

**ENTERING THE CHINESE WASTEWATER REUSE
MARKET IN THE CONSTRUCTION INDUSTRY:
STRATEGIC ANALYSIS FOR CWRTC**

by
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ABSTRACT

China's enormous economic growth has created a water crisis that the Chinese government is addressing through policies, which require wastewater reuse for institutional and new private-residential developers. The China Water Reuse Trade Consortium (CWRTC) is dedicated to marketing integrated Canadian-based Environmentally Sustainable Technologies solutions to meet this new business opportunity and to helping member firms enter the Chinese wastewater reuse industry.

This project provides a strategic analysis for CWRTC to enter the Chinese wastewater reuse market in the construction industry. Background information on the wastewater reuse industry is introduced, a business environment in which CWRTC is going to operate is described through external analysis, and strategic capabilities are explored through internal analysis. Based upon these analyses, we recommend that CWRTC adopt a focused differentiation strategy, set up a new company with functional structure in China, and identify the key points of the business flow through the construction industry.

DEDICATION

To my parents: Zhiqiang and Renlian.

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LIST OF ABBREVIATIONS AND ACRONYMS

BCIT	British Columbia Institute of Technology
BOT	Build-Operate-Transfer
CSFs	Critical Success Factors
CSCC	Center for Sustainable Communities Canada
CWRTC	China Water Reuse Trade Consortium
EDC	Economic Development Canada
EPB	Environmental Protection Bureau
EST	Environmentally Sustainable Technologies
GDP	Gross Domestic Product
IP	Intellectual Protection
ISO 9000	International Standard Organization 9000
JXW	Tianjin Jiahua Xinbao Water Treatment Co. Ltd.
MBR	Membrane Bioreactor
PHC	Puhua Holdings Co. Ltd.
PRC	People's Republic of China
SCM	Supply Chain Management
SME	Small- to Medium-sized Enterprise
SWOT	Strengths, weaknesses, opportunities, and threats
TQM	Total Quality Management
WRB	Water Reclamation Branch in Beijing
WRC	Wastewater Reuse China
WTO	World Trade Organization

1 INTRODUCTION

1.1 Background of the Project

China's enormous economic growth has created a water crisis that the government is addressing through a number of policies, including regulations requiring wastewater reuse for institutional and new private-residential developers. The cost of water is dramatically increasing, as evidenced by the 85% increase in the price of water in Beijing in the past year, creating an economic rationale for the introduction of new technologies to address this water shortage.

The Center for Sustainable Communities Canada (CSCC) assists member firms in developing new international markets through network building that promotes Canadian technologies and services through the center's integrated full-service trade association. The CSCC Trade Consortium aims to capture and develop international markets for EST.

Canadian manufacturers are recognized leaders in the development of EST, including water reuse solutions that have market potential for China. These solutions require a range of expertise not found in the small to medium-sized enterprise (SME) manufacturers that presently dominate the water reuse technology sector in Canada. Therefore, a consortium approach is required. The consortium is comprised of a range of companies that can provide engineering, architecture, legal, patents, training, operations and maintenance as well as management services in support of the manufactured technologies.

The China Water Reuse Trade Consortium (CWRTC) concept was developed out of market research completed by CSCC members in China on water technology-related projects. The concept has also been recommended by leading Economic Development Canada (EDC) economists, who note that on a global scale, Canadian engineering companies compete with

large integrated full service firms or consortiums. The EDC recommends that Canadian firms need to strengthen links between engineers, contractors, manufacturers, equipment suppliers and, in some cases, financial institutions and government agencies, to generate the critical mass of expertise required to win more profitable integrated projects in the export market, such as China and India. CWRTC has agreed to market integrated Canadian-developed EST solutions to meet this new business opportunity and help member companies open new international markets for the export of Canadian EST products and services. (Center for Sustainable Communities Canada, 2005).

CWRTC is currently comprised of 18 member organizations (Appendix A: China Water Reuse Trade Consortium), which can be divided into six categories. These six categories and organizations within them are:

1. Manufacturing: Ecofluid, Sanitherm, EcoTek, Twinco (China), MS Filter, Koi, Fujian Newland, Joule, NWTechC
2. Operations/Maintenance: AEO
3. Engineering: NovaTec, New East
4. Management service: Teon (China), Trilogics
5. Training: BCIT, Parix
6. Legal/patents: Blake LLP, KEGB

1.2 The Aim and Scope of the Project

The aims of this project are to provide a corporate-level strategic analysis, including external environment and internal capabilities, for CWRTC to enter the Chinese market; to identify the target market and position the related product; to present the rationale for the project sponsor to make strategic decisions; to provide market information for member firms to manage their production and innovation; and to recommend an entry strategy for CWRTC to

sell and promote its products to the commercial/residential/industrial property developers and buildings retrofit market.

The project mainly concentrates on providing wastewater reuse solutions to developers of commercial, residential, and industrial buildings that are between 30,000 and 100,000 square meters, including new buildings and retrofit of old ones, with wastewater flows of about 1000 cubic meters per day. As the first step to enter into the Chinese wastewater market, this project is confined to two major cities: Beijing and Tianjin. This limitation of scope was requested by CWRTC.

1.3 The Structure of the Project

Chapter 1 introduces the background, aim and scope of the project, describes the structure of the whole paper, and introduces the relevant business models and frameworks that are used in this paper.

In Chapter 2, a definition of municipal wastewater and some background on wastewater in the world is provided. Then a profile of water supply and wastewater treatment in China is given. Finally, the construction industry and wastewater reuse industries in the two target cities, Beijing and Tianjin, are discussed.

Chapter 3 provides a deeper analysis of CWRTC's future business environment. We use the PESTEL framework to analyze the macro-environment and its impact on CWRTC. To analyze the wastewater reuse industry, Porter's five forces of competition is used to identify the sources of competition that determine the profitability of an industry. At the intra-industry level, segmentation analysis, competitor analysis, and balanced scorecard provide a detailed look into the wastewater reuse industry.

Chapter 4 is concerned with understanding the organization's strategic capability and how it underpins its competitive advantage or promotes excellence in providing value-for-money products. Value chain analysis can help managers understand the separate activities that

add value to the product and how to manage the linkages among these activities. We cite an external activity - importing knowledge from outside the firm - to address the issue of how to increase core capabilities. To deliver value for money, CWRTC needs to manage costs and operate effectively. Finally, the analysis of the firm is summarized using the SWOT framework.

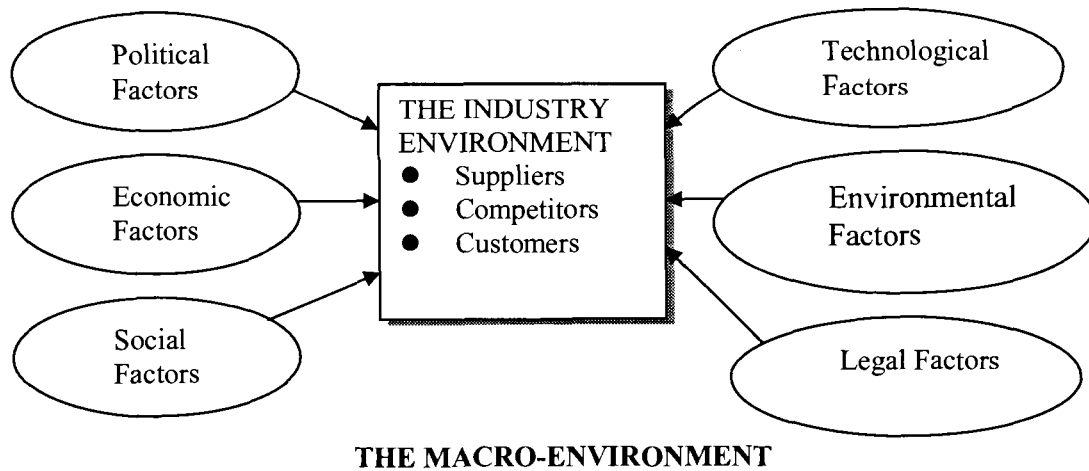
In Chapter 5, recommendations are provided. After describing CWRTC's current competitive strategy, the future business operating process and the organizational structure for the new company that will be set up in China are discussed. An analysis of the business flow in the construction industry in Beijing and Tianjin and a possible entry strategy for the consortium are described.

1.4 Brief Introduction of Business Models/Frameworks

1.4.1 The PESTEL framework

The most general 'layer' of the environment is often referred to as the macro-environment. This consists of broad environmental factors that influence, to a greater or lesser extent, all organizations. It is important to identify these issues – especially those that are likely to have a significant impact on a specific organization. The PESTEL framework can help identify these issues and point to future trends in the political, economic, social, technological, environmental and legal environments that might impinge on the organization (Figure 1.1).

Figure 1.1 The Business Environment

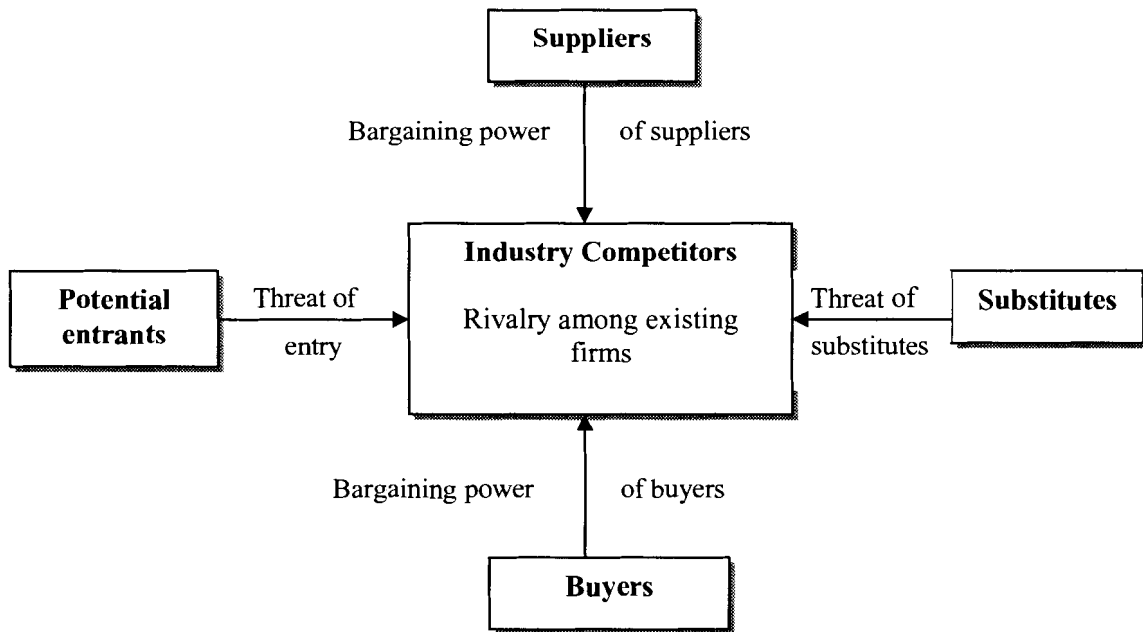


Source: Grant, 1998, p. 53

1.4.2 Porter's five forces of competition framework

Porter's five forces of competition framework (Porter, 1980) assert that the attractiveness of an industry is determined by five forces of competitive pressure. These five forces of competition are competition from substitutes, competition from entrants, competition from established rivals, the bargaining power of suppliers, and the bargaining power of buyers (See Figure 1.2). Being a potential entrant to the Chinese municipal wastewater reuse industry, it is very helpful to know the existing "rules of the game." Thus, in section 3.2, we use Porter's five forces framework to analyze the wastewater reuse industry in Beijing and Tianjin.

Figure 1.2 Porter's Five Forces of Competition



Source: Porter, 1980, Chapter 1

1.4.3 Segmentation analysis

Market segmentation identifies similarities and differences between groups of customers or users. Segmentation always reflects customer needs. Segmentation analysis disaggregates industries and markets, allowing a company to:

1. "Identify segments with greatest profit potential;
2. Identify strategies to exploit Critical Success Factors within a segment;
3. Evaluate the merits of a niche strategy compared with a broader, multi-segment strategy."

(Grant, 1998, p. 101)

1.4.4 Competitor analysis

The purpose of competitor analysis is to predict the behaviour of one's closest competitors. The importance of competitor analysis depends upon the structure of the industry.

The approach used in this paper is less theoretical but more practical. It concentrates on two main issues: acquiring competitors' information and predicting their behaviour.

1.4.5 Balanced scorecard

The balanced scorecard can link the overall corporate goal of maximizing shareholder value to more specific strategic and operating targets. The balanced scorecard can identify the expectations of different shareholders and link an assessment of performance to choice of strategy through both qualitative and quantitative tools. It generally includes four perspectives: financial, customer, internal business, and learning and growth. In this case, the balanced scorecard is used to select the most attractive market segment for CWRTC by comparing the three submarkets from these four perspectives.

1.4.6 Value chain analysis

The value chain describes the activities within and around an organization, which eventually create a product or service. It includes primary activities that are directly concerned with the creation or delivery of a product or service; and support activities, which can improve the effectiveness or efficiency of primary activities (Figure 4.1). Managers should understand how these separate activities add value to the final product, and how these separate activities can be linked effectively and efficiently.

1.4.7 SWOT

SWOT analysis identifies and lists the firm's strengths, weaknesses, opportunities, and threats. SWOT analysis summarizes the key issues in the business environment and defines the strategic capabilities of an organization that are most likely to influence on strategy development. By studying the business environment, the organization should identify the opportunities and threats within the environment. Meanwhile, the organization must analyze its

strategic capabilities, and identify its strengths and weaknesses. Thus, SWOT analysis aims to identify the extent to which the current strengths and weaknesses are relevant to, and capable of, dealing with threats or capitalizing on the opportunities in the business environment.

2. BACKGROUND OF THE WASTEWATER REUSE INDUSTRY

2.1 Introduction of Municipal Wastewater Reuse

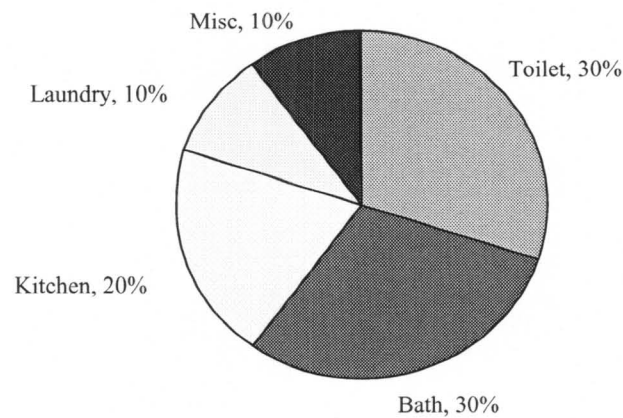
2.1.1 What is municipal wastewater?

Municipal wastewater is a mixture of all water discharge within the household including bathroom sinks, bathtubs, toilets, kitchen sinks, and laundry water. This wastewater is characteristically divided into three sub-categories related to the organic “strength” or level of contaminants typically contained in the water: blackwater, dark greywater, and light greywater. Blackwater comes from toilets and contains a high concentration of disease-causing micro organisms and high levels of organic contaminants. Dark greywater primarily originates from kitchen sinks. It may also contain disease-causing micro organisms and can have high levels of organic contaminants from food waste and grease/oil. Light greywater typically consists of drainage from bathroom sinks, tubs, showers, and the laundry. Light greywater can also contain disease-causing micro organisms, but the organic contaminants are usually in much lower levels than the organic contaminants found in the other two types of wastewater.

Both dark greywater and light greywater may contain varying levels of disease-causing micro organisms that are washed off during bathing or washed off from clothes during laundering; they may also contain fats, oils, grease, hair, lint, soaps, cleansers, fabric softeners, and other chemicals. Nonetheless, all wastewater categories, black, dark greywater, and light greywater contain some level of organic contaminants and potential disease-causing micro organisms. Therefore, all wastewater categories should be given the same consideration with respect to their potential risk to public health risk and safety, and treatment and reuse applications.

In China, reclaimed greywater is called zhongshui, a term that refers to undrinkable water that has been treated and can be used to flush toilets, wash cars, irrigate, cool power plants, etc. The CWRTC plans to promote solutions in China to treat the mixture of light-greywater, dark greywater, and blackwater. In this paper, this mixture will be referred to as municipal wastewater. Similar to zhongshui, reclaimed wastewater in residential/commercial buildings can be used to flush toilets, clean roads, water gardens, etc., thus reducing the consumption of potable water. Figure 2.1 illustrates a generic approximate proportion of daily wastewater flows generated by a household in Beijing.

Figure 2.1 Breakdown of Household Wastewater by Source



Source: Author, 2005

2.1.2 International water supply and wastewater reuse

Water is essential for life; however, millions of people around the world face water shortages. It is estimated that 1.1 billion people lack access to safe drinking water, and 2.4

billion people live without adequate sanitation. (Newsletter of International Water Resources Association, 2005). Water-borne diseases, such as diarrhea, cholera, and typhoid, are some of the prime causes of mortality for children under five. (GEO year overlook 2004/2005). By 2025, it is predicted that more than 2.8 billion people or 35 percent of the world's projected population living in 48 countries will face water scarcity. (Newsletter of International Water Resources Association, 2005). Furthermore, international waters are among the most polluted and over-exploited ecosystems on earth. Environmental problems tend to build up over time, adding to the scarcity of safe drinking water.

Governments and regulatory bodies worldwide are trying to develop new ways to conserve depleting water resources. One of the key methods being considered is wastewater treatment and reuse. Israel is one of the best countries in the world with respect to wastewater reuse. The wastewater treatment and reuse rate is almost 100 percent. Specifically, about 46 percent of reclaimed water is used for farm irrigation, 33.3 percent of reclaimed water is used to re-irrigate groundwater, and 20 percent of reclaimed water goes to rivers. In Japan, there is a perfect municipal wastewater infrastructure; 40 percent of reclaimed water is used to flush toilet and wash cars. USA, Germany, Brazil, and Austria also perform very well in wastewater treatment and reuse. Comparatively, China lags far behind these countries.

2.2 Snapshot of Water Supply and Wastewater Treatment in China

2.2.1 Distribution of water resources in China

The total annual average water resource volume in China is estimated at approximately 2.8 trillion cubic meters, making China the fourth largest source for water in the world. However, due to its large population, the water resource volume per capita is only 2,200 cubic meters, ranking China 88th in the world in this category.

Water resources vary significantly throughout China. Per capita volume in northern China, such as Beijing and Tianjin, is about 10 percent of the world average and represents

about one-fifth of the per capita water resources available in southern China, such as Guangzhou. In 2002, the total water volume in the five major watersheds in northern China was only 415.8 billion cubic meters, whereas the total water volume available in the four major watersheds of Southern China was about 2.41 trillion cubic meters.

China's water resources are also subject to significant seasonal variability, particularly in northern China, where 70 to 80 percent of the annual precipitation in the region falls between the months of July and September. Table 2.1 summarizes the distribution of water resources in northern China and southern China.

Table 2.1 Water Resources Distribution Summary in Northern and Southern China

National Values	Northern Five Major Watersheds	Southern Four Major Watersheds
Water Resources (%)	19	81
Population (%)	46.5	53.5
Per capita water resources (m ³)	1,127	3,381
Gross domestic product (%)	45.2	54.8
Cultivated land (%)	65.3	34.7

Source: PRC, Ministry of Commerce, "General Condition of Water Resources in China" (unpublished report, July 22, 2002)

2.2.2 Natural water resources pollution

Despite the great abundance of water in southern China, the region still lacks water resources because of extensive water pollution. According to a national surface water quality monitoring survey conducted in 2002, 35.3 percent of the river sections surveyed could only fulfil the water quality requirements for types IV and V bodies of water. (According to China's National Environmental Quality Standard for Surface Water GB3838-88, type II is required for drinking water, type IV areas are general industrial water zones and water recreation areas where no direct contact with humans occurs, and type V areas are agricultural water zones and scenic water areas). In some river sections, water quality is worse.

Almost 75 percent of China's lakes are significantly polluted. According to a study of 24 primary lakes, only six lakes are equal to or better than a Type III water body, six lakes are partially deteriorated, and 12 are severely polluted. (Water supply and wastewater treatment market in China, 2005).

Finally, groundwater pollution occurs in nearly half of all urban areas in China. Of the total national groundwater resources, only 63 percent are usable as drinking water without treatment.

2.2.3 Water supply and demand: current conditions and trends

Water Supply. Water shortages are affecting China's economic and social development. Official data cite that the annual total amount of water resources available between 2000 and 2002, including surface water and groundwater, was between 2.7 trillion to 2.8 trillion cubic meters, while water consumption was 549.7 billion to 556.7 billion cubic meters. The water supply volume accounted for almost 20 percent of the total water resources. Some of the water resources were difficult to use, and many were severely polluted. Due to these conditions, there was approximately 40 billion cubic meters in the year 2000.

Water supply shortages are pronounced in many major Chinese urban areas. More than 400 cities throughout China face water shortages, with more than 100 cities facing serious water shortages, particularly large cities such as Beijing and Tianjin.

Increasing population, rapidly developing economic and social systems, accelerating urbanization, and continuing improvements in the standard of living indicate that China's per capita water resources will decrease even further while demand will increase. Thus, water shortages may limit future sustainable economic and social development in China.

Water Consumption. Domestic water consumption is largely used for irrigation and industrial purposes. From 2000 to 2002, water used for agricultural irrigation accounted for almost two-thirds of the total water consumption and industrial water consumption accounted

for one-fifth of the total water supply. The water consumption amounts in various sectors from 2000 to 2002 are shown in Table 2.2.

Table 2.2 Water Consumption in China, 2000-2002 (billion cubic meters)

Year	Domestic		Industrial	Irrigation	Other*	Total
	Urban	Rural				
2000	28.6	29.1	113.8	346.4	31.9	549.8
2001	30.7	29.4	114.2	348.5	33.9	556.7
2002	31.9	29.7	114.3	337.5	36.3	549.7

*"other" consists of forestry, animal husbandry, and agriculture.

Source: PRC, Ministry of Water Resources, "China's Water Resources;" English text available at www.mwr.gov.cn/english

Among all water that was consumed, about 80 percent was extracted from surface water, about 19.5 percent was extracted from groundwater, and about 0.5 percent was extracted from reused water and storm water.

Water Demand and Trends. Industrial growth, agricultural development, and population growth are the key issues for water demand in China. China's key economic performance indicators, as provided by the World Bank, are shown in Table 2.3.

Table 2.3 Key Economic Performance Indicators for China

Indicator	2001	2002	2003	2004	2005
GDP (annual percent growth)	7.30%	7.70%	7.50%	7.20%	7.00%
Consumption (annual percent growth)	7.30%	7.50%	8.00%	8.00%	7.80%
Investment (annual percent growth)	12.80%	11.50%	7.20%	6.10%	5.40%
Net foreign direct investment inflows (billion of U.S. dollars)	\$37.40	\$45.00	\$45.00	\$50.00	\$55.00
Stock of international reserves (billion of U.S. dollars)	\$212	\$264	\$296	\$323	\$348

Sources: World Bank, China Country Management Unit, East Asia and Pacific Region, "Memorandum ... on a Country Assistance Strategy for the World Bank Group for the People's Republic of China," report no.25141(Beijing: World Bank Office, 2003; available at www.worldbank.org.cn/English/Overview/overview.cas.htm).

Although the net population growth rate is expected to decrease in the future improvements in quality of life and urbanization will increase the demand for water. In 2002, the per capita water consumption in urban areas of China was 219 liters per day; the per capita water consumption in rural areas of China was 94 liters per day. The estimated population in China will be 1.5 billion in 2020 and 1.6 billion in 2050. Table 2.4 shows China's water demand forecasts for 2010, 2030, and 2050.

Table 2.4 Future Water Demand Trends in China

Year	Agriculture			Industry			City and Town			Total (billion m ³)
	Amount (billion m ³)	Growth Rate	Proportion	Amount (billion m ³)	Growth Rate	Proportion	Amount (billion m ³)	Growth Rate	Proportion	
2010	465.3	-0.13%	79.5%	92.9	3.64%	15.9%	26.8	2.69%	4.6%	585
2030	453	-0.43%	65.8%	189.9	3.00%	27.6%	45.6	3.38%	6.6%	688.5
2050	415.7		49.9%	343.6		41.3%	73		8.8%	832.3

Source: Chinese Academy of Science, "Analysis of Water Resource Demand and Supply in the First Half of the 21st Century," China Water Resource (January 2000). English-language abstract is available at www.chinawater.net.cn/CWR_Journal/200001/

Water Treatment. The total amount of wastewater discharged in 2002 was 63.1 billion cubic meters. Industrial wastewater made up 38.5 percent of this total. The amount of municipal wastewater treated in 2002 was 13.5 billion cubic meters, with a treatment rate of 39.9 percent. In towns and rural areas, wastewater treatment rates were significantly lower. As a large amount of wastewater is discharged directly into surface water bodies without treatment, the actual wastewater treatment rate in China may be less than 20 percent.

The Chinese government has adopted a policy that requires all cities in China to construct wastewater treatment facilities. Wastewater treatment facilities include wastewater collection systems, sewer systems, wastewater treatment plants, sludge disposal systems, and any other auxiliary systems. By 2005, the treatment rate of city municipal wastewater is estimated to increase to 45 percent; the wastewater treatment rate in cities with populations greater than 500,000 is expected to increase to 60 percent.

2.2.4 Review of wastewater treatment infrastructure in China

The earliest wastewater reclamation in China occurred in the 1950s, when wastewater was used for irrigation. Large-scale wastewater reclamation development occurred in commercial buildings 20 years ago and gradually spread to municipal and industrial sectors. Although wastewater reclamation systems may play an important role in water savings, China's serious water shortages have meant that only limited operations have been implemented to date. In addition, most buildings, residential areas, municipal wastewater treatment plants, and industrial enterprises still need to set up wastewater reclamation facilities.

By 2002, 310 of the 660 cities in China had constructed municipal wastewater treatment facilities, but most of the 17,000 towns had no municipal wastewater treatment facilities. In the same year, approximately 500 municipal wastewater treatment plants were in operation. The annual wastewater treatment amount was 13.5 billion cubic meters, equal to

39.9 percent of the total wastewater volume; however, the actual treatment rate of domestic wastewater was only 22.3 percent because treatment plants often operated below design standards or capacity.

Currently, all municipal wastewater treatment plants and piping networks are state-owned property; however, operation rights may be transferred to some enterprises through special agreements by the government. Unfortunately, many municipal wastewater treatment systems are now facing a shortage of capital and aging equipment.

Compared with wastewater reclamation in commercial buildings and residential communities, wastewater reclamation in municipal wastewater treatment plants has been encouraged because these plants can handle large volumes of wastewater. Table 2.5 shows two wastewater treatment plants in Beijing and Tianjin. Wastewater reclamation is especially important in northern China due to the emerging severe water shortage. Municipal wastewater reclamation is in its infancy in China; the volume of reused water and the number of end users are still low.

Table 2.5 Wastewater Reclamation Projects in Municipal Wastewater Treatment Plants

Location	Project	Capacity (1,000 m³/day)	End User or Purpose
Tianjin	Tianjin Jizhuangzi Wastewater Treatment Plant	530 (planned)	Industrial water and municipal water
Beijing	Beijing Gaobeidian Wastewater Treatment Plant	300	Cooling water for the NO.1 Thermal Power Plant and municipal water for irrigation and dust suppression

Source: U.S. Department of Commerce, International Trade Administration (2005) *Water Supply and Wastewater Treatment Market in China*. Retrieved June 12, 2005, from <http://www.ita.doc.gov>

Traditional treatment technologies commonly used to reclaim water include clarification, sand filtration, and disinfection. More technical systems, including reverse osmosis, electrodialysis, nanofiltration, ultrafiltration, microfiltration, electrodeionization, ion

exchange, activated carbon filter, cartridge filter, ultraviolet disinfection, and ozone generators, are also used to reclaim water.

2.3 Construction Industry and Wastewater Reuse in Beijing

2.3.1 Beijing and water

Geographically located in the northwest part of the North China Plain and covering an area of 16,800 square kilometers, Beijing is the second largest city in China with a population of more than 14 million. Situated in the warm temperate zone, Beijing has a semi-humid continental climate, with an annual average temperature of 12 degrees centigrade and rainfall of 641 millimetres. This famous historical city is a municipality governing 16 districts and 2 counties. As the capital of the People's Republic of China, Beijing is under the direct control of the Central Government and functions as the country's political, economic, cultural, and transportation center. Beijing is also an international exchange center.

Beijing is the home of the Party's Central Committee, the State Council, the ministries and commissions under the government, and more than 140 foreign embassies. It is also one of the biggest industrial bases in China, with established several industries such as iron and steel, coal, machinery, chemical and petroleum, textile, and electronics industries.

As the country's center of culture, education, science and technology, Beijing has more than 40 state scientific research institutions, over 30 universities, the greatest number of professional and technical personnel, numerous museums and libraries, and the largest collection of books in China. It is a hub of communications, with good railroad and air links to all parts of China and to major cities of the world, thus facilitating rapid development in the tourism industry.

Beijing is remarkable for its soaring economic and social progress, and it aims to develop into a modern international metropolis. When Beijing hosts the 2008 Olympic Games, it will be one step closer to this goal. It is predicted the Olympic Games will bring Beijing new

opportunities and cultural exchanges with other countries. The spirit of the Olympics will take root in this 9.60 million square kilometers of land and will spread rapidly in the hearts of 1.3 billion Chinese people. Under the banner of the Olympic Games slogan, “New Beijing, New Olympic Games,” this ancient city will speed toward modernization. Specifically, Beijing will focus on such themes as “Green Olympic Games, Technological Olympic Games and Humanistic Olympic Games” and during its preparation for the hosting of the 2008 Olympic Games; Beijing’s construction industry will grow and its environmental protection standards will improve. In addition to using the existing stadiums and gyms, Beijing will rebuild, expand, or build 37 large-scale stadiums and gyms and 59 supporting sites for training, thereby providing great opportunities for the construction industry and EST.

One of the major concerns related to Beijing’s expansion is having adequate water resources. Although Beijing has always used surface water from water reservoirs and groundwater as water resources, continuous drought in recent times has plunged Beijing into a serious water shortage. Annual water shortages are estimated to reach 790 million to 1.65 billion cubic meters in 2005 and 1.18 billion to 2.0 billion cubic meters by 2010. Currently, the total volume of surface water in Beijing is 2.53 billion cubic meters per year and the total volume of groundwater is 2.63 billion cubic meters per year. The water resource per capita is one seventh of the average of the country. In 2000, Beijing residents used less than 250 liters of water per day, while in other major cities like Shanghai, residents used 340 liters per day. Guangzhou residents used 550 liters per day. (Beijing Statistical Information Net, 2005).

The rainfall was 539 millimeters in 2004, increasing 19 percent compared to 2003; however, the water resources were still low. For instance, the average depth of groundwater in the plains region was 19.04 meters, dropping 0.71 meters from 2003, thereby decreasing the groundwater 360 million cubic meters in 2004.

In 2004, 630 million cubic meters of tap water was sold, showing an increase of 5.7 percent from 2003; 540 billion cubic meters was used for living, showing an increase of 8

percent compared to the year 2003. The overall price of tap water was adjusted from 4.01 yuan per ton to 5.04 yuan per ton.

Beijing is aiming to build a water saving community through strategic planning and stricter regulations. To manage water resources more efficiently and effectively, the Beijing government has set up a new administration department, the Beijing Water Bureau. In addition, although the water resources and other public utilities like gas and electricity are mainly owned and managed by the government, the Beijing government wants to change this system by introducing market competition and foreign investment. To that end, by 2004, Beijing had completed 51 industrial and municipal large-scale water-saving projects.

2.3.2 Construction industry in Beijing

The construction sector is growing rapidly. The added value in 2004 was 32.0 billion yuan, increasing 6.2 percent from 2003. The total production value in the construction industry was 150.6 billion yuan, increasing 15.2 percent from 2003. The area under construction was 130.7 million square meters, representing an increase of 7.5 percent; the completed area was 45.3 million square meters, an increase of 0.9 percent. The total revenue of construction industry in 2004 was 154.3 billion yuan, an increase of 16 percent from 2003, with a profit of 13.2 billion yuan, an increase of 16.4 percent.

The real estate sector in Beijing is developing rapidly as well. The added value in 2004 was 22.8 billion yuan, increasing 15.7 percent from 2003; investment in real estate was 147.3 billion yuan, increasing 22.5 percent. The area of residential buildings under construction was 99.3 million square meters, increasing 9.5 percent from 2003, and the area of completed residential buildings was 30.7 million square meters, increasing 18.2 percent. (Beijing 2004 Annual Economic and Social Development Statistics Report, 2004).

The real estate market was very active in 2004. For instance, the area of residential buildings sold in 2004 was 24.7 million square meters, increasing 30.4 percent compared to

2003; the sales revenue of residential buildings was 124.9 billion yuan, increasing 39.1 percent. The price of residential buildings increased. The average price per square meter was 5,053 yuan, increasing by 316 yuan per square meter from 2003. (The detailed information of construction projects and buildings can be found through Beijing Construction Committee website www.bjjs.gov.cn.)

2.3.3 Wastewater reuse in Beijing

To mitigate water shortages, the Beijing government constructed centralized wastewater reclamation projects and supported a number of discrete wastewater reuse projects. Table 2.6 highlights the current wastewater reuse projects in Beijing.

Table 2.6 Current Wastewater Reuse Projects in Beijing

Project	Scale (1,000 m³/day)	Current Status
Wastewater reuse project of Gaobeidian Municipal Wastewater Treatment Plant	300	In use
Jiuxianqiao greywater reuse project	60	Under construction
Fangzhuang greywater reuse project	20	Under construction
More than 200 greywater reuse facilities in buildings	24	In use

Source: Beijing Municipal City Planning Management Committee, "Wastewater Reclamation and Utilization in Beijing" (October 18, 2003); Chinese text available at www.h2o-china.com/paper/viewpaper.asp?id=3480

The volume of reclaimed wastewater in Beijing is currently 147 million cubic meters per year. By 2008, an increase of 600 million cubic meters per year is planned. Once achieved, the wastewater reclamation rate will increase from the current 20 percent to 50 percent of the total amount of discharged municipal wastewater. (Beijing 2004 Annual Economic and Social Development Statistics Report, 2004).

With the completion of the Lugouqiao wastewater plant and the Qinghe wastewater plant, there are eight wastewater treatment plants in the urban areas. In 2004, the disposal

capacity of wastewater reached 1.9 million cubic meters per day. The wastewater treatment rate in urban areas was 58 percent, increasing 2 percent from 2003.

Currently, Beijing treats 924,000 cubic meters of wastewater per day, and it is estimated Beijing will treat 1.7 million cubic meters of wastewater by the end of 2005. (Beijing Scientific Window, 2005). Thus, it is projected that Beijing can treat 70 percent of its wastewater in 2005. Table 2.7 compares Beijing with other three cities.

Table 2.7 Wastewater Treatment Rate Comparison

City	Wastewater Treatment Rate
Tokyo (1991)	90%
London (1991)	95%
Paris (1991)	93%
Beijing (2001)	42%

Source: U.S. Department of Commerce, International Trade Administration(2005)
Water Supply and Wastewater Treatment Market in China, <http://www.ita.doc.gov>

Wastewater reclamation is also developing significantly. The city built 52.7 kilometers of new pipeline exclusively for wastewater reuse in 2004. As a result, the wastewater reuse rate reached 25 percent or 200 million cubic meters by the end of 2004. Beijing aims to improve the wastewater reuse rate to 30 percent by the end of 2005 while maintaining the reclaimed wastewater price of 1 yuan. To achieve this goal, Beijing will invest 170 million yuan to build 70 kilometers of new reclaimed wastewater pipeline and plans to establish two new wastewater reclamation plants in 2005.

In 2004 Beijing consumed 3.6 billion cubic meters of tap water; 20 percent of this water can be replaced by reclaimed wastewater, amounting to approximately 700 million cubic meters per year. Although Beijing can produce reclaimed 630 million cubic meters of wastewater per year, only 30 million tons were reused.

In 2004, eight wastewater treatment plants were capable of treating 450 million cubic meters of wastewater per year and could provide 215,000 cubic meters of reclaimed

wastewater per day. Taking 50,000 cubic meters of reclaimed wastewater per day from the large-scale buildings' facilities, Beijing is able to offer 265,000 cubic meters of reclaimed wastewater per day, amounting to approximately 100 million cubic meters of reclaimed wastewater per year. However, even after a price adjustment was made to encourage wastewater usage, the reused wastewater was only 30 million cubic meters in 2004, amounting to 30 percent of the total offering. The main reason for this result was a shortage of adequate reclaimed wastewater pipes and relevant facilities to deliver to the end users. The total pipe for reclaimed wastewater is only 170 kilometers long, covering very few users. Building this pipeline requires time and a lot of capital. Furthermore, in some places it is impossible to use wastewater pipes because there is no room underground for such pipes. Therefore, the discrete wastewater reuse facilities that CWRTC plans to promote in Beijing have the potential to increase the use of wastewater.

According to the "New Beijing, New Olympic" strategy, Beijing has set goals for wastewater reuse. By 2008, the wastewater treatment rate will reach 90 percent in urban areas and 50 percent in suburban areas. Beijing also plans to build 11 wastewater reclamation plants that can offer 580,000 cubic meters of reclaimed wastewater per day. Meanwhile, Beijing plans to build the 400-500 kilometers main pipe line for reclaimed wastewater. In places inaccessible by pipeline, the government can use vehicles to deliver the reclaimed wastewater. In addition, price plays an important role in using wastewater. The current price of tap water is 5 yuan whereas reclaimed wastewater is 1 yuan. It is estimated that the price of tap water will reach 7 yuan per cubic meter in 2007 and is expected to continue to rise. Therefore, it is assumed people would be willing to use reclaimed wastewater in the future. (Wang, 2005)

2.4 Construction Industry and Wastewater Reuse in Tianjin

2.4.1 Tianjin and water

Tianjin, one of the four municipalities directly controlled by the Central Government in China, is located in the northeast of the North China Plain and is the closest seaport to Beijing. Tianjin, also known as “the diamond of the Bohai Gulf” is one of the biggest industrial and port cities in China. Tianjin has 15 districts and three counties, covering an area of 11,000 square kilometers and over 10 million people. (Travel China Guide, 2005)

Tianjin is the cradle of modern machinery manufacturing and the weaving industry in China. In 1980, Tianjin was opened to foreign investment. By the end of 2004, over 118 countries and regions had invested in Tianjin, setting up 16,000 enterprises. In addition, 106 Fortune 500 companies had set up branches in Tianjin. (Enorth, 2005). For years, Tianjin’s industrial production and port trade volumes were second only to Shanghai; but Tianjin has become the second largest commercial city in China and the biggest financial and trading center in northern China.

Tianjin is very ambitious to develop its economy. You can see this in “Tianjin’s Development Goal” summarized below.

Step 1: to increase the per capita GDP to US \$3,000 by the end of 2002 and accomplish major indexes of a well-off society;

Step 2: to double the GNP and per capita disposable income of 2003 ahead of our original schedule, bringing the overall economy and people’s income to a higher level; and

Step 3: to increase the per capita GDP to \$6,000 by 2010, making Tianjin a modernized international port and major financial center in northern China and realizing modernization before 2010.

While the economy is booming, water shortages have already occurred. In 2002, Tianjin’s production capacity of tap water was 3.6 million cubic meters per day. The annual

volume of water sold was 601.2 million cubic meters; 298.8 million cubic meters was for residential use. In 2004, 580 million tons of tap water was sold, of that amount 190 million tons was used by residents. Tianjin is one of the cities experiencing severe water shortage problems. In 2002, the water resource per capita was 160 cubic meters and the daily consumption of tap water per capita was 132.9 cubic meters; the wastewater treatment rate was 43 percent.

Tianjin's main water sources are groundwater and surface water from the Luan River. Currently, the water resources are stressed and it is predicted that water shortage will be a long-term problem that may hinder Tianjin's social and economic development. Specifically, the water shortage is estimated to reach 3.6 billion cubic meters per year in 2005 and 4 billion cubic meters per year by 2010. Table 2.8 shows established and planned wastewater reclamation projects in Tianjin. The planned amount of reused water will be 813,000 cubic meters per day by 2010, with a reuse rate exceeding 50 percent.

Table 2.8 Wastewater Reclamation Projects in Tianjin

Project	Scale (1,000 m³/day)	Current Status
Wastewater reclamation project of Xiangyanglu Municipal Wastewater Treatment Plant	50	planned
Wastewater reclamation project of Jizhuangzi Municipal Wastewater Treatment Plant	50	in use
Wastewater reclamation project of Juzhuangzi Municipal Wastewater Treatment Plant (Phase 2)	100	planned

Source: Tianjin Construction Committee, "The Utilization of Reclaimed Water Resource in Tianjin" (October 28, 2003); Chinese text available at www.h2o-china.com/pater/viewpoint/asp?id=3480.

2.4.2 Construction industry in Tianjin

The construction industry in Tianjin developed rapidly in 2004. The total production value of the construction industry was 63.1 billion yuan, increasing 26.6 percent compared to 2003. The total area of buildings under construction was 34.4 million square meters, increasing 88.3 percent compared to 2003. The total area of completed buildings was 13.1 million square

meters. There were 922 construction companies in Tianjin, realizing profits 1.1 billion yuan and paying 1.8 billion yuan in taxes in 2004, increasing 44.4 percent and 25.9 percent respectively from 2003.

Real estate is growing fast, too. The added value of real estate in 2004 was 14.7 billion yuan, increasing 6.1 percent compared to 2003. The investment in 2004 in real estate was 26.4 billion yuan, increasing 24.8 percent from 2003. The area under construction was 28.7 million square meters, and the completed area was 11.1 million square meters, of which residential construction was 10.1 million square meters, increasing 35.1 percent from 2003. The area of buildings sold was 8.5 million square meters, and revenue was 26.4 billion yuan, increasing 7.7 percent and 33.2 percent respectively compared to 2003.

According to the Tianjin Development Plan of 2003-2007, 8-10 million square meters for new residential buildings and 2.5-4.6 million square meters for new commercial buildings will be allocated by city planners. In the next few years, Tianjin will add estimated 1600-2000 residential buildings and 125-230 commercial buildings, averaging 5,000 square meters for one residential building and 20,000 square meters for one commercial building.

On average, 80 percent of the new residential buildings, approximately 1,300-1,600 buildings, and 100 percent of the new commercial buildings, approximately 125-230 buildings will be more than 30,000 square meters. It is estimated that almost 1,500 new buildings will be constructed every year.

2.4.3 Wastewater reuse in Tianjin

In 2004, Tianjin invested heavily in water sewage infrastructure. Three large-scale wastewater treatment plants, Jizhuangzi, XianyangLu, and Beichang, were completed. (Statistics of Tianjin, 2004)The municipal wastewater treatment rate was 58.8 percent in 2001 and 70 percent in 2004. According to Tianjin's medium-term development plan, the municipal waste treatment rate is projected to be 89 percent in 2007. To separate the government from enterprise, the city will continue to invest heavily in environmental protection, such as water

reuse technology, and reform its managerial system. The city will guarantee the land demand to ensure there are adequate public utilities like water supply and water sewage infrastructures.

In the short-term, Tianjin planners will invest 53.3 billion yuan in environmental protection. Of this total, 1.3 billion yuan will be invested in water infrastructure, 3.8 billion yuan will be invested in water supply projects, and 9 billion yuan will be invested in water sewage and treatment projects. (Tianjin Bureau of Planning and Land Resources, 2004).

2.5 Conclusions about the Wastewater Reuse Industry

Water shortage is becoming a severe world-wide issue that governments must address through strategies such as investing in new technologies, building water and wastewater infrastructures, and investing in water-saving products. China, with its large population and severe environmental pollution caused by quick economic development, little foresight, and an inefficient management system, is facing even more severe water problems.

Beijing and Tianjin are especially hard hit by water issues. However these two major cities, backed by their strong economic strength and support from the Central Government, have planners who are dedicated to improving the situation. To that end, strict laws have been made to force and promote the use of wastewater reuse facilities. Ambitious plans have been made to invest heavily in environmental protection, including water supply and wastewater treatment and reuse, thus creating a great opportunity for foreign wastewater reuse technologies and products. At the same time, the booming construction industry in these two cities and the lack of central reclaimed wastewater pipelines has created good opportunities for foreign organizations, such as CWRTC, to enter into this attractive marketplace by providing wastewater reuse solutions to residential and commercial buildings.

3. EXTERNAL ANALYSIS

3.1 Macro-Environmental Analysis of the Chinese Wastewater Reuse Industry: the PESTEL Framework

Political factors

The attitudes and reactions of people, social critics, and governments all affect the political environment. The political environment can also have a dramatic effect on opportunities at a local and international level. Some business managers have become very successful by studying the political environment and developing strategies that take advantage of opportunities related to changing political dimensions.

In the wastewater reuse sector in China, government influence plays a critical role in the success of foreign firms due to its unique social and political systems. First, because the wastewater reuse sector is a relatively long-term investment, stable government and consecutive policy is important for such investment. Second, there is an issue of nationalism. The policy in many government contracts and business purchases to “buy Chinese” reflects this attitude. This is especially true when foreign firms want to enter the water supply and wastewater infrastructure industry. Many businesses require government permission. Third, local protectionism favors local products over foreign ones. The big cities, such as Beijing and Shanghai, face less local protectionism than small- and medium-sized cities. Fourth, the Chinese government is encouraging foreign investment in environmental protection sectors through tax reduction and other incentives. For example, water pollution control equipment and environmental monitoring instrument are listed on the “High and New Technology Product Catalogues to Encourage the Foreign Businesses to Invest (2003)” by Ministry of Science & Technology and Ministry of Commerce. Beijing lists environmental protection products and

technologies as its focus for imported goods. (Industry direction, 2003)“The high-tech firms recognized by the Beijing government can enjoy tax free enterprise income in the first three years, and a 50 percent tax discount from 4th to 6th year”. (The tax policy for high-tech enterprises in Beijing, 2004). EST is also listed as priority imported projects in Tianjin, which has a similar tax policy as Beijing to encourage investment in high-tech products. (The main industries for foreign investment encouraged by Tainjin city, 2004).

Personal influence is usually significantly involved in business in China and bribes are sometimes expected. This raises both legal and ethical issues for marketing managers since it is illegal for Canadian firms to offer such bribes. As a result, this can make it difficult for a Canadian firm to compete with a local company.

The foreign exchange rate is another important political factor. China is currently implementing fixed foreign exchange rate, and is facing the pressure, mainly from US, to raise the Chinese yuan. This definitely affects those foreign companies that have invested and want to invest in China. Will the Chinese government change its foreign exchange rate in the near future? What impact will this change have?

Most of the time, policies can not be executed correctively by local governments because of the conflicting interest of different groups. In order to understand and benefit from the relevant policies and regulations, CWRTC representatives should conduct ongoing research to fully understand the game rules in this regulatory environment.

Economic factors

It is widely thought that China’s economy will continue to develop rapidly over the next twenty years. The Tenth Five-Year Plan (2001-2005) targeted a gross domestic product (GDP) growth rate of 7 percent per year. China’s key economic performance indicators, as provided by the World Bank, are shown in Table 2.3. According to latest data from National Bureau of Statistics of China, in the first quarter of 2005, the GDP was 3,135.6 billion yuan, increasing 9.5 percent compared to the same period last year.

Strong economic growth presents great opportunities for foreign companies to enter the Chinese market. Following China's World Trade Organization (WTO) accession in 2004, the customs duties on most environmental protection products decreased according to China's commitment on imported commodities. The degree of reduction depends on the type of product. For instance, the tariff on water treatment separation machinery has decreased from 12 percent to 10 percent.

With the rapid development of the national economy, the overall standard of living continues to improve. In Beijing, the per capita disposable income in 2004 reached 15,637 yuan, increasing 12.6 percent from 2003. An increase in disposable income indicates that the construction industry will likely continue to grow. (Statistical Report of 2004, Beijing)

Social-cultural factors

People's attitudes towards wastewater reuse have changed in recent years. A decade ago, Chinese people considered municipal wastewater dirty and were reluctant to reuse it. However, with increasing levels of education and awareness of the environmental problems around them, Chinese people are now more willing to do something to protect their environment. Residents in Beijing and Tianjin are considered to have the highest levels of education in China. As the host city to the 2008 Summer Olympic Games, more people will become accepting of wastewater reuse.

Lifestyle changes will also affect the rate of wastewater reuse. More and more Beijing families are buying cars and the government is investing heavily in creating green spaces. Yet these changes increase demand for water to wash cars and to irrigate gardens. Reclaimed wastewater, instead of potable water, can meet this demand.

Technological factors

Beijing and Tianjin are very strong in R&D and innovation, which poses great challenges as well as opportunities for foreign products and technologies entering the Chinese

marketplace. For instance, Beijing is China's largest research base. At the end of 2003, there were nearly 4,000 institutions engaged in scientific activities in Beijing. Of the Fortune 500 companies, 293 had opened representative offices or R&D centers in Beijing. There were 274,000 people engaged in scientific activities in Beijing, including 227,000 scientists and engineers (those with university education or with middle- and high-ranking professional titles) who accounted for 82.8 percent of the total number of technological personnel. There were a total of 5000 intermediary scientific organizations, 150 more related industrial associations, and 500 professional service centers in Beijing. Registered technical contracts numbered 32,173 in 2003, with the contractual transaction value at 26.54 billion yuan including 22.66 billion yuan of technical transactions, up by 19.0 percent, 20.0 percent and 25.2 percent over the previous year respectively.

Universities in Beijing and Tianjin, such as Tshinghua University and Tianjin University, have strong capabilities in new technologies innovation and development. Puhua holdings Co. Ltd. (formerly Tshinghua Ziguang Environmental Protection Co. Ltd.) was founded by Tshinghua University. Based on innovations from Tshinghua, Puhua's products include air pollution protection products, industrial and municipal wastewater treatment and reuse products, and so on. However, many small-sized companies in the wastewater reuse sector don't have the ability to develop new products and invest in R&D. Technologies and new products invented by Chinese universities frequently die before being commercialized. CWRTC can take advantage of this situation by partnering or co-developing with local universities and institutions to develop new products.

Environmental factors

There are no restrictions from the related environmental protection laws on the technologies and products CWRTC is planning to promote in China. But it is necessary to know the environmental laws and regulations related to wastewater discharge before entering the Chinese market.

Two types of wastewater discharge systems are defined in China: polluted wastewater discharge (typically industrial and domestic wastewater) and non-polluted wastewater discharge (i.e., storm water). Separate drainage systems for wastewater and storm water discharge are required in facilities where the municipal sewer system is available. For industrial and domestic wastewater discharge, the National Integrated Wastewater Discharge Standard (GB8978-1996) applies. For wastewater discharged to a municipal wastewater treatment plant, Class 3 limits apply.

A facility with wastewater discharge must obtain a wastewater discharge permit from the local Environmental Protection Bureau (EPB) before operations begin, according to the Implementation Regulation of Water Pollution Prevention and Control law. The local EPB is responsible for inspecting wastewater discharge through a routine monitoring program (up to four times annually). Non-compliance results in a warning or penalty from the EPB, indicating that the facility needs to address the issue. Repeated non-compliance can result in the operation being shut down.

All enterprises operating in China, including foreign and domestic entities, are subject to national and local environmental regulations. Local regulations are often more stringent than the corresponding national regulations.

Variations in the enforcement of environmental legislation are due to discrepancies in financial and human resources among provincial, municipal, county and local EPBs. In some areas, the pressure for economic development and the desire to lure investment and jobs means that local leaders are more often concerned about development than the environment. In

contrast, several EPBs located in wealthy areas with significant foreign investment, such as Beijing and Tianjin, have reputations for implementing local regulations that are significantly stricter than corresponding national standards. This is good news for CWRTC due to its outstanding solutions to serve the wastewater reuse sector in Beijing and Tianjin.

Because environmental protection technologies and products will be the focus for the Chinese government for a long time, it is the right time to enter the Chinese market with these goods.

Legal factors

It is likely that the laws and regulations regarding municipal wastewater discharge and reuse in China will become increasingly strict, presenting opportunities for foreign companies that can provide cost-efficient and reliable products. Legislative and administrative authorities in Beijing and Tianjin have tried to perfect the local laws and regulations, yet there are still problems that need to be addressed, such as protecting Intellectual Property (IP), which may increase risk for foreign high-tech products and services. Although there are a series of laws to protect IP, such as trademark law, contract law, patent law, copyright law, and laws against unfair competition, the enforcement of these laws is questionable, especially under local governments. Local protectionism plays a significant role even if the law prohibits it. Professional consulting from a company like Blakes LLP will help CWRTC address these legal issues.

Summary of macro-environmental analysis

The overall macro-environment in China for the wastewater reuse industry is attractive. The strong economic growth and deteriorating environment have presented business opportunities in the wastewater reuse industry. EST is considered a “sunrise sector” in China due to its huge market potential in the near future. Among all six factors, CWRTC should pay significant attention to government influence. CWRTC should build a good relationship with government officials, gain a deep understanding of the related regulations and policies, and

evaluate the impact of policy changes -- responding quickly to seize new business opportunities created by these changes.

CWRTC should also try to take advantage of the strong technological and R&D capabilities in Beijing and Tianjin to develop its own patent technology and products, and to improve its current wastewater treatment solutions and processes. In this way, CWRTC will gain a competitive advantage and compete more effectively with lower cost products in the market.

IP is a very complex issue in China. On one hand, CWRTC can protect its IP assets by producing the core technology itself. This would make the technology more difficult to copy. If the technology is copied, CWRTC would eventually seek protection through legal channels. Even so, the patented product or technology could be copied. However, the intangible assets and capabilities, such as the marketing relationships, marketing abilities, operations process, knowledge, management, and innovation capabilities, cannot be easily copied. These factors will be discussed in greater detail in chapter 4.

3.2 Analysis of the Wastewater Reuse Industry in Beijing/Tianjin: Porter's Five Forces of Competition

Competition from substitutes – High

There is product-for-product substitution in the wastewater reuse industry. For example, Ecofluid and Sanitherm products can achieve similar result using different processes and technologies. There are also many small-sized companies in China that can work in this sector.

The extent to which substitutes limit prices and profits depends on the propensity of buyers to substitute between alternatives. This, in turn, is dependent on price-performance characteristics of these alternatives. The more complex the needs being fulfilled by the product

and the more difficult it is to discern performance differences, the lower the extent of substitution by customers on the basis of price differences. This is true for CWRTC.

Although there is fierce competition from substitutes in the Chinese market, CWRTC can avoid direct competition by implementing the right product strategy. For the wastewater reuse industry, price is not everything. Quality, reliability, operations cost and maintenance, and potential value in the long term often determine customers' decision making. Psychologically, most clients in China would be willing to pay more for a good quality product than a cheap substitute, because nobody likes to deal with wastewater and equipment that breaks down regularly. CWRTC should focus on quality, reliability, and good after-sales service and support rather than price.

Threat of entry - Medium

Threat of entry will depend on the extent to which there are barriers to entry. These are factors that need to be overcome by new entrants if they are to compete successfully. As a new entrant to the Chinese wastewater reuse market, CWRTC will face six main barriers:

Capital Requirements. The capital cost of entry will vary according to the technology and scale. For CWRTC, this barrier is of medium significance. But the initial cost of marketing research, promotion, demonstration projects, and possible losses in the beginning need to be taken into consideration. CWRTC can avoid making a large initial investment by delivering the core components from Canada and assembling them in China. To lower costs, CWRTC can consider establishing a manufacturing base in China later on. However, a lower barrier on capital requirements is also an advantage for other new entrants. It is a double-edged sword.

Economies of Scale. Economies of scale are not a big issue in this industry because most of products are customized. However, to be competitive in the long run, CWRTC should consider manufacturing its product locally to lower costs.

Absolute Cost Advantages. CWRTC is weak in this area compared with local Chinese suppliers.

Product Differentiation. Suppliers in the municipal wastewater industry have differentiated products. Different processes, technologies, sizes, customized designs, and services are a few dimensions of this differentiation. In an industry where products are differentiated, established firms possess the advantage of brand recognition and customer loyalty. Compared to early entrants, late entrants such as CWRTC, will incur additional advertising and promotional costs.

Experience. Lack of local experience may be the biggest challenge for CWRTC. Early entrants gain experience sooner than others. In addition to local Chinese suppliers, there are many big players from Japan, France, Germany, and the US that entered the Chinese market twenty years ago. These players are advantaged by lower costs and by their relationships with customers and suppliers. It is difficult for a competitor to break into a market if there is an established operator with good knowledge of the market and how to overcome market and operating problems, and with good relationships with key buyers and suppliers. Networking, called *guanxi* in Chinese, is sometimes a key determinant in gaining business contracts.

Governmental and Legal Barriers. Although various levels of government encourage foreign investment and import of foreign technology, local protectionism prevails. In terms of legal barriers, not all areas in the wastewater reuse sector are currently open to foreign investment. Constraints exist regarding business operating models, such as Build-Operate-Transfer (BOT) or joint venture, or branch, or wholly-owned corporation, or agents, or import/output. Limits on foreign investment depend on regulation by local government. A qualification certificate must be obtained from the related government departments before starting business in the industry.

Rivalry between established competitors - Medium

For most industries, the major determinant of the overall state of competition and the general level of profitability is competition among the firms within the industry. This applies to the Chinese wastewater reuse market.

However, the competition from immediate competitors is not so fierce:

1. The extent to which competitors are in balance. Generally, less competitive markets tend to have dominant organizations within them, and the small players tend to accommodate themselves to this situation (for example, by confining activities to certain niches). The big players in the municipal wastewater reuse industry in Beijing and Tianjin are Beijing Sewage Group and Tianjin Water Group, which are state-owned companies focusing on centralized wastewater treatment and reuse. CWRTC targets a niche market: commercial and residential buildings areas from 30,000 to 100,000 square meters.
2. Market growth rates may affect rivalry. The idea of the life cycle suggests that conditions in markets, primarily between the stages of growth and maturity, are important considerations in terms of competitive behavior. In situations of market growth, an organization might expect to grow with the market size; whereas when markets are mature, growth must be achieved by taking market share from competitors. Because the wastewater reuse markets in Beijing and Tianjin are growing, especially for the residential and commercial buildings, CWRTC will not focus on taking market share from competitors but on achieving growth on par with the growth of the overall market.
3. Relatively lower fixed cost, and exit barriers, and there is limited concern regarding excess capacity.
4. Product differentiation makes switching costs high for customers, thus decreasing the intensity of head-on competition.

The bargaining power of buyers - Medium

The bargaining power of buyers is appropriate:

1. The supplying industry is comprised of a large number of small operators which can intensify competition. There are 56 registered companies that can supply wastewater reuse products in Beijing as well as a large amount of companies outside Beijing.

2. Differentiated products, to some extent, can lower the competition. The cost of switching suppliers is relatively high and involves some risk. Both factors can lower the head-on competition, thus lowering the power of buyers.
3. Buyers' price sensitivity is not very high as previously discussed.

The bargaining power of suppliers – Low

Apart from core components, other parts are standard, such as valves, electrical motors and pumps, pipes, and controlling units. There are many suppliers of these parts in China, and switching costs are low. These products are not heavily branded.

Summary of Porter's Five Forces analysis – Medium attractiveness

In summary, the wastewater reuse industry in Beijing and Tianjin faces high competition from substitutes, medium threat of entry, medium rivalry between established competitors, medium bargaining power of buyers, and low bargaining power of suppliers. Thus, the overall attractiveness, or expected profitability, is medium.

Knowing that competition from substitutes is high, CWRTC can keep on innovating with its products, technologies, and processes to provide high quality and reliability, and excellent service and support. CWRTC should try to differentiate and customize its solutions to add more value to its target customers. In terms of threat of entry, CWRTC is disadvantaged with respect to experience, absolute cost advantages, brand recognition, and customer loyalty as a new entrant compared to existing players. Using an appropriate entry strategy and manufacturing locally in the near future can help CWRTC overcome the threat of entry.

Although the threat from established competitors is not significant, CWRTC must monitor its competitors and use the best player in the industry as a benchmark. That the bargaining power of buyers is medium doesn't mean CWRTC can ignore the customers' needs. Buyer power can be reduced if the CWRTC differentiates its products through customization.

Due to the low bargaining power of suppliers, CWRTC can consider manufacturing in China to lower its costs.

Therefore, the wastewater reuse industry in Beijing and Tianjin presents opportunities as well as threats and risks. CWRTC should adopt strategies that can respond to each force of competition. The intra-industry analysis that follows can help CWRTC deeply understand its potential submarket and competitors.

3.3 Intra-Industry Analysis of the Wastewater Reuse Market

3.3.1 Segmentation analysis

3.3.1.1 Market segments

Market segmentation defines possible target markets, so that marketers can better understand the target customers' needs and allocate the resources to develop more suitable marketing mixes to satisfy those needs.

For the wastewater reuse industry in China, there are industrial and municipal wastewater reuse submarkets. Municipal wastewater reuse can be segmented according to the way in which the wastewater is collected. Large-scale wastewater reuse products are often used where wastewater is collected by the municipal sewage pipeline and delivered to the wastewater treatment plants and then to big wastewater reuse plants. Characteristics of this segment include the ability to deal with a large amount of wastewater and provide a large amount of reclaimed water. Small-to medium-scale wastewater reuse products that can be used independently in residential, commercial, hospital, or community buildings are examples of the products CWRTC plans to promote in the Chinese market.

3.3.1.2 Target market

CWRTC will target the submarket comprised of residential and commercial buildings with a construction area between 30,000 and 100,000 square meters in Beijing and Tianjin. The

target customers will be construction developers, and/or building owners. These groups of customers have many similarities:

1. Local regulations require that new buildings are equipped with wastewater reuse facilities, especially when current infrastructure of central delivery and disposal cannot meet this need.
2. The potential economic value for customers is defined as the gap between the roaring price of potable water and the lower fixed price of reclaimed water.
3. Tendency to encourage the wastewater reuse.
4. Target customers demand high quality, appropriate pricing, full after-sales service, small- to medium-sized facilities, reliable and stable output, lower operation costs (energy consumption, labor cost, maintenance costs, and a relatively simple process and operation).
5. Developers can promote real estate by showing the wastewater reuse facilities to potential buyers.
6. The price of potable water will continue to rise. For residential buildings, end users can save money by using reclaimed wastewater to flush toilets. Every time a toilet is flushed with reclaimed water, it saves 9 liters of potable water, amounting to a saving of 10 cubic meters of potable water per month for a five-person family. Real estate management companies can also save money and potable water by using reclaimed wastewater to irrigate and wash cars.
7. CWRTC has the potential to earn substantial profits due to the rapid development of the local economies in Beijing and Tianjin.

CWRTC's target market is defined in Table 3.1 and its positioning statement is outlined in Table 3.2.

Table 3.1 CWRTC's Target Market

	Description
What	municipal wastewater reuse solutions
To meet what	economic and environmental needs by treating municipal wastewater and reusing some or all of it for flushing toilets, irrigating, cleaning road, washing cars, etc., and meeting regulatory guidelines before discharging it into the municipal wastewater pipelines. Moreover, excess treated water can be sold to other specific business customers such as car-washing companies or farms, adding more value to the target customers.
For whom	construction developers, building owners,
Where	Beijing and Tianjin

Source: Author, 2005

Table 3.2 CWRTC's Product Positioning Statement

For	New building developers/owners with the area between 30,000 and 100,000 square meters in Beijing and Tianjin.
Who	The target customers must build our products into their buildings; they are unsatisfied with the current lower-quality alternatives; they need a simple, customized, and cost efficient solutions.
Our product is	High-end, customized, reliable, full-served solutions
That provides	Higher quality, lower operations cost, full after-sales service, and potential value the facility will bring in the near future.
Unlike	Current competitors' lower-quality and unreliable products.
We have assembled	Such solutions in North America.

Source: Author, 2005

3.3.1.3 Identifying what customers value

Developing a strategic capability is about providing customers with the products or services that they value -- or might value in the future. Thus, an understanding of what customers value is the starting point.

Threshold product features

Threshold product features are product features that all potential providers must be able to offer if they want to stay in a particular market or market segment. In this case, threshold product features include the ability to meet the relevant Chinese national and/or local standard regarding the reclaimed municipal water, no matter what technology or process the supplier

uses in the product. However, organizations who want to win this market will need to focus on several critical success factors.

Critical Success Factors

Critical Success Factors (CSFs) are those product features that are particularly valued by a group of customers and, therefore, where the organization must excel to outperform competition.

For CWRTC, the CSFs are:

High quality. Features include high quality and reliability of the product, mature and proven technology, fewer breakdowns, less maintenance, stably qualified output, monitoring and alarming, long product life, etc.

Integrated solution. Providing an integrated solution to the project, not just the first year.

Excellent after-sales follow-up and service. Monitoring and inspection, operation and maintenance, technical supports are examples of this kind of service.

Competitive price. Price is an important product feature in the target market.

3.3.1.4 Summary of segmentation analysis

In most situations, developers are direct customers, not end users. For residential buildings, the end users are the individual residents, who are ultimately driving market demand. Therefore, understanding the needs of end users is as important as that of direct customers.

Currently, CWRTC is adopting a single target market approach, segmenting the market and picking one of the homogeneous segments as the firm's target market. So CWRTC should aggressively develop marketing mixes that satisfy the target market better than its current and potential competitors. After successfully entering the Chinese wastewater reuse market, a multiple target market approach and combined target market approach may be considered.

Because identifying and occupying attractive segments of an industry is critical to success, the selected target market for CWRTC is strategically fit at the current stage.

3.3.2 Competitor Analysis

Competitors in the wastewater reuse industry in Beijing and Tianjin can be classified into three groups: state-owned big players; comprehensive, medium-sized environmental companies; and small, but concentrated companies.

3.3.2.1 State-owned big players

Beijing Municipal Drainage Co. Ltd. and Beijing Waterworks Group. Ltd. Water Reclamation Branch (WRB) are currently operating in Beijing. Here we cite WRB as an example to analyze.

WRB uses the output water from the big wastewater treatment plants, such as Gaobeidian Wastewater Treatment Plant, to produce reclaimed water. It owns 30 kilometers of pipe for reclaimed water and can provide 170,000 cubic meters of reclaimed water per day. Currently it has 28 customers including 7 parks, 14 cleaning companies, and 2 public washrooms. In 2004, it invested 10 million yuan to build new pipelines to serve residential communities and gardens. In addition, it delivers reclaimed water directly to business clients such as car-washing companies via truck.

Table 3.3 WRB's Strengths and Weaknesses

Strengths	Weaknesses
<ul style="list-style-type: none"> • More than 60 years' experience in the Beijing water supply and wastewater treatment industry • State-owned company, gaining privileges from some policies • Very strong in finance and resources • Greatly affects the small- and medium-sized players in this industry 	<ul style="list-style-type: none"> • Lower efficiency, high operations cost, lack of flexibility • Ineffective management system • Slow to respond to change • Excessive capacity due to lack of pipeline

Source: Author, 2005

Although WRB is not a direct competitor, it can steal market share from the whole wastewater reuse industry in Beijing. If new residential or commercial buildings are within the scope of reclaimed water supply through municipal pipelines, customers would likely prefer to use WRB because they wouldn't need to purchase the extra facilities and pay operations costs. CWRTC should pay attention to WRB's strategy and development plan in order to avoid direct competition and to better satisfy the target market

3.3.2.2 Comprehensive, medium environmental companies

Puhua Holdings Co. Ltd. (PHC) is a comprehensive company that focuses on environmental protection products and services. It was founded by Tsinghua University, one of the best science and technology universities in China. Its business involves environmental protection engineering projects, industrial and municipal water supplies, industrial and municipal wastewater treatment, air pollution control, etc. Municipal wastewater reuse is only a part of its whole businesses. Completed projects include Beijing Youth Hubaojin Building, Shangxi High-rise Building, and Haitai Building.

Table 3.4 PHC's Strengths and Weaknesses

Strengths	Weaknesses
<ul style="list-style-type: none"> • Strong R&D capabilities and new product development abilities. • Strong finance • Ten years' local experience and good relationship with members of government and industry • Flexible management system 	<ul style="list-style-type: none"> • Full range of products may lead to lack of resources on CWRTC's target market. • Scope covers all of China. • Focus on large projects

Source: Author, 2005

PHC is a direct competitor. CWRTC needs to watch for PHC's strategic changes, marketing mix changes, and its R&D in new products. PHC is also a potential strategic partner. PHC could be an agent for CWRTC's products at the beginning, or CWRTC could take advantage of PHC's R&D capabilities. To compete with such companies, CWRTC must have better market sensitivity, quicker and deeper action, and better after-sales service, etc.

3.3.2.3 Small but concentrated companies

Like CWRTC, Tianjin Jiahua Xinbao Water Treatment Co. Ltd. (JXW) is one of hundreds of such companies in China. JXW is an immediate competitor of WRTC and can be regarded as representative of the strategic group. Such companies have very narrow product lines and most focus on a very targeted submarket. JXW's target market is the same as CWRTC's. The technology that JXW uses is Membrane Bioreactor (MBR).

Table 3.5 JXW's Strengths and Weaknesses

Strengths	Weaknesses
<ul style="list-style-type: none"> • Competitively priced • Mature products • Local experience and established market relationship 	<ul style="list-style-type: none"> • Weak finance • Poor R&D • Lower product quality • Weak management

Source: Author, 2005

Recognizing the strengths and weaknesses of competitors and of CWRTC is the key to winning target customers. Focusing on its competitive advantages, CWRTC should be very flexible in its marketing plan. Creating more aggressive marketing mixes and giving salespeople more flexibility to make decisions can help CWRTC defeat its rivals. In addition, CWRTC can consider acquiring such a company, or forming a joint venture to gain the local experience and the incumbent's market relationships. Acquiring another small concentrated company would decrease the risks of entry.

3.3.2.4 Summary of competitor analysis

Competition can significantly affect the demand, profitability, and strategy of CWRTC. Through competitors' analysis, CWRTC should monitor the strategic changes and business plans of state-owned big players, consider taking advantage of the strength of medium environmental companies, and probably acquire or form a joint-venture with immediate competitors. Because it cannot avoid head-on competition, CWRTC must focus on its competitive advantages and provide added value to its target markets through more aggressive marketing mixes.

3.3.3 Selecting the most attractive market segment for CWRTC

Now that we have identified the three submarkets of the wastewater reuse industry, how can we choose the most attractive submarket for CWRTC? The balanced scorecard shown in Table 3.6 can guide this decision.

From the financial perspective, only the small-to-medium-sized municipal wastewater reuse submarket requires small initial capital, which is suitable for CWRTC. The large-scale municipal wastewater reuse submarket needs huge investment, is a very long-term investment, and involves higher financial risks.

In terms of customers, it is hard to enter into the large-scale municipal wastewater reuse submarket because foreign investment is not permitted in this market. The industrial

wastewater reuse submarket requires significantly innovative technologies due to the high degree of complexity in treating the industrial wastewater. With strong financial support, large companies from France, Germany, Japan, etc. are competing fiercely in the industrial wastewater reuse submarket market. However, the municipal wastewater market is rather simple and stable.

Internally, CWRTC is advantaged by quality assurance, cost controls from its member firms. In learning and growth, CWRTC is advantaged by its core competence and skills in small-to-medium-sized municipal wastewater reuse.

To conclude, CWRTC should select the small- to medium-sized municipal wastewater reuse submarket as its target market and try to satisfy the target customers by developing more competitive marketing mixes.

Table 3.6 Balanced Scorecard for Selecting the Most Attractive Market Segment for CWRTC

	Strategic Measures	Industrial	Large-scale Municipal	Small-to-medium-scale Municipal
Financial	F1 Initial capital required F2 Profitability F3 Risk	<ul style="list-style-type: none"> • Medium • High • Low 	<ul style="list-style-type: none"> • Huge • Uncertain • High 	<ul style="list-style-type: none"> • Small • High • Low
Customer	C1 Market share C2 Continually delight the targeted customer	<ul style="list-style-type: none"> • Somewhat difficult • Difficult 	<ul style="list-style-type: none"> • Difficult to penetrate • Difficult 	<ul style="list-style-type: none"> • Can be gained quickly • Easier
Internal	I1 Innovative products I2 Lower manufacturing costs I3 Quality	<ul style="list-style-type: none"> • Higher demand • Medium • Cannot guarantee 	<ul style="list-style-type: none"> • Appropriate • High • Difficult 	<ul style="list-style-type: none"> • Appropriate • Medium • Good
Learning & Growth	L1 Core competence and skills L2 Organizational involvement	<ul style="list-style-type: none"> • Low • Low 	<ul style="list-style-type: none"> • Low • None 	<ul style="list-style-type: none"> • High • High

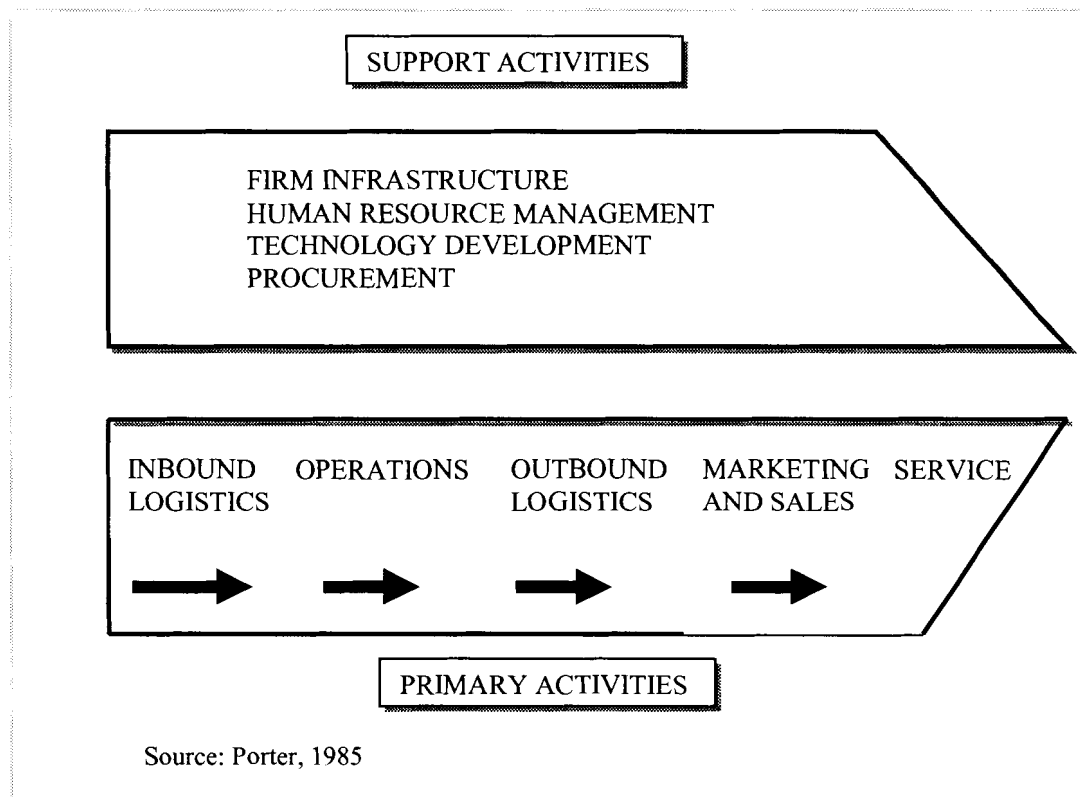
Source: Grant, 1998.

4 INTERNAL ANALYSIS

4.1 Value Chain Analysis of CWRTC

Value chain concept can help understand how value is created or lost by analyzing all the activities within and around an organization. The final value of the product or service are determined by cost of all these activities and value that they deliver.

Figure 4.1 Porter's Value Chain



Primary activities are directly concerned with the creation or delivery of a product or service. Primary activities involve:

Inbound logistics. Inbound logistics are those activities concerned with receiving, storing and distributing the inputs to the product or service. CWRTC must design the overall product, and then select the main product provider from among the member firms. CWRTC may also consider outside suppliers. Next, the main product provider, with other partner companies, prepares the inputs, such as materials handling and storing, before operations commence.

Operations. Various inputs are transformed into the final product or service through operations. The CWRTC and selected member firms work together to produce the product. For example, if Ecofluid is recognized as the main product provider, CWRTC should work with Ecofluid to ensure the product can meet the customer's requirements before it is delivered to China.

Outbound logistics. Outbound logistics include collecting, storing and distributing the product to the customer. Compared with local competitors, outbound logistics incur a significant cost to the final product. To lower costs, CWRTC can deliver the core parts of the products from Canada to worksites in Beijing and Tianjin, purchase the standard components locally, and assemble and test the final product in China. In this situation, the quality of the product should be assured through Total Quality Management (TQM).

Marketing and sales. The means whereby consumers/users are made aware of the product or service and are able to purchase it involve marketing and sales. This includes all the marketing and sales activities in Beijing and Tianjin. Activities include visiting the design institutes, advertising, product demonstrations, and networking are a few examples.

Service. All those activities which enhance or maintain the value of a product or service, such as installation, repair, training, and obtaining spare parts are service activities. This is an especially important activity for CWRTC as we have identified the full after-sales service as one of CSFs. A member firm such as BCIT can provide a training program, either in Canada or in China. In addition, professional engineers from CWRTC can offer training to

Chinese customers. AEO can provide maintenance and Trilogics can provide the infrastructure based on information technologies to monitor the running equipment 24 hours a day and 365 days a year. All these activities definitely add value to CWRTC's final product from the customer's perspective.

At the same time, each of these groups of above primary activities is linked to support activities. **Support activities** help improve the effectiveness or efficiency of primary activities.

Procurement. This is the process for acquiring the various resource inputs necessary for the primary activities. CWRTC can help member firms acquire the best quality components in inbound logistics based on shared information.

Technology development. All value activities involve technology, even if it is just know-how. For CWRTC, member firm Novatec can play a key role in technology development because of its technological advantage in the consortium.

Human resources management. Human resources must be effectively managed by all members of the consortium because it is a particularly important area included in all activities. At the present time, the project leader oversees the whole consortium. Yet one person might not be able to manage the overwhelming tasks at the beginning. CWRTC needs to recruit some new employees to work in Canada. For example, CWRTC needs a new employee who can build and manage the information system. Also, CWRTC needs other new employees who will work in China.

Infrastructure. The systems of planning, finance, quality control, and information management are part of the organization's infrastructure and are crucially important to an organization's performance in its primary activities. CWRTC needs to build a brief and effective management team to undertake all these functions. In this point, infrastructure building should be linked with human resources management.

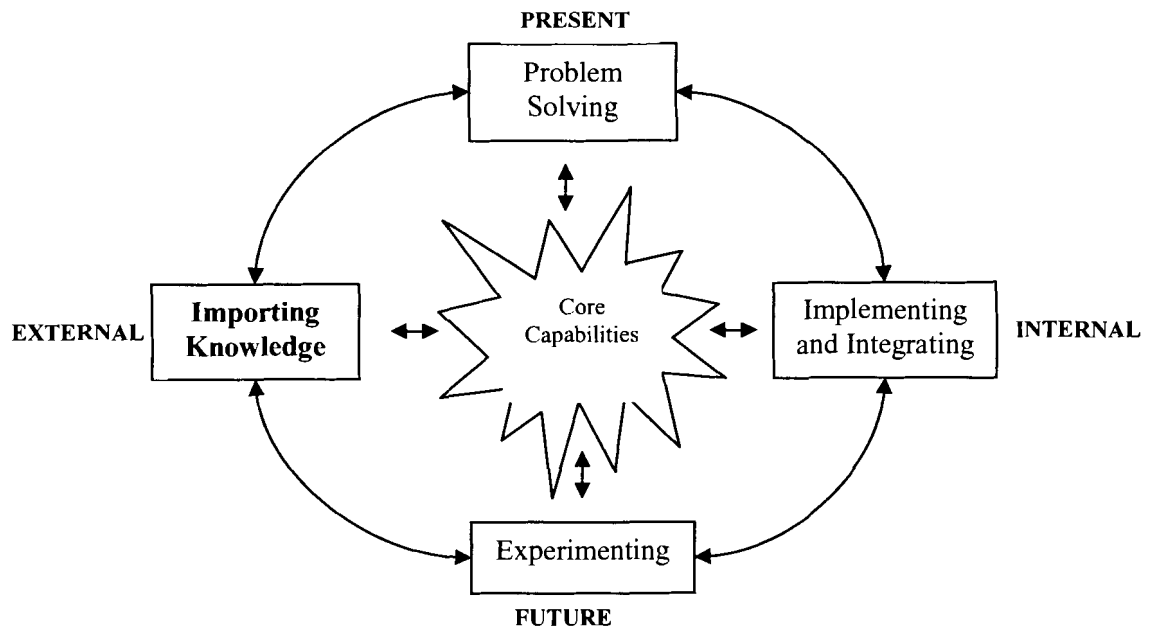
In conclusion, an organization's competences can contribute to the delivery of customer value in two ways. Competence in separate activities and competence in linking

activities together, which includes the ability to ensure that all these separate activities (both inside and outside an organization) help deliver the same customer value and are not working on different agendas. This is especially important for CWRTC in that it consists of 18 member firms, each of which has its own expectations and interests. Only after all these separate activities add value to the final product, and these separate activities are linked effectively and efficiently, can the final product create more value for customers.

4.2 Increasing CWRTC's Core Capabilities

“Companies achieve competitive advantage through acts of innovation. They approach innovation in its broadest sense, including both new technologies and new ways of doing things.” (Porter, 1990). Facing the changing environment, firms need to innovate to increase the core capabilities. According to Leonard, D. (1995), there are four knowledge-building activities that enhance a firm's capabilities: problem solving, implementing and integrating, experimenting, and importing knowledge (See Figure 4.2). Here we only discuss how CWRTC can increase core capabilities through importing knowledge in order to maintain its competitive advantage.

Figure 4.2 Knowledge-Creating and –Diffusing Activities



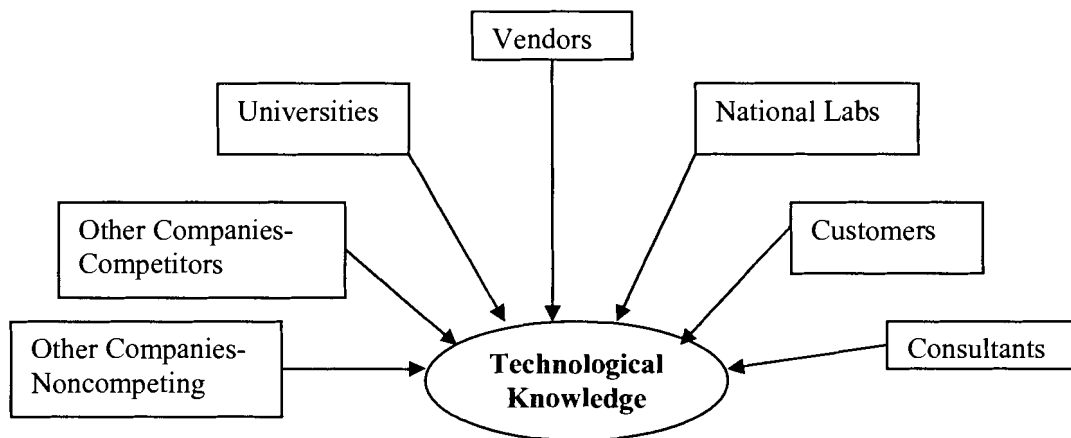
Source: Leonard, 1995, p. 137

4.2.1 Importing and absorbing technological knowledge from outside the firm

Very few companies can build core capabilities without importing some knowledge from beyond their boundaries. So a company's capacity to absorb knowledge – the ability to identify, access, and use technology from a wide variety of sources, is very important in building core capabilities.

Identifying external sources for technological knowledge is the first step to learning from outside. Figure 4.3 shows the common external sources of technological knowledge

Figure 4.3 External Sources of Technological Knowledge



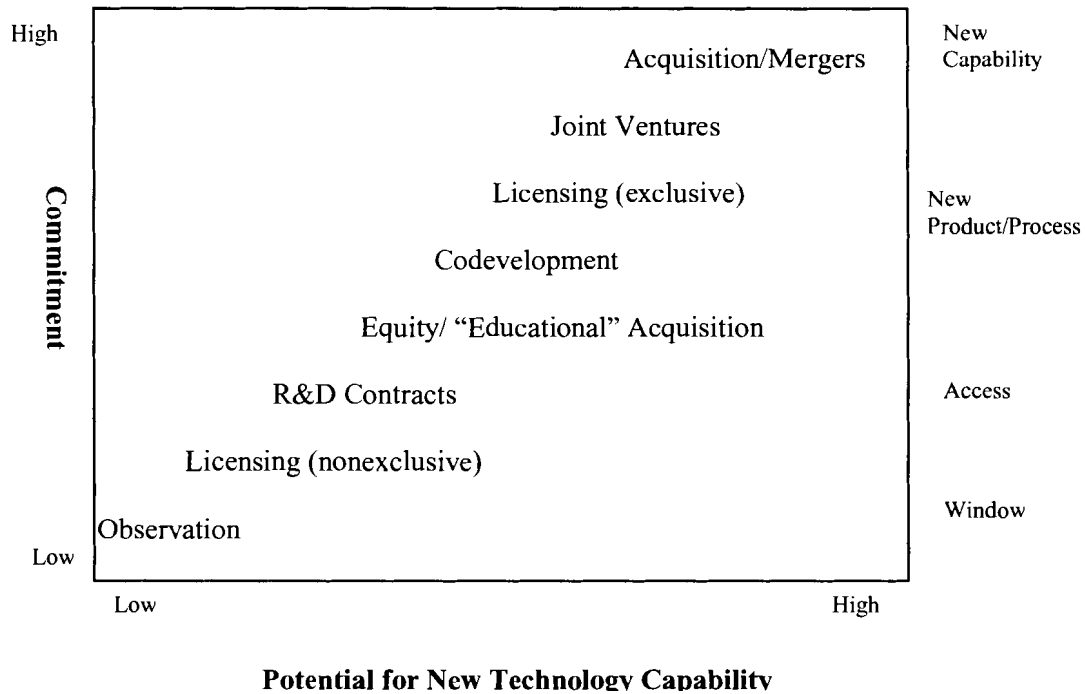
Source: Leonard, 1995, p. 152

Universities are important external sources of technological knowledge for CWRTC. Actually, CWRTC has begun cooperating with Tianjin Nankai University, a famous university in China that is very strong in EST. There are many other universities in Beijing and Tianjin, such as Tianjin University and Tshinghua University, which may also provide technological knowledge.

CWRTC can learn from other companies, regardless of whether they are competitors or non-competitors. Customers are another valuable external source of knowledge because their feedback can trigger technological inspiration. CWRTC can easily find related national labs in Beijing. CWRTC can learn from suppliers and wastewater consulting companies like Novatec in China and Canada.

Technology from external sources may be acquired through multiple means, ranging from industrial theft (neither recommended nor discussed herein) to mergers and acquisitions. Figure 4.4 shows the mechanisms for sourcing technology. CWRTC needs to be flexible enough to use the different tools to import technological knowledge from the outside.

Figure 4.4 Mechanisms for Sourcing Technology



Source: Leonard, 1995, p. 153

To manage the absorption of knowledge tremendous management effort is required to nurture the initial outlay into an enabling or core capability. This creates a challenge for CWRTC due to its consortium structure. The new company that will be built in China should gradually nurture this capability.

Developing the ability to evaluate technology involves assessing technology potential, evaluating the expertise of the source, and pinpointing the location of knowledge. CWRTC managers should nurture this ability in the future Chinese marketplace.

4.2.2 Learning from the market

The growth and nurturing of core technological capabilities requires constant fertilization through streams of information. Of these, none is more important to a technology-based firm than knowledge flowing from the market. "Listen to the customer" has become an

important management mantra in many companies. In recent years, the mechanisms for interacting with the market, and especially for obtaining guidance for new-product development, have been challenged.

Leonard, D. (1995) suggests techniques that can help managers of technology-based firms learn from the market. For example, inquiry is a traditional market research tool. By asking customers' questions about their preference, marketers can gain information from customers' responses which provide guidance to new-product development. However, customers may not always be conscious of how they use a product. In these instances, managers can observe and film users' practices to assess the actual preferences of representative customers.

4.3 Delivering Value for Money

4.3.1 Managing cost

Cost efficiency is a measure of the level of resources needed to create a given level of value. Customers can benefit from cost efficiency in terms of lower prices or more product features for the same price. For the reclaimed wastewater industry, customers are more concerned with lower prices than with more product features. Cost efficiency is determined by four factors called cost drivers: economies of scale, supply costs, product/process design, and experience.

Economies of Scale. Compared with its direct Chinese competitors, CWRTC may not benefit from economies of scale, especially when it starts to penetrate the Chinese market. It may sustain losses due to lower output at the beginning.

Supply Costs. Supply costs are a main part in the product's cost structure. For the member firm to provide a product, it has its supply cost; so does CWRTC from the customer's perspective. For instance, location can influence supply costs. This is true for CWRTC

especially when it competes with local Chinese rivals. CWRTC can consider manufacturing its product in China to lower the supply costs.

Product/Process Design. Product design influences product cost. CWRTC can more effectively design a suitable product or process that can meet the customers' requirements at lower costs than their Chinese competitors. CWRTC can do this by drawing on the design expertise of their consortium firms.

Experience. Experience is a key source of cost advantage for CWRTC in Canada. However, compared with Chinese rivals, CWRTC is in an adverse position. The best way to gain experience is to "just do it."

4.3.2 Operating effectively

The success of an organization is also related to how well it is able to provide product features that are valued – at a given price. Organizations must operate effectively to be profitable. Effectiveness is the ability to meet customer requirements on product features at a given cost. For CWRTC, effectiveness can be achieved only if managers are able to do the following:

1. Understand threshold product features and CSFs (as discussed in section 3.3.2)
2. Understand the drivers of uniqueness within their organization or wider value system and how they can create and sustain this uniqueness. For example, this may relate to customizing their product to better satisfy customers' requirements at a given cost. Or it could be about developing the competence to manage the linkages between activities in the Porter Value Chain.
3. Understand whether any added costs of providing better features are more than recovered through the value which customers place on this uniqueness – the price they are prepared to pay. Customers will pay a premium for features that they especially value, such as higher

quality/reliability. They will not pay for features that are above their threshold requirements, such as more sophisticated technology within the facilities.

4. Communicate the product's features. Since value is often about perception, the ways in which a product's features are communicated are important, and in some circumstances could constitute a core competence. For example, this could apply to the processes through which a brand name or corporate image is built and communicated when CWRTC is marketing to the Chinese wastewater reuse industry.
5. Deliver high quality service. In a fast-changing world, competitive advantage is increasingly concerned with service rather than the product per se. as we discussed above, after-sales service is a critical success factor for CWRTC to enter into target market.
6. Develop a dynamic view of strategic capabilities. Strategic capability cannot be regarded in a static way. What customers value will vary over time – particularly in terms of the critical success factors discussed above. Currently, customers often complain about lower quality/reliability in the incumbent facilities. But after a couple of years, quality/reliability will become threshold competences, and price might be the most important factor to affect their purchase decision.
7. Consider providing value in new markets and arenas. CWRTC managers can consider building strategies in new markets by stretching and exploiting their competences. This is because customers elsewhere already value the features underpinning that core competence. For instance, after entering the Beijing and Tianjin markets, CWRTC can promote its product in Shanxi province or Heilongjiang province where higher quality/reliability might still be most valued.

4.4 SWOT Analysis – A Summary of CWRTC’s Entry Into the Chinese Wastewater Reuse Market

SWOT stands for strengths, weaknesses, opportunities and threats. A SWOT analysis is concerned with the key issues from the business environment and the strategic capabilities of an organization that are most likely to influence strategy development. Following is a summary of the strengths and weaknesses of CWRTC, opportunities CWRTC has, and threats CWRTC has to face, when it enters the Chinese wastewater reuse market.

Strengths:

- Can provide customized solutions to the target market; can design unique processes and adopt various technologies to meet customers’ requirements
- Consortium can integrate limited resources to create maximum synergy effect
- Knowledge and experience in the industry
- Government involvement and support
- Higher product quality and proven technological advantage
- Human resources within the consortium
- International experience

Weaknesses

- Lack of local experience. Although CWRTC has gained some knowledge from its Chinese partner and other sources, it is not enough. Compared with local veterans, CWRTC’s lack of experience puts it at a competitive disadvantage
- Higher labour costs, long distance delivery, tariffs, etc. will result in a higher price for CWRTC’s products. The only way to address this problem is to manufacture products in China
- The consortium structure presents a great challenge for CWRTC. Managing various expectations, adding value to each of the separate activities, and enhancing the linkage between these activities to benefit from the resources integration will be difficult

- Management is not strong enough, and generally lack an understanding of Chinese society and market.
- Need more money to start up business in China

Opportunities

- The increasing deficit of water supply and demand in Beijing and Tianjin is the main driver of wastewater reuse industry
- Strong economic growth and severely deteriorating environment in Beijing and Tianjin create great business opportunities for CWRTC to enter the Chinese market.
- The “Green Olympics” slogan increases public and government awareness of the importance of protecting environmental resources
- Beijing and Tianjin governments require that commercial/residential buildings with an area over 30,000 square meters should have wastewater reuse facilities
- Lack of capital to build more underground pipelines, the gap between the price of potable water and reclaimed water, complaints about the lower quality/reliability of current products from end users, all present opportunities for CWRTC
- National and local policies to encourage foreign investment and technologies in EST
- Beijing and Tianjin have strong technological advantage and R&D capabilities
- Lower labor costs, and nice industry clusters provide the opportunity for CWRTC to manufacture its products in China in the near future

Threats:

- Instability of society, changing policies and regulations, local protectionism, government interruption, government and legal barriers
- High competition from substitutes
- Lack of local experience

- Competition from state-owned big players, comprehensive medium environmental companies, and immediate competitors
- The tendency of price between portable and reclaimed water is uncertain
- Cost disadvantage, especially in the beginning
- Lack of capital to start the business in Beijing and Tianjin

In conclusion, CWRTC is presented with the business opportunity to enter the Chinese wastewater reuse industry. By enhancing its strengths, decreasing or eliminating its weaknesses, taking advantage of the opportunities, and controlling threats, CWRTC can succeed in this market.

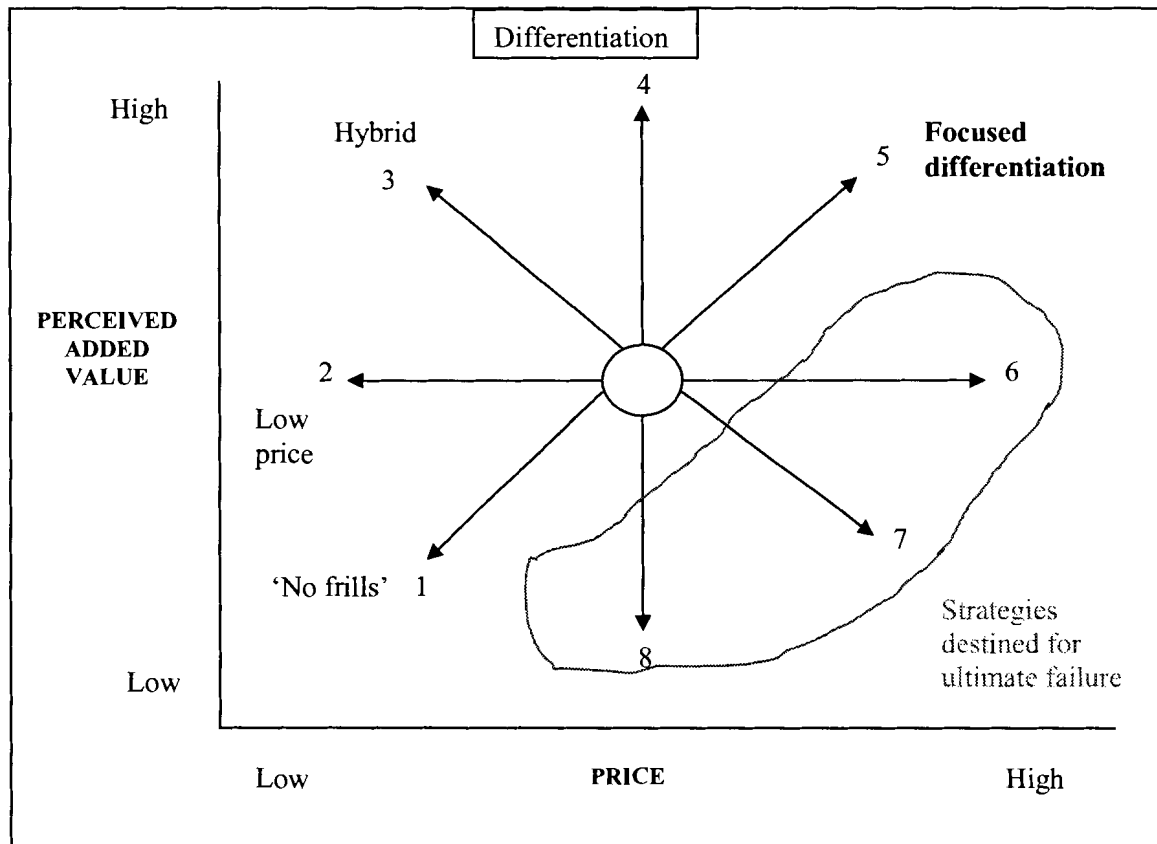
5 RECOMMENDATIONS

5.1 Competitive Strategy for CWRTC

5.1.1 Choice of Competitive Strategy

Competitive strategy is the bases on which a business unit might achieve competitive advantage in its market. Figure 5.1 depicts a “strategic clock” (Johnson & Scholes, 2002, p. 320) which shows 8 competitive strategy options for CWRTC to select. Table 5.1 explains these options.

Figure 5.1 The Strategy Clock: Competitive Strategy Options



Source: Johnson & Scholes, 2002, p. 320.

Table 5.1 Description of Each Item in the Strategy Clock

		Needs/risks
1	No frills	Likely to be segment specific
2	Low price	Risk of price war and low margins; need to be cost leader
3	Hybrid	Low cost base and reinvestment
4	Differentiation	
	(a) Without price premium	Perceived added value by user, yielding market share benefits
	(b) With price premium	Perceived added value sufficient to bear price premium
5	Focused differentiation	Perceived added value to a particular segment, warranting price premium
6	Increased price/standard value	Higher margins if competitors do not follow; risk of losing market share
7	Increased price/low value	Only feasible in monopoly situation
8	Low value/standard price	Loss of market share

Note: 3-5 belongs to Differentiation, and 6-8 likely failure.

Source: Johnson & Scholes, 2002, p. 320

According to the previous analysis, price is one of CWRTC's weaknesses (Section 4.4). However, CWRTC can provide customized solutions to the target market. CWRTC can design unique processes and adopt various technologies to meet the customers' unique requirements, thus adding more value. CWRTC can also offer full after-sales service, operations and maintenance, training, etc. to increase the perceived added value for customers. All these activities from the value chain can be considered as CSFs (Section 3.3.1.3). To conclude, the focused differentiation strategy is the right choice for CWRTC.

When entering China, CWRTC can adopt a focused differentiated strategy which seeks to provide high perceived value, justifying a substantial price premium, usually to a selected market segment. The key here is to convince the customers that our product is differentiated from that of our competitors. Since CWRTC is a new entrant, it does not have the brand recognition of its competitors; advertising campaigns should aim to persuade consumers that they should buy wastewater reuse facilities not on name, but based on features. The features include not only the functions of the facility, but also different processes/technologies, customized sizes and functions, lower operation costs, higher quality and reliability, training,

maintenance, technical support and upgrading, spare parts, 24-hour monitoring, and excellent after-sales customer service. Some important issues should be raised here when applying this focused differentiated strategy:

1. CWRTC can use this strategy when entering the Beijing and Tianjin markets. However, when the competition becomes intense, CWRTC needs to switch to a “differentiation strategy”: lowering its price without lowering its added value and features; perhaps needing to add more value. Later on, a “hybrid strategy” might be adopted. This change in strategic direction will be a challenge for CWRTC, but this situation may be better evaluated in the future.
2. CWRTC can use the “focused differentiation” strategy in other cities or towns where competition is not very strong. If the competition in Beijing and Tianjin grows fiercer in the future, CWRTC can consider adopting the “differentiation strategy,” which involves lowering its price while increasing the perceived added value.
3. Route 6, 7, and 8 must be avoided because these strategies are destined for ultimate failure. Evaluate whether your added value through differentiation is worth the price premium customers are willing to pay.

5.1.2 Sustaining differentiation-based advantage

Sustainable differentiation needs to be based on less imitable aspects of competitive advantage. After entering the Chinese market, CWRTC should focus not only on the technological side of the product, which is easier to imitate, but on the core competences.

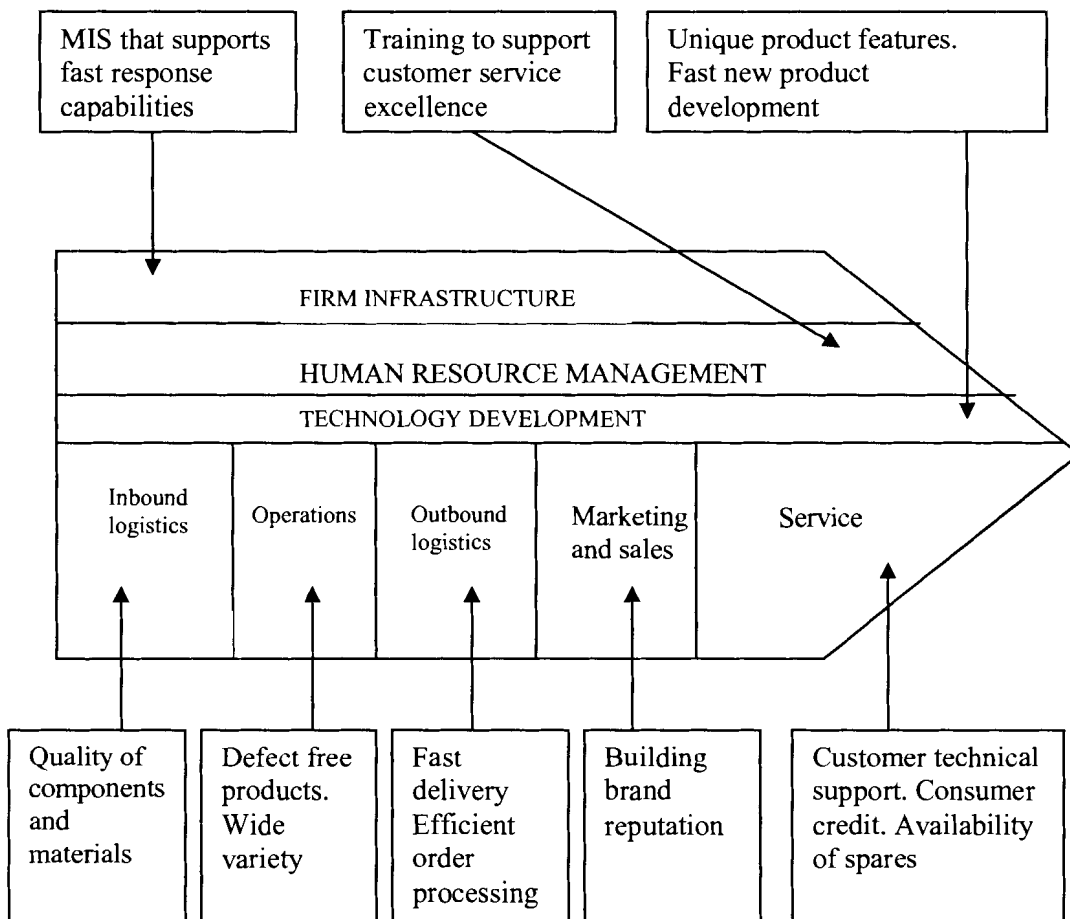
Intangible Assets: such as brand name, established market relationships, human resources, etc.

Switching Costs: the buyer might be dependent on the supplier for particular components, services or skills; or the benefits of switching may simply not be worth the cost or risk.

5.1.3 Identifying opportunities for differentiation-based advantage

Here we use the value chain to identify opportunities for differentiation-based advantage. Figure 5.2 provides examples of opportunities for differentiation in several activities on a generic industry value chain. For each activity, we cite an example on how to differentiate it from competitor's corresponding activity. In fact, there are many ways to achieve differentiation, and most of them can constitute the organization's core competences which competitors will find difficult to imitate.

Figure 5.2 Using the Value Chain to Identify Differentiation Potential for CWRTC on the Supply Side

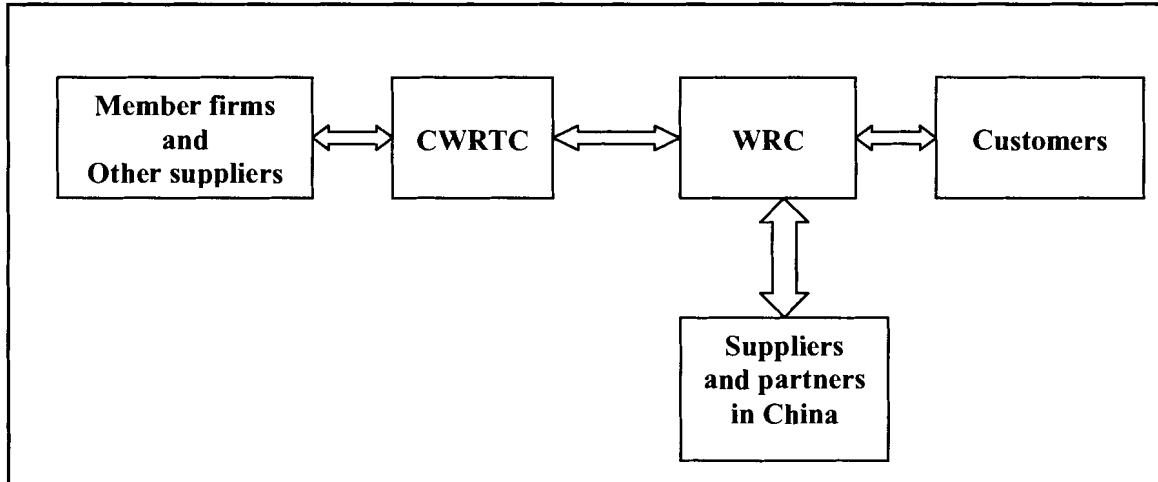


Source: Grant, 1998, p. 234

5.2 Business Operating Process for CWRTC

Figure 5.3 shows the future business operating process recommended for CWRTC.

Figure 5.3 Business Operating Process



Source: Author, 2005

It is recommended that CWRTC incorporates a Chinese company, referred to here as Wastewater Reuse China (WRC). WRC would collect the customer's product attributes required for CWRTC, which would organize the member firms to provide the product. Novatec would design the solutions, and one or more manufacturers such as Ecofluid could produce the product based on the designing. CWRTC then would deliver the qualified product to WRC, then to customer. After that, member company AEO could provide operations and BCIT offers training. At least at current stage, the role of CWRTC is very important in that it would link WRC and Canadian suppliers. WRC is also very important because it connects CWRTC, local suppliers and partners, and customers. Section 5.3 describes WRC's structure.

Since higher quality/reliability is one of the CSFs, Total Quality Management (TQM) can be applied in the whole business process. TQM puts quality at the heart of everything that is done by an operation, including all activities within an operation. In our case, TQM system covers Canadian suppliers, CWRTC, WRC, Chinese suppliers and partners, and customers.

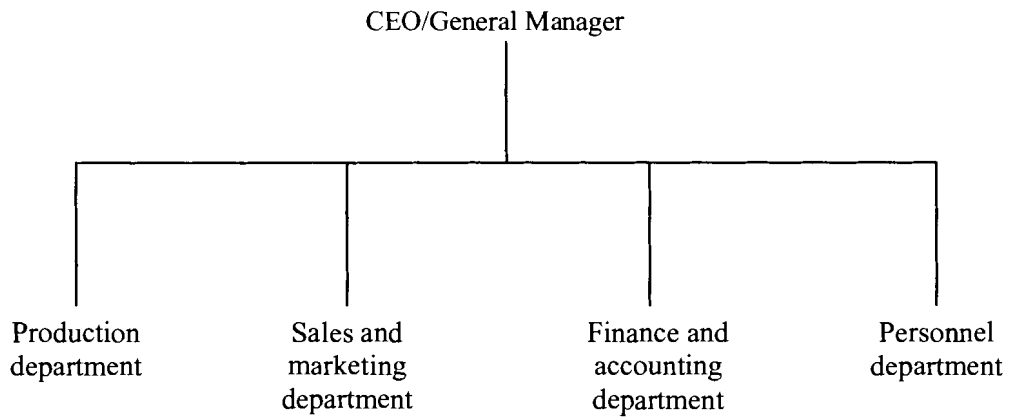
Every part should put quality at the forefront. Given the limited resources available, CWRTC can adopt the ISO 9000 quality management systems at the beginning.

To make the business operate efficiently and effectively, Supply Chain Management (SCM) can be adopted. SCM is concerned with managing the flow of materials and information between the operations which form the strands or 'chains' of a supply network. This system is especially useful for CWRTC because the business covers long supply distance and many suppliers and partners.

5.3 Organizing for WRC

Based on the product features and future development in China, the functional structure would be suitable for the new company in China (Figure 5.4). At the beginning, WRC would depend on CWRTC to provide solutions and technical support. In the future, WRC should build its own capabilities in production, R&D, customer service, new product development. Novatec, other member firms, or outside investors could provide investment capital.

Figure 5.4 Functional Structure of WRC



Source: Author, 2005

CWRTC can exist depending on the future development of WRC. Table 5.2 lists main responsibilities for the leader of CWRTC and general manager of WRC.

Table 5.2 Main Responsibilities of the Leader of CWRTC and General Manager of WRC

	Responsibilities
Leader of CWRTC	<ul style="list-style-type: none"> • Based on the customer's needs, organize the member firms to produce the solution/product • Deliver the solution/product on time • Technical support • Help WRC build the functional departments and train the new employees • Finance and accounting between the consortium and WRC • Coordinate between consortium and WRC • Other support
General Manager of WRC	<ul style="list-style-type: none"> • Set up the new company • Manage the new company • Marketing • Production • Finance and accounting, and HR • Communicate with the consortium members

Source: Author, 2005

Since the CEO/GM is especially important for WRC, Table 5.3 lists the qualifications that the future general manager should possess.

Table 5.3 Qualifications of Future General Manager of WRC

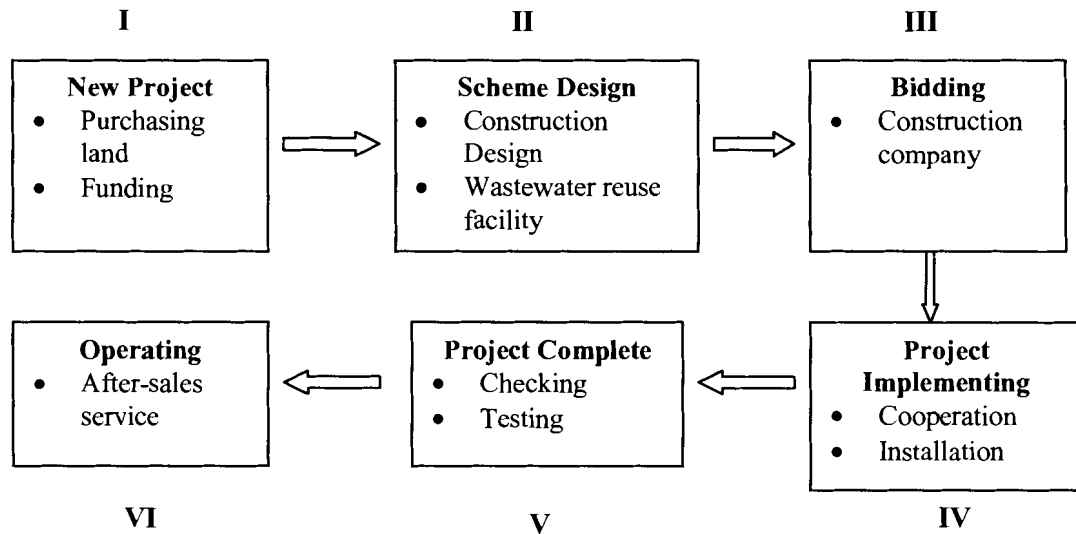
	Qualifications
General Manager of WRC	<ul style="list-style-type: none"> • Entrepreneurial characteristics with Chinese background. • Overall managerial knowledge and skills. • Understanding Canada. • Understanding the wastewater reuse industry • good communication skills, project management capability • Work ethic, responsible, • Excellent marketing and sales skills. • Willing to dedicate to and develop self in the wastewater reuse industry.

Source: Author, 2005

5.4 Entry Strategy

Figure 5.5 shows the general business flow in construction industry in China so that we can find the cut point to penetrate the sector.

Figure 5.5 Business Flow in the Construction Industry in China



Source: Author, 2005

Phase I: The developers/building owners set up the building project in this phase. They need to buy the land, and develop an agreement from related government department, such as the Beijing Construction Committee, Beijing Municipal Administration Committee, and Beijing Land and Resources Bureau. WRC can obtain the market demand information directly from the customers, from the above government departments, design institutes, or other sources.

Phase II: The developers/owners will contract a certified design firm to complete the scheme design, including the supplier of the wastewater reuse facility.

This is the key phase for WRC to obtain the business contract. Generally, the design engineer will confirm one supplier, or give several wastewater suppliers for developers/owners to choose from. Of course, the customer has the most power to determine which supplier will get the contract. But sometimes other people can affect the customer's decision, such as the design engineer, his or her supervisor, reference from a government representative, or people who have networked with the customer. WRC needs to do more research and employ the right marketing plan to obtain the contract.

Phase III: The developers/owners contract the construction company that will build the project through public bidding. In some cases, the selected construction company will determine the wastewater reuse facility supplier. In this situation, the design firm would only define the features that the wastewater reuse facility should include. WRC needs to persuade the construction company to use its solutions.

Phase IV: the construction company executes the project. WRC needs to install and test its products as the building's construction progresses and work closely with the construction company.

Phase V: When the building is completed, WRC demonstrates that its products can meet the customer's requirements.

Phase VI: the wastewater reuse facility is operating. WRC needs to provide full after-sales service, discussed. Good customer relationship management can lead to customer loyalty and affect word-of-mouth.

To conclude, CWRTC's Chinese company, WRC, needs to be very sensitive to any market demand information in Phase 1. Phase 2 often determines whether WRC will get the business contract. However, sometimes the construction companies in Phase 3 can decide which wastewater reuse products will eventually be used. The key stakeholders, such as developers or building owners, design engineers, government agencies and representatives, and construction companies play a critical role in decision making. In addition to providing competitive products, networking, or guanxi in Chinese, will be very important to WRC's success in the Chinese market.

APPENDICES

Appendix A China Water Reuse Trade Consortium Water Reuse Solution Map - New Water Technology Canada

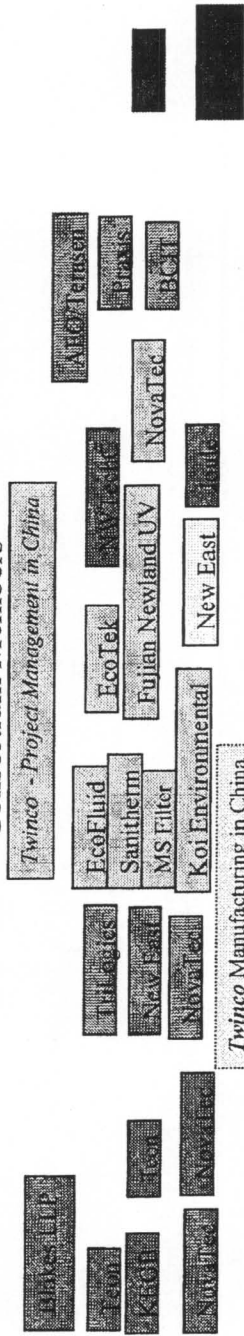
Stakeholder Communications

Expectations + Requirements + Input + Buy-in + Agreements + Changes + Disputes + Results + Feedback

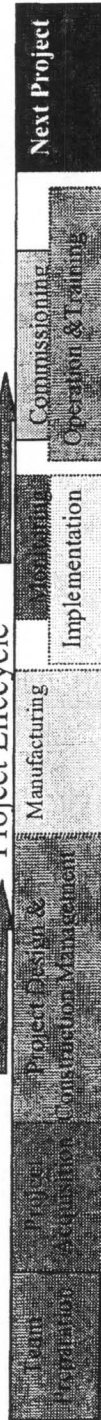
Project Management Plan



Consortium Members



Project Lifecycle



Source: Center for Sustainable Communities Canada, 2005

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