324	215	4,539	1,420	848	2,268	6,808
1997	4,663	263	4,926	1,523	938	2,461	7,387
1998	4,616	293	4,909	1,183	1,206	2,389	7,297
1999	5,092	369	5,461	1,296	1,427	2,723	8,184
2000	5,683	414	6,096	1,333	1,689	3,022	9,118
2001	5,399	510	5,909	1,341	1,743	3,084	8,993
2002	5,589	597	6,186	1,551	1,916	3,467	9,652

Source: Hong Kong Port and Maritime Board (2002).

period 1993-2002, sea and riverborne cargo throughput increased from 118 million tonnes to 193 million tonnes (Figure 5). In 2002, the figures for sea and riverborne cargo throughput were 138 and 54 million tonnes respectively. About 80% of Hong Kong port's cargo originates from the PRD area. While about 10 million TEUs were transported by trucks via Shenzhen to the

**Figure 5** Sea and riverborne cargo throughput in Hong Kong, 1993-2002

Source: Hong Kong Port and Maritime Board (2002).

port of Hong Kong, Shenzhen (642,000 TEUs), Huangpu (610,000 TEUs), Zhongshan (354,000 TEUs), Nanhai (215,000 TEUs), Zhuhai (191,000 TEUs), Foshan (182,000 TEUs), Jiangmen (160,000 TEUs) and Shunde (151,000 TEUs) were the main sources of laden containers from the river-ports of the PRD to Hong Kong in 2001 (*South China Morning Post* 28 June 2002). The share of container cargoes handled by the container terminals decreased from 64% in 2001 to 62% in 2002 in Hong Kong. The share by river trade operators increased from 19% to 21% and the share by mid-stream operators remained at 17% in the period 2001-2002 (Hong Kong Port and Maritime Board 2002).

The recent rapid expansion of container shipments in some seaports in the PRD is a result of their lower costs as compared to the port of Hong Kong. Cargoes handled by the port of Hong Kong have experienced a slower rate of growth. Hong Kong's total container throughput dropped by about 1.5% in 2001 but

increased by 7.4% in 2002 (Hong Kong Port and Maritime Board 2002). In general, terminal handling charges (THCs) in Hong Kong are higher than those in Shenzhen, especially for TEU containers (Table 5). But the table also shows that the THCs are not cheap in Shenzhen, compared with other international ports.

There are good reasons to believe that Hong Kong will continue to be South China's key conduit for international trade in the foreseeable future. The cost factor does not fundamentally change the significance of Hong Kong's entrepôt function, given Hong Kong's advantages. These include its prime location at the mouth of the PRD, excellent port conditions, trading liberty, rule of law, world-class strength in finance, telecommunications, efficiency in port handling and other logistics-related professional services. In addition, Hong Kong is still able to attract mainland, especially PRD, shippers because of many systemic issues on the mainland, such as the cumbersome

procedures and under-the-table cost of customs inspection services, and export statistics that might affect the economic and political interests of local governments. In other words, the port of Hong Kong has taken advantage of the institutional gap between Hong Kong and the mainland in international trade.

Hong Kong's importance as an entrepôt has been such that the interrelationships between Hong Kong port and the PRD ports have largely defined the structure of the port system in the PRD and therefore the functions of the ports in the western PRD.

### 3.2 *The Structure of the Port System in the PRD and the Functional Roles of Major Ports in the Western PRD*

There are many ports in the PRD with different natural conditions and economic hinterlands. The port system can be defined according to the origin and destination of major cargoes. While all seaports of the PRD can offer international calls, most river-ports are feeder ports for Hong Kong only.

Hong Kong is the leading container hub in the PRD, with the busiest international shipping services and the largest hinterland. It serves not only the PRD but also South China. Yantian and Huangpu are also major container ports in the PRD, but the frequency of their international services and throughput volumes are much lower than those of Hong Kong. Yantian's hinterland now mainly covers the eastern PRD and Huangpu serves its surrounding areas. Zhongshan and Zhuhai ports are currently feeder ports for Hong Kong and serve small hinterlands under the administration of city governments. Similarly, Yangjiang near the western PRD currently also serves a small hinterland (Figure 6). In Figure 6, among the total of 19.1 million TEUs handled in Hong Kong in 2002, it is estimated that 3.1 million TEUs (about 20%) originated in Hong Kong, 5.2 million TEUs from feeder ports in the PRD and 10.8 million TEUs were brought in by trucks from the PRD.

However, ports in Shenzhen are playing a growing role in international shipping services. In the 1980s, the Shenzhen authority decided to develop its own ports in Yantian, Shekou

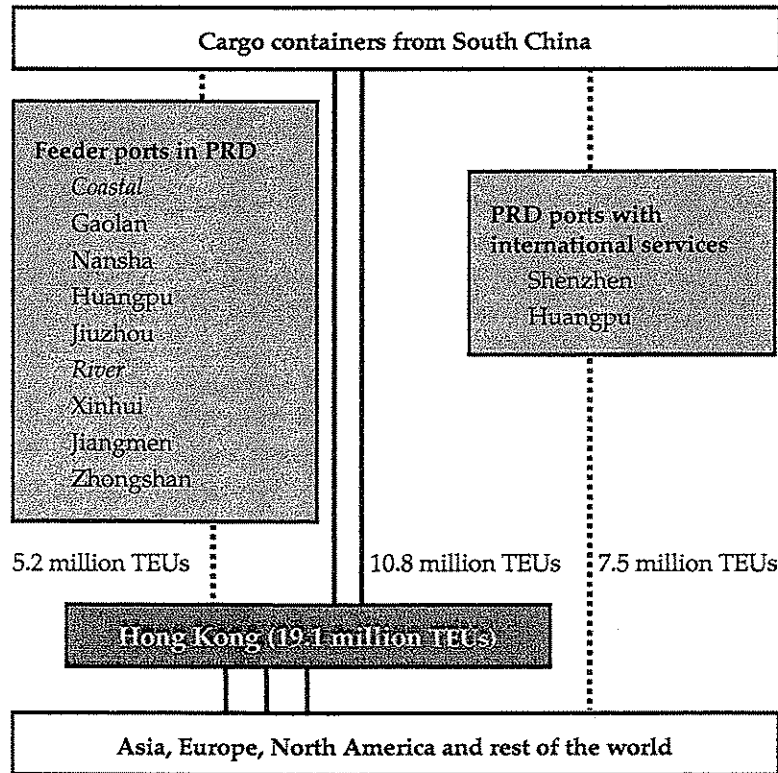
**Table 5** THCs in major Asian ports, August 2002 (HK\$)

Ports	USA		Europe		Asia	
	TEU	FEU	TEU	FEU	TEU	FEU
Hong Kong	2,140	2,855	2,060	2,750	1,800	2,650
Shenzhen	1,096	2,087	1,100	2,100	1,096	2,087
Taiwan	1,271	1,589	1,150	1,450	1,096	1,386
Singapore	788	1,170	720	1,020	788	1,170
Japan	749	936	1,870	2,680	686	1,030
South Korea	657	891	620	840	657	891
Malaysia	590	880	480	710	590	880
Shanghai	510	680	120	180	113	175

Notes: The THCs for Europe are as at March.  
FEU = Forty equivalent unit.

Source: Hong Kong Shippers' Council, see Loh (2002).

**Figure 6** Current roles of Hong Kong and the PRD ports in the regional container port system, 2002



Note: Based on container throughput in 2002.

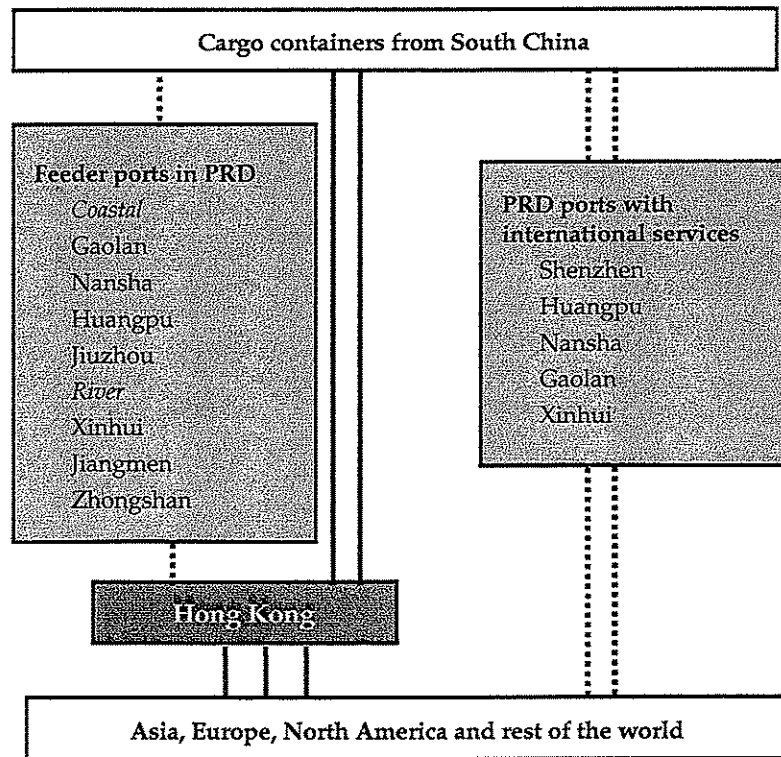
and Chiwan. The Shenzhen container terminal has had an average annual growth in freight handling of 44.6% for six years up to 2000. Shenzhen became the eleventh busiest container port in the world in 2000, the eighth in 2001 and the fifth in 2002. Its container throughput reached 5.1 million TEUs in 2001 and 7.5 million in 2002 (Shen 2002b; Enright et al. 2003:89). The number

of lines calling in Shenzhen increased from 5 in 1995 to 14 in 1997, 19 in 1998 and 69 in 2002 (Song 2002). It now records a monthly run of 417 ships involving major shipping companies such as Maersk, COSCO and the members of the Global Alliance (Yantian Port Group 2002). According to the port's expansion plan, by 2005 annual freight will amount to 85 million tonnes of cargo and 7 million TEUs. It will have 100 overseas routes by the same year. Thus, it is expected that Shenzhen will play a more important role in the future but that Hong Kong will remain the most important container port in South China (Figure 7). Nansha, Gaolan and Xinhui ports may also offer some international services in the future (see section 5).

The functional role of the ports in the western PRD is determined by their physical conditions and relationship with Hong Kong. The western PRD relies on Hong Kong almost as its only gateway. According to Table 6, it is cheaper to export a FEU (forty equivalent unit) container to the US from the western PRD by barge to Hong Kong than by truck to Shenzhen and then to the US. As mentioned before, the western PRD is an important source of containers for Hong Kong. This importance has been rising in recent years as some containers in the eastern PRD use Shenzhen port.

Currently, a major feeder port is missing in the western PRD. This role can be taken up by Xinhui port, which has a relatively large hinterland (Figure 8). Gaosha port in Jiangmen can provide the same feeder service to Hong Kong as Xinhui port (see section 5). They essentially belong to the same group of ports within the city of Jiangmen. But Xinhui port has superior natural conditions to become a major regional hub port in the western PRD. Nansha port is currently being developed to offer international shipping services like Shenzhen. But Nansha may take five to ten years to become a major port. Even then, Xinhui could continue to act as a feeder port for Hong Kong. Even now, many containers in Shenzhen continue to be sent to Hong Kong by truck and barge to be shipped overseas.

**Figure 7** Future roles of Hong Kong and the PRD ports in the regional container port system



Note: Five to ten years later.

#### 4. Advantages of Xinhui Port in the Western PRD: A Case Study

The development potential of a port essentially depends on both natural endowment and logistical demands, including:

- Attractive water and channel conditions and port capacity for container shipments according to the technical requirements of river and cross-ocean shipment. Large

**Table 6** Cost of exporting a FEU container to the US from the western PRD, mid-2000 (US\$)

Origin	Via HK by truck	Via HK by barge	Via Shenzhen by truck	Cost difference via HK by barge vs. Shenzhen by truck
Foshan	3,849	3,607	3,775	168
Zhongshan	3,922	3,562	3,797	235
Zhuhai	4,043	3,562	3,882	260
Jiangmen	3,952	3,620	3,885	265

Source: Loh (2002).

container ships are built and used in sea transportation to achieve economies of scale.

- A large hinterland with development potential.
- A good geographic location and good accessibility to the hinterland.
- Land available for port and logistics-related services.
- A good institutional setting and government support are crucial to the productivity and efficiency of port services.

In summary, the key determinants of a port's development potential are a good combination of natural conditions, a land, river and/or air transportation network and an economic hinterland with growth potential. Existing port facilities are an important but not a determining factor. The following examines the advantages of Xinhui port in the western PRD (Xinhui Port 2002).

##### 4.1 Excellent Natural Condition for Port Development

Xinhui port has a strategic location and excellent natural conditions for development in the western PRD. It is located in Yinzhou Lake inside Yamenkou, the so-called Yamen Channel (Figure 9). Yinzhou Lake has an area of 65 km<sup>2</sup>. It has an average



depth of 8-13 m and the current in the lake is gentle. It can accommodate vessels up to 10,000 DWT (dead weight tons). It is one of the two river channels in the Pearl River System, Yamen Channel in the south and Fumen Channel in the north, that can support the navigation of ships over 10,000 DWT. Guangzhou's Huangpu port makes use of the advantage of Fumen Channel. Xinhui port has been designated as a regional hub port, similar to Nansha, by the governments of Guangdong, Jiangmen and Xinhui. Xinhui port has been designated as a class one port and is expected to play a key role in the development of the western PRD.

The navigation channel from Yamenkou to the sea can currently accommodate ships of up to 5,000 DWT. A feasibility study has been undertaken to upgrade its capacity, dredging the channel by another 7 m in depth so that it can accommodate ships of 10,000 DWT to facilitate near-ocean shipping services to Asian ports. The Guangdong provincial government has approved the funds to complete this project by the end of 2003. Two navigation improvement projects, listed in both the national and provincial Tenth Five-year Plans for 2001-2005, will also be implemented. These projects will upgrade the navigation capacity of Laolongfu Channel (14 km long) and Tanjiang Channel (58 km long) so that it will be able to accommodate ships of 1,000 DWT. These two channels directly link Xinhui port with the Xijiang and Tanjiang Rivers. Ships of 1,000 DWT can come to Xinhui port from the western PRD, western Guangdong, as well as Wuzhou in Guangxi. A navigation channel for Xijiang River that will allow ships of 3,000 DWT to pass through the Futiaomen Channel and Yamenkou to the sea is under construction, and will further improve the link between the Xijiang River basin and Xinhui port.

#### *4.2 Current Status of Xinhui Port*

Currently, Xinhui port has two freight terminuses, located at Xihekou and Tianma. The water is 6.50 m and 8.84 m deep in Xihekou and Tianma terminuses, respectively. The Xihekou terminus began operations in 1980 and was expanded in 1986-

1989. It has three berths that can accommodate vessels up to 3,000 DWT. Its current throughput capacity is 0.45 million tonnes. The terminus has an area of 35,000 m<sup>2</sup>. However, there is an insufficient amount of land for further expansion.

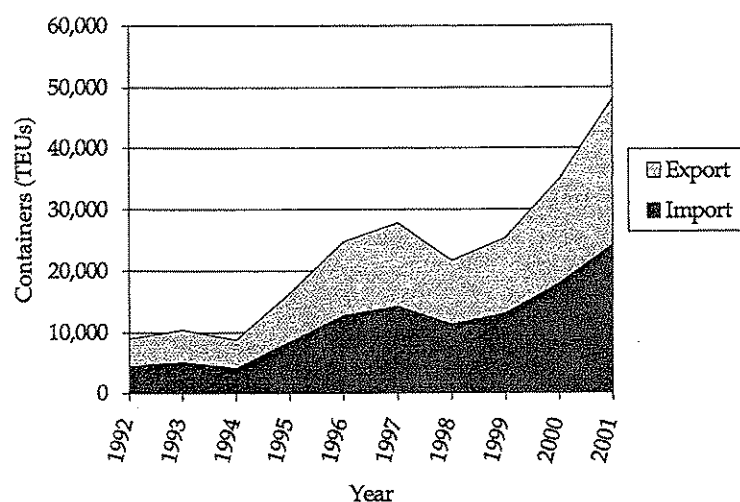
Tianma terminus began operations in January 2002. The waterfront of the port area is at least 1,000 m. The construction of phase one, involving a total investment of RMB 130 million, has been completed. The terminus has two berths that can accommodate vessels up to 5,000 DWT. It has a throughput capacity of 0.86 million tonnes and an annual container handling capacity of 100,000 TEUs. In phase one the terminus has an area of 128,000 m<sup>2</sup>, which will be increased by 271,000 m<sup>2</sup> in phase two. There is ample land to further expand the terminus. In phase two, two berths will be constructed that can accommodate vessels up to 10,000 DWT (involving a structural design for 30,000 DWT), with a throughput capacity of 0.91 million tonnes and 90,000 TEUs. A total of RMB 200 million will be invested in phase two. The cost of port construction here is low due to good natural conditions. By contrast, ports in Nansha, Zhongshan and Jiuzhou face serious problems with silting.

In 2001, total throughput in Xinhui port was 0.72 million tonnes. Container throughput was 48,098 TEUs. There has been a significant increase in the number of containers handled since 1992 (Figure 10).

#### *4.3 Facilities and Services of Xinhui Port*

Currently, there is a stack-up-yard of 40,000 m<sup>2</sup> for containers and another of 10,000 m<sup>2</sup> for bulk cargoes. The total floor-space of the two warehouses is 4,608 m<sup>2</sup>. An ample amount of land is available to expand the port area by building more stack-up-yards for cargoes and warehouses for assembling and dismounting.

The port was officially designated a class one port in December 2001, making it open to all of the world's ports. It is currently effectively operating as a feeder port. Tianma terminus has four to five daily scheduled services to Hong Kong. There are also three scheduled services to Guangzhou and Shekou each week.

**Figure 10** Containers handled in Xinhui port, 1992-2001

Source: Xinhui Port (2002).

Various government inspection units and related services have been set up in Tianma. There is a full complement of cargo handling equipment, customs and CIQ (Customs and Inspection Quarantine) facilities in the terminus. It takes only five minutes for a container to be inspected by customs officials using an advanced X-ray machine, ranking the port sixth in mainland China for speed of customs inspection. The processing time for a departing container is about three hours and that for an arriving container is about one day. Service charges are competitive and flexible. The charges can be further adjusted to compete with other ports. The THCs to shippers are listed in Table 7.

#### 4.4 Land Transportation

An extensive network of highways and expressways has been built in the PRD and Guangdong, with Guangzhou as the centre,

**Table 7** THCs to shippers in Xinhui port, 2002 (RMB)

Item	TEU	FEU	One tonne of bulk cargo
Port service charge for imports	33.0	66.0	3.3
Port service charge for exports	16.5	33.0	1.7
Up-loading to trucks	46.0	64.0	12.0
Goods ordering	—	—	1.5
Up-loading to ships	—	—	25.0
Container opening	180.0	250.0	—
X-ray inspection	200.0	200.0	—

Sources: Field survey on 16-18 December 2002; Xinhui Port (2002).

with further links to the rest of China. Xinhui port, located in the centre of the western PRD, is well connected with the highway network to its economically dynamic hinterland (Figure 2). It is connected with the Foshan-Kaiping expressway, the Xinhui-Taishan expressway, the coastal expressway (the portion from Xinhui to Yangjiang has been completed, that from Xinhui to Zhuhai has yet to be completed) and with the Jiangmen-Zhuhai expressway (to be completed soon). Heshan, Kaiping, Enping and Taishan can now be reached from Xinhui port via expressways within two hours. The Guangzhou-Zhuhai quasi-express railway has been approved for construction and will run through Xinhui with a spur line to Xinhui port.

#### 4.5 Favourable Conditions for Joint River-Sea Transportation

Situated on the shore of Yamen Channel, Tianma port is conveniently located for both river and sea transportation via Yinzhou Lake. Most other ports in the PRD do not offer such convenience. As mentioned before, vessels up to 5,000 DWT can



move through Yamenkou to the sea. When the waterways are improved with an investment of RMB 300 million, vessels of up to 1,000 and 3,000 DWT will be able to move via the Xijiang River up to Zhaoqing in the western periphery of the PRD and to Wuzhou in Guangxi. They will also be able to reach the cities of Taishan, Kaiping and Enping via the Tanjiang River. Cheap water transportation can link these areas with Xinhui and further to Hong Kong and to other coastal ports of North China for a north-south exchange of goods. Transportation costs will be reduced by over 40% if goods are sent to and from Northeast China by ship rather than by road. Although it takes an extra day, shipping is also much more reliable.

#### 4.6 *Economic Strength of the Hinterland*

The hinterland of Xinhui can be divided into four parts: Xinhui and other urban districts of Jiangmen (a prefecture-level city); the rest of Jiangmen city including Heshan, Kaiping, Enping and Taishan; the rest of the western PRD and western Guangdong province. The areas within Jiangmen city can be reached effectively by short-distance transport via highways and expressways. The rest of the western PRD and western Guangdong can be reached using economical river transportation, especially via Xijiang. For feeder services to Hong Kong, Xinhui port can compete effectively with the new Nansha port, as Xinhui is closer than Nansha to the above hinterland. The Xijiang's main navigation channel passes through Xinhui rather than Nansha.

The above hinterland has great economic potential (see section 2 for the economic strength of western PRD). Xinhui is one of the most economically developed county-level cities in China, ranking 34 among the 100 economically strongest county-level cities/counties in 2001. It had a population of 0.87 million and a GDP of RMB 12.5 billion in 2001. In 2002, Xinhui became an urban district of Jiangmen city. Jiangmen city, including all urban districts and the four county-level cities under its administration, had a population of 3.61 million and a GDP of

RMB 61.6 billion in 2001. The city has been selected as a site of the Regional Growth Centre Demonstration Project (RGC Project) under an international Project of Regional Integration for Sustainable Economies (RISE), administered by the Pacific Economic Cooperation Council (PECC). One focus of the RISE Project is the role of infrastructure in linking rural communities to broader regional, national and global economies. The Tianma port project is one of the 19 Jiangmen Projects recommended by the RISE Project. Those proposed projects, having passed an initial economic evaluation based on the "Economic Evaluation Methods for Construction Projects" issued by the State Development and Planning Commission, are expected to be able to attract large amounts of external investment.

Indeed, the area surrounding Yinzhou Lake will become a new port-based development zone, with an area of 962.5 km<sup>2</sup>. About 187 large enterprises have been established in the Yinzhou Lake area, 30% of which are foreign-owned enterprises or joint ventures. Two container-manufacturing firms located there are producing 240,000 TEUs a year, making the area an important base for container manufacturing. The total industrial output of the area is US\$713 million a year.

#### 4.7 *Government Support*

There is strong government commitment and support for the development of the port. Xinhui has a good plan for developing the port zone, separating domestic and foreign trade.

On the basis of the above considerations, the advantages of Xinhui port can be summarized as follows:

- It is the best river-port in the western PRD. It is one of the two river channels in the Pearl River system that can support the navigation of ships of over 10,000 DWT. It has good berth conditions and a good river channel.
- Xinhui port is a class one port open to all ports of the world. It has been designated as a regional hub port, similar to the status of Nansha, by the governments of Guangdong, Jiangmen and Xinhui.

- The irreplaceable role of Hong Kong as entrepôt and good river accessibility to Hong Kong is vital to Xinhui.
- River transportation from the western PRD to Hong Kong is much cheaper than road transportation. The time required is only half-day more.
- The project of improving navigation channels gives additional strength to Xinhui's potential to become a regional logistics centre. It will improve Xinhui's river links with its hinterland in the western PRD and the Xijiang River basin. With improvements to the navigation channel in Yamenkou, direct shipping line services to and from Southeast Asia can be offered.
- An ample amount of land available for the expansion of the port area, such as for stack-up-yards for cargoes and warehouses for assembling and dismounting.
- Xinhui port is well connected by a highway network to the economically dynamic hinterland.
- There are favourable conditions for joint river-sea transport linking the western PRD with Hong Kong and/or Northeast China.
- The economic strength of the city and the hinterland. Xinhui was one of the most economically developed county-level cities in China in 2001. In 2002, Xinhui became an urban district of Jiangmen administration. Jiangmen city has been selected as a site of the RISE Project.

In conclusion, in addition to a good location (the coastal land of western Guangdong), low costs (good water conditions) and high efficiency (government support), Xinhui's infrastructure, market and institutions are sound.

### 5. Comparison with Ports in the Western PRD and Surrounding Areas

Table 8 presents detailed information comparing the ports of Xinhui, Gaosha, Zhongshan, Gaolan, Yangjiang, Nansha and Huangpu. The key features of these ports are summarized as follows.

Table 8 Comparison of seven ports in the western PRD

Basic information	Xinhui		Gaosha		Zhongshan		Gaolan		Yangjiang		Nansha		Huangpu	
	Port class	One River	Two River	Two River	Two River	One Sea	One Sea	One River	One River	One Sea	One Sea	One Sea	One Sea	One Sea
Type of port		River	River	River	River	Sea	Sea	River	River	Sea	Sea	Sea	Sea	Sea
Water depth (m)		8.8	4.5	4.5	4.5	9.5	9.5	11	11	11.5	11.5	11.5	11.5	11.5
Joint river-sea transportation		Yes	No	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Harbour siltation		No	Light	Light	Light	No	No	No	No	Serious	Serious	Serious	Serious	Serious
Distance to HK (nautical miles)		98	99	52	52	45	45	180	180	35	35	35	35	68
<b>Berth tonnage</b>														
Current maximum berth tonnage		5,000	1,000	5,000	5,000	50,000	50,000	20,000	20,000	25,000	25,000	25,000	25,000	35,000
Current maximum berth tonnage for containers		5,000	1,000	5,000	5,000	20,000	20,000	10,000	10,000	25,000	25,000	25,000	25,000	35,000
Planned maximum berth tonnage		10,000	3,000	5,000	5,000	250,000	250,000	35,000	35,000	50,000	50,000	50,000	50,000	50,000
Maximum vessel (DWT)		5,000	3,000	3,000	3,000	20,000	20,000	20,000	20,000	25,000	25,000	25,000	25,000	35,000
<b>Throughput</b>														
<i>Actual annual throughput</i>														
Containers (1,000 TEU)		48	100	630	630	—	—	1.5	1.5	32	32	32	32	1,738
Cargo (1,000 tonnes)		720	1,556	2,742	2,742	10,000	10,000	1,012	1,012	270	270	270	270	128,230

Table 8 Comparison of seven ports in the western PRD (continued)

	Xinhui	Gaosha	Zhongshan	Gaolan	Yangjiang	Nansha	Huangpu
<i>Planned handling capacity (next 5 years)</i>							
Containers (1,000 TEU)	190	200	1,200	—	30	—	6,000
Cargo (1,000 tonnes)	1,770	—	—	150,000	4,255	—	—
<b>Shipping and port services</b>							
Feeder service to HK	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Customs service	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate
CIQ service	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate
<b>Development potential</b>							
Development stage	Phase one	Full operation	Full operation	Phase one	Phase one	Further construction	Full operation
Port-based industry	Yes	No	No	Yes	No	Yes	Yes
Land for port expansion	Large	Limited	Little	Large	Large	Large	Limited
Potential shipping service to Southeast Asia	Yes	No	No	Yes	Yes	Yes	Yes
Potential shipping service to Europe/America	No	No	No	Yes	No	Yes	Yes

Sources: Field survey on 16-18 December 2002; Li et al. (1997); Hong Kong Shippers' Council (2000).

First, an analysis of advantages and disadvantages of each port shows that Xinhui is a good location for a regional logistics hub (Table 9). It has the best natural conditions among all feeder ports in the western PRD. In the meantime, its feeder services to Hong Kong are facing competition from some small feeder ports such as Gaosha port.

Second, among all ports concerned, Gaolan port possesses the most favourable conditions for the construction of berths, with a harbour basin area of more than 80 km<sup>2</sup> and with 70 km of coast line. Gaolan port will be linked by railways, highways, waterways and airways. Zhuhai airport is in operation, the Guangzhou-Zhuhai railway project has been approved for construction, and the Guangzhou-Zhuhai west expressway is under construction.

Third, given Zhuhai's plans for industrial development, Gaolan port will function mainly as a pivotal port for the transportation of coal, oil, chemical products and grain for South China, and will also serve the emerging petrol-chemical industries of Zhuhai. It is not suitable as a feeder port for Hong Kong.

Fourth, cargoes from the PRD and South China to Hong Kong are now being shared by some seaports in the PRD, mainly Yantian, because of the cost disadvantage of Hong Kong port. If Nansha is fully developed as a container port, it can play a similar role as Yantian, but it may take five to ten years to reach a scale similar to Yantian. It seems that, in the initial stage, Nansha port will be used to meet the needs of bulk cargo transportation for the heavy and chemical industries that are to be located in Nansha. In the meantime, feeder services between Xinhui and Hong Kong will still be needed because Xinhui will still need to rely on Hong Kong's entrepôt functions.

Fifth, Huangpu is a well-established port in the PRD. But its land and river channel limit further growth. Currently, Huangpu mainly functions as a port for the transportation of bulk cargoes and as a container feeder port for Hong Kong.

Sixth, Gaolan and Yangjiang offer good conditions for port construction. However, their source of goods for containers is limited and they cannot effectively compete with small feeder ports.

**Table 9** Advantages and disadvantages of seven ports in the western PRD

Port	Advantages	Disadvantages
Xinhui	<ul style="list-style-type: none"> <li>• Good natural conditions</li> <li>• Good location in the western PRD</li> <li>• Large hinterland</li> <li>• Potential for joint river-sea transportation</li> <li>• Ample land for expansion</li> <li>• Feeder port for HK and potential shipping services to Asia</li> <li>• Potential for south-north transportation by sea</li> </ul>	<ul style="list-style-type: none"> <li>• Feeder function in competition with Gaosha</li> <li>• Potential impact from HK-Zhuhai/Macao bridge and Nansha port (in 5-10 years)</li> </ul>
Gaosha	<ul style="list-style-type: none"> <li>• Good location</li> </ul>	<ul style="list-style-type: none"> <li>• Depth limits on berths and on the river channel</li> <li>• Only a feeder port</li> </ul>
Zhongshan	<ul style="list-style-type: none"> <li>• Strong local demand</li> <li>• Good river connectivity with Hong Kong</li> </ul>	<ul style="list-style-type: none"> <li>• Depth limits on berths and on the river channel</li> <li>• Port development is constrained by a land shortage</li> </ul>
Gaolan	<ul style="list-style-type: none"> <li>• Natural deep-water port</li> <li>• Large harbour zone</li> <li>• Development of petrol-chemical industry</li> <li>• Special port for oil and chemical products</li> </ul>	<ul style="list-style-type: none"> <li>• Poor land transport to Hong Kong</li> <li>• Limited source of goods for containers</li> <li>• Not fully developed</li> </ul>

**Table 9** Advantages and disadvantages of seven ports in the western PRD (continued)

Port	Advantages	Disadvantages
Yangjiang	<ul style="list-style-type: none"> <li>• Natural deep-water port</li> <li>• Rail connection in early 2003</li> </ul>	<ul style="list-style-type: none"> <li>• Small local demand</li> <li>• Limited source of goods for containers</li> </ul>
Nansha	<ul style="list-style-type: none"> <li>• Deep-water port</li> <li>• Close to the western PRD</li> <li>• Development of heavy and chemical industries</li> </ul>	<ul style="list-style-type: none"> <li>• Serious siltation</li> <li>• Not fully developed</li> <li>• Ocean shipping services yet to be offered</li> </ul>
Huangpu	<ul style="list-style-type: none"> <li>• Well established as a major port in the PRD</li> <li>• Large hinterland</li> </ul>	<ul style="list-style-type: none"> <li>• Siltation</li> <li>• Hinterland shared with Nansha</li> </ul>

Seventh, many feeder ports in the western PRD such as Zhongshan only serve their own immediate hinterland, within the boundaries of a city.

Eighth, as many class two ports can only offer direct shipping services to Hong Kong and Macao, the city governments in charge of those ports would prefer that they function as feeder ports for Hong Kong. The source of goods is mainly local. These city governments may try to keep imports and exports as part of local statistics in a bid to protect local interests by competing with other ports to maintain such feeder services through pricing and other institutional means.

Ninth, the materials and products for *san lai yi bu* (processing, assembling, manufacturing and compensation trade) enterprises, largely invested by Hong Kong businessmen, must be shipped from and to abroad, mostly via Hong Kong. Thus there is a continuous need for transportation to and from Hong

Kong, as Hong Kong remains the largest source of external investment in the PRD.

Finally, Table 10 presents the results of a cost analysis on shipping a TEU container from Xinhui to Singapore using waterways between various ports in the PRD and Hong Kong port. Due to market fragmentation and monopoly, the current THCs and fees for river and road transportation do not reflect the real costs. This means that all of these charges will be adjusted when competition intensifies. For the purposes of this paper, the THCs in the PRD ports are assumed to be the same. The THCs in Hong Kong port and the shipping cost from Hong Kong to Singapore are the same for all shipments using Hong Kong port.

Therefore, the difference in total cost depends on the cost of highway transport from Xinhui to various PRD ports and on the cost of feeder services by waterway from the PRD ports to Hong Kong. If the container is shipped from Xinhui/Gaosha to Hong Kong, then the cost is the lowest (RMB 3,882 per TEU) if Xinhui or Gaosha port is used. Moving containers to other ports in the PRD first to use their feeder services will cause additional costs to be incurred. For Zhongshan, Gaolan and Nansha ports, such costs will be moderate (RMB 4,332-4,632 per TEU) but for Yangjiang and Huangpu ports they will be high (RMB 4,882-5,342 per TEU). In the meantime, the cost of feeder services in Zhongshan and Gaolan ports should be low (RMB 500 per TEU) as these ports are close to Hong Kong, but high in Yangjiang port (RMB 800 per TEU). The cost of feeder services is medium in Xinhui/Gaosha, Nansha and Huangpu (RMB 600 per TEU).

It is also useful to compare the cost of different transport modes. Table 11 presents four scenarios. The first scenario (S1) assumes that the feeder service by waterway from Xinhui to Hong Kong is used, resulting in a medium cost (RMB 3,882 per TEU), as the feeder service is cheap but the THCs in Hong Kong are high.

The second scenario (S2) assumes that land transportation will be used from Xinhui to Hong Kong before the Hong Kong-Zhuhai/Macao bridge is completed, resulting in a high cost

**Table 10** Comparison of transportation costs from Xinhui to Singapore using waterways between various ports in the PRD and Hong Kong port (RMB per TEU)

Port	Xinhui/Gaosha	Zhongshan	Gaolan	Yangjiang	Nansha	Huangpu
Xinhui to PRD port by highway	0	550	750	1,260	750	1,000
PRD port THCs	500	500	500	500	500	500
PRD port to HK	600	500	500	800	600	600
HK THCs	1,200	1,200	1,200	1,200	1,200	1,200
HK to Singapore shipping cost	1,582	1,582	1,582	1,582	1,582	1,582
Total cost	3,882	4,332	4,532	5,342	4,632	4,882

Sources: Field survey on 16-18 December 2002; Wang (2002).

**Table 11** Comparison of transportation costs from Xinhui to Singapore via various routes (RMB per TEU)

Routes	Cost
<b>S1: Via HK by waterway</b>	
Xinhui port THCs	500
Xinhui port to HK	600
HK THCs	1,200
HK to Singapore shipping cost	1,582
Total cost	3,882
<b>S2: Via HK by highway (without HK-Zhuhai/Macao bridge)</b>	
Xinhui to HK border	1,500
HK highway	1,300
HK THCs	1,200
HK to Singapore shipping cost	1,582
Total cost	5,582
<b>S3: Via HK by highway (with HK-Zhuhai/Macao bridge)</b>	
Xinhui to Zhuhai/HK border	750
Bridge toll/HK highway	150
HK THCs	1,200
HK to Singapore shipping cost	1,582
Total cost	3,682
<b>S4: Direct shipping service to Singapore</b>	
Xinhui port THCs	500
Xinhui to Singapore shipping cost	2,213
Total cost	2,713

Sources: Field survey on 16-18 December 2002; Wang (2002).

(RMB 5,582 per TEU) due to expensive highway transport in the mainland and in Hong Kong, and a high THCs in Hong Kong.

The third scenario (S3) assumes that land transportation will be used from Xinhui to Hong Kong after the Hong Kong-Zhuhai/Macao bridge is completed, resulting in a medium cost (RMB 3,682 per TEU) due to cheap highway transport to Hong Kong but a high THCs in Hong Kong.

The fourth scenario (S4) assumes that there is a direct shipping service from Xinhui to Singapore. The cost is the lowest (RMB 2,713 per TEU) due to a medium shipping cost and the saving of the feeder service charge and THCs in Hong Kong. But the port of Hong Kong will still be used for other shipping services to destinations beyond Asia.

Under the above different scenarios, Xinhui port will be viable for various logistics activities because of its central location in the western PRD. It will handle imports and exports involving the hinterland in Jiangmen city, the western PRD, western Guangdong and beyond. Transportation may cover feeder services to and from Hong Kong, shipping services between South and North China, and direct shipping service between Xinhui and ports in Asia.

## 6. Conclusion and Prospects

This study has examined the economic development and the potential for port development in the western PRD, within the context of Hong Kong as an entrepôt. Xinhui port has been selected for a detailed case study. The strengths and functions of the surrounding ports of Gaosha, Zhongshan, Gaolan, Yangjiang, Nansha and Huangpu have been compared. Natural port and navigation channel conditions, geographic location, hinterland, sufficient land and government support are considered key factors of the development potential of a port. Xinhui port has the following favourable factors:

First, rapid economic growth in the western PRD has led to a strong demand for logistics services. Xinhui port has a large hinterland that can be divided into four parts: Xinhui and other

urban districts of Jiangmen; the rest of Jiangmen city; the rest of the western PRD and western Guangdong province.

Second, Xinhui port is well connected to its hinterland by a highway network. The areas within Jiangmen city can be effectively reached by short-distance transportation via highways and expressways. The rest of the western PRD and western Guangdong can be reached using economical river transportation, especially via Xijiang River.

Third, Hong Kong plays an important role in the PRD, both as a source of investment and as a hub port. Many river-ports in the western PRD serve as feeder ports for Hong Kong rather than Shenzhen port due to the low cost of river transportation. Xinhui port has the best natural conditions among all feeder ports in the western PRD. Yinzhou Lake is one of the two river channels in the Pearl River system that can support the navigation of ships of over 10,000 DWT. It is most suitable to be developed as a regional logistics hub serving port-based industries and the large hinterland in the western PRD.

Fourth, Xinhui port can offer three cost-effective services: feeder services to Hong Kong, north-south river/sea transportation, and ocean shipping to destinations in Asia. River/sea transportation offer substantial savings of over 40% compared with highway transportation. Xinhui has a distinctive role to play in the western PRD.

A cost analysis of various transportation routes and modes shows that the cost of shipping containers from Xinhui and its surrounding areas to Hong Kong and then to overseas ports such as Singapore is the lowest using the feeder service from the Xinhui port to Hong Kong. Based on above analyses, Xinhui port will be viable for various logistics activities because of its central location in the western PRD.

Looking into the future, the following developments have important implications for Xinhui port. First, the upgrading of the navigation channel from Yamenkou to the sea to accommodate ships of 10,000 DWT will facilitate near-ocean shipping services to Asian ports. Two navigation improvement projects will upgrade the navigational capacity of Laolongfu

Channel (14 km long) and Tanjiang Channel (58 km long) to accommodate ships of 1,000 DWT. These two channels directly link Xinhui port with the Xijiang and Tanjiang Rivers.

Second, Gaosha port in Jiangmen can provide the same feeder services to Hong Kong as Xinhui port. They essentially belong to the same group of ports within Jiangmen city. But Xinhui port has superior natural conditions to become a major regional hub port in the western PRD. It is a class one port while Gaosha port is a class two port.

Third, Nansha port is currently under development and the intention is that it will offer international shipping services like Shenzhen. But Nansha may take five to ten years to become a major port. Even then, Xinhui could continue to function as a feeder port for Hong Kong because of the status of Hong Kong port as an entrepôt.

Fourth, potential direct shipping services from Xinhui to ports in Asia such as Singapore will dramatically cut shipping costs. But the port of Hong Kong will still be used for other shipping services to destinations beyond Asia.

Fifth, the proposed construction of the Hong Kong-Zhuhai/Macao bridge will also reduce highway transportation costs from Xinhui to Hong Kong to a level comparable to that by river. It provides an alternative option for transportation between Xinhui and Hong Kong.

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## Glossary

Baijiao 白蕉	Nanping 南屏
Boluo 博羅	Nansha 南沙
Chiwan 赤灣	Panyu 番禺
Conghua 從化	Pearl River Delta 珠江三角洲
Dongguan 東莞	san lai yi bu 三來一補
Doumen 斗門	Sanshui 三水
Enping 恩平	Sanzao 三竈
Foshan 佛山	Shekou 蛇口
Fumen 虎門	Shenzhen 深圳
Futiaomen 虎跳門	Shunde 順德
Gaolan 高欄	Sihui 四會
Gaoming 高明	Taishan 台山
Gaasha 高沙	Tanjiang 潭江
Gaoyao 高要	Tiansha 天馬
Guangdong 廣東	Tuen Mun 屯門
Guangxi 廣西	Wuzhou 梧州
Guangzhou 廣州	Xihekou 西河口
Heshan 鶴山	Xijiang 西江
Huadu 花都	Xinhui 新會
Huangpu 黃埔	Xinqing 新青
Huidong 惠東	Yamen 崖門
Huiyang 惠陽	Yamenkou 崖門口
Huizhou 惠州	Yangjiang 陽江
Jiangmen 江門	Yangzi River 長江
Jinguzhou 今古州	Yantian 鹽田
Jiuzhou 九州	Yinzhou Lake 銀洲湖
Kaiping 開平	Zengcheng 增城
Kwai Chung 葵涌	Zhaoqing 肇慶
Laolongfu 勞龍虎	Zhongshan 中山
Nanhai 南海	Zhuhai 珠海