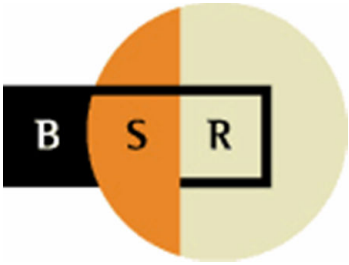
BEYOND COMPLIANCE:
ASSESSING WATER MANAGEMENT PRACTICES & OPPORTUNITIES IN CHINESE APPAREL FACTORIES

BUSINESS FOR SOCIAL RESPONSIBILITY
MAP TEAM 2008 FINAL REPORT



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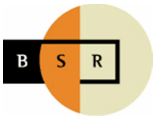
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Executive Summary

Background

Consumers hold global apparel brands accountable for the social impact of not only their own actions, but the actions of suppliers along their supply chains. Today, consumers consider environmental stewardship to be a priority social responsibility of global apparel brands. Hence, brands are seeking solutions for ensuring that their suppliers are minimizing their environmental impact. Of primary concern is water management in China: among apparel manufacturing processes, those involving water constitute the greatest threat to environmental protection, and, in the case of China, pose the greatest risk to public health. Currently, however, brands lack reliable information regarding best practices for supplier water management operations, oversight and control at the factory level.

Objective

Business for Social Responsibility (BSR) has launched the Apparel Water Quality Initiative in China. The goal of the three-phase program is to identify and incentivize best practices for improving water efficiency and treatment in Chinese apparel factories. For the first phase of the initiative, BSR has partnered with a Multidisciplinary Action Project (MAP) Team comprised of six, first-year MBA students from the Stephen M. Ross School of Business at the University of Michigan. The team was engaged to:

- Research current water management practices in apparel factories in Guangdong province;
- Identify patterns in their water management processes and practices;
- Analyze the economic, regulatory and social factors that influence factory decision-making on water management.

Research and Analysis

Based on data collected, the BSR MAP Team has developed a framework of findings and recommendations designed to provide a foundation for the second and third phases of the initiative.

Conclusions and Recommendations

The BSR MAP Team finds that water management is not a pressing concern for factories, and that current brand involvement reinforces that attitude. The primary contributors to this predicament are:

- Inconsistency of brand monitoring and enforcement programs;
- Ignorance among factories about the economic benefits of water management optimization;
- Insufficient sharing of best practices among brands and factories.

In response, the team recommends that:

- Brands develop and collectively subscribe to a set of standardized water management guidelines, and collaborate on inspections and audits of supplier factories;
- Factories continually seek ways to optimize water usage, treatment processes and recycling of wastewater;
- Both brands and factories collaborate on training for factory water managers, and share best practices in all categories among both brands and factories.

The BSR MAP Team believes that implementation of these recommendations will provide both economic and water management benefits to brands and their factory suppliers, and will accomplish BSR's goal of improving water efficiency and quality through brand-factory collaboration.

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Project Overview

Background

Brands and Their Environmental Impact

Consumers hold global apparel brands accountable for the social impact of their enterprises. And in a globally integrated world, brands are held accountable by consumers not only for their own actions but for the actions of suppliers along their supply chains. This paradigm became readily apparent in the 1990s when public outcry over "sweatshop" conditions and the employment of child labor in source factories led brands to pledge to eliminate those practices within their supply chains, and intensify their oversight of supplier labor practices—sometimes at considerable cost.[1]

Today, environmental stewardship has joined the enforcement of labor rights as a central component of the social responsibilities that consumers ascribe to global apparel brands. Learning from their experience with labor concerns, brands have recently moved to anticipate and prevent similar backlash on environmental issues. Well-aware of public concern over environmental degradation, and the increasing value to consumers of "green" business practices, brands are seeking solutions for ensuring that their suppliers are minimizing their environmental impact.

Water Management in China Focus

Within the apparel industry, water management—an umbrella term that refers to conservation, usage efficiency and recycling, as well as wastewater treatment and discharge quality—is the greatest factor in determining that impact. Apparel manufacturing utilizes high volumes of water, often containing concentrated dyes and chemicals; and apparel factory wastewater is often laden with toxic byproducts. Indeed, among apparel manufacturing processes, those that utilize water have the greatest environmental impact. Water shortages, decline in water quality and increased demand for water have become pressing concerns for brands sourcing from China[2]. Currently, however, global apparel corporations lack reliable information regarding best practices for supplier water management operations, oversight and control at the factory level.

BSR's Apparel Water Quality Initiative in China

In response, Business for Social Responsibility (BSR) has launched the Apparel Water Quality Initiative in China. The initiative's mission is to identify and incentivize best practices for improving water efficiency and treatment in Chinese apparel factories. The key stakeholders are BSR's Apparel Water Quality Working Group (AWQWG), a coalition of

[1] New York Times (1/1/1985 to present); 2/14/1997, p1, 0p
[2] "The Apparel Water Quality Initiative in China: An Initiative of BSR's Environmental Research and Development Team" Business for Social Responsibility, 2007.

global apparel brands including Nike, Adidas, The Gap Inc., Levi Strauss & Co., Nordstrom, Inc., Timberland, L.L. Bean, H&M, J.C. Penney and Coldwater Creek, Inc., among others.

The initiative will be executed in three phases. The first phase consists of a comparative study of water management practices in Guangdong province apparel factories.

The second phase will consist of the development of a web-based water management monitoring and best practices–sharing toolkit. The toolkit will be comprised of a web-based data collection form that will allow factory managers and brands to report water management data and share best practices in different facilities.

The third phase will consist of the development and launch of a best practices training program for factory managers and brands focused on product and process innovation and strategic partnerships. This training program will be designed in conjunction with BSR's Apparel Water Quality Working Group (AWQWG), and will be rolled out to AWQWG members. The program will be administered by BSR's China Training Institute (CTI).

Guangdong province was selected as the geographical locus of the initiative because its high concentration of apparel factories, combined with its enduring pollution problem, poses a great opportunity for environmental improvement. Additionally, Guangdong province has shown signs of progressive policies, recently investing more than ¥60 billion in environmental protection programs.[3]

Project Scope & Objectives

The BSR MAP Team engagement constituted the first phase of the initiative. The project objectives were as follows:

> *Patterns* – Identify patterns in current water management practices in apparel factories in Guangdong province;
>
> *Factors* – Analyze the economic, regulatory and social factors that influence factory decision-making on water management and lead to those patterns;
>
> *Recommendations* – Develop and present recommendations for improving oversight and control of supplier factories.

The BSR MAP Team notes that the scope of its engagement does not include an assessment of the toxicological or ecological impact of water pollution in China, nor of the effectiveness of water quality standards to ensure public and environmental health.

[3] Brownlow, Kaleb. "Is Guangdong the Dark Horse in Addressing Ecological and Human Health Threats?" Woodrow Wilson International Center for Scholars. 2007.

Methodology

The BSR MAP Team developed its analysis via the following steps:

Survey design – The team designed a comprehensive apparel manufacturer survey, which examined current water management practices at the operational level, as well as factors affecting water management decisions.

Survey administration – The team administered the survey to senior factory managers and water specialists in 11 apparel factories throughout Guangdong province.

Data analysis – The team developed and analyzed a database of collected data in order to identify patterns and trends in water management processes and issues.

The team notes that all non-background data contained in this report are drawn from its factory surveys, conducted in 11 apparel factories in Guangdong province, China, during March and April, 2008.

Research & Analysis

China Water Profile

Background

In January 1999, China's then–Vice Premier Wen Jiabao uttered a stark warning: "The survival of the Chinese nation is threatened by the country's shortage of water."[4] He went on to predict that the Chinese population was expected to reach 1.6 billion in the 21st century, and that its water problem would become a worldwide concern. Since then, Wen has risen to become prime minister. In that time, not only has China's water shortage grown more acute, but its water supply has become increasingly polluted. Water industry executives say that up to 40% of the Chinese population depend on water systems that provide less than half the minimal per capita volume recommended by international standards. Moreover, because of severe pollution, these systems are often unsafe for human consumption.[5]

Water Quality: A Growing Concern

China's economy has grown rapidly since the nation entered into reforms in 1978, and particularly since the beginning of its industrial expansion in the mid-1980s. During the three decades since former Communist Party leader Deng Xiaoping launched China's "Reforms and Openness" program, spurring the country's fast-track economic growth and the opening of its markets to new sources of capital, rapid industrialization and urbanization have lifted hundreds of millions of Chinese out of poverty and made the country the world's largest producer of consumer goods. Within the last few years, China's skyrocketing gross domestic product sent its economy soaring past those of France, Britain, and Italy, to become the world's fourth-largest. According to a poll conducted by the BBC, China is set to become the world's largest economy by 2026.[6]

But there is little question that China's growth has come at the expense of the country's air, land and water. Decades of economic planning prioritizing the development of heavy industries in urban areas has scourged the country's environmental integrity. In much the same way that China's meteoric rise as an economic power has no precedent in history, so its pollution crisis has no historical equivalent. In particular, water quality has risen to become the centerpiece of China's environmental concerns. In many parts of China, factories and farms dump waste into surface water with few repercussions. China's environmental monitors say that one-third of all river water, and vast sections of China's great lakes, have

[4] "Water Supply and Treatment in China: Industry Analysis." Research and Markets. Retrieved April 18, 2008 from <http://www.researchandmarkets.com/reports/343>
[5] "China, parched and polluted, puts a price on water." (December 16, 2005) International Herald Tribune. Retrieved April 18, 2008 from < http://www.iht.com/articles/2005/12/16/business/rdevchin.php>
[6] "China set to be largest economy." (May 22, 2006) BBC News. Retrieved April 18, 2008 from <http://news.bbc.co.uk/1/hi/business/4998020.stm>

water ratings of Grade V, the highest level of degradation,[7] meaning the water is unfit not only for human consumption but for industrial and agricultural use.

In 2005, only 52% of sewage produced by China's largest cities was treated. That same year, 38 billion metric tons of wastewater flowed into the Yangtze, Yellow, and Huaihe river systems. (The Yangtze alone harbors 9,000 chemical plants along its banks.[8]) Five of the seven major river systems in China are now considered severely polluted by China's environmental protection agency. And the Yellow River no longer reliably reaches the sea due to withdrawals and upstream use.[9]

In December 2004, China's Minister of Water Resources, Wang Sucheng, said that drought and accelerating water pollution poses a grave threat to the country's agriculture and could have catastrophic consequences. In addition, he noted that more than 70% of China's lakes and rivers are polluted.[10] In March the following year, Wang said that more than 300 million Chinese in rural areas lacked access to clean drinking water, with hundreds of thousands ill from fluorine, arsenic and sodium sulfate contamination.[11] This might have been a conservative estimate. According to a presentation delivered by Dr. John McAlister at the Deutsche Bank China Expert Series in 2005, about 700 million people in China (over half the country's population) have access only to drinking water of quality below World Health Organization standards.

Water Scarcity: A Looming Crisis

Water shortages only serve to compound China's water quality problems. With a natural water endowment well below global averages, China has always struggled with water scarcity. Although China's total water resource volume ranks 6th among all countries, its huge population dramatically reduces its per capita availability. Per capita water resource volume in China is just 28% of the worldwide average, meaning that each Chinese citizen is afforded little more than quarter of the water afforded to the individuals in the rest of world. According to a survey of 180 countries conducted by the UN's Food and Agriculture Organization, China's per capita available water resources ranks 128th among all nations, behind Nigeria and the Dominican Republic.[12] Exacerbating the problem, annual supply shortfalls now stand at about 40 billion metric tons, causing frequent supply cuts in cities and industrial disruption, especially in water-intensive sectors such as power generation.[13] And

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[7] "The State of the Environment: China State Environmental Protection Administration." (March 26, 2004) ChinaTaiwan.org. Retrieved April 17, 2008 from <http://2006.chinataiwan.org/web/webportal/W5180047/Uadmin/A5609996.html>

[8] "Plight of Yangtze River Worsened by Water Shortage." (January 19, 2007) Xinhua News Agency Retrieved April 18, 2008 from <http://www.china.org.cn/english/environment/196669.htm>

[9] "At The Crest of a Wave: A Proactive Approach to Corporate Water Strategy" Business for Social Responsibility: September 2007

[10] China Daily: December 23, 2004

[11] "China, parched and polluted, puts a price on water." (December 16, 2005) International Herald Tribune. Retrieved April 18, 2008 from < http://www.iht.com/articles/2005/12/16/business/rdevchin.php>

[12] "Water availability per person per year." (2002) Food and Agriculture Organization: Retrieved April 23, 2008 from < http://www.unesco.org/bpi/wwdr/WWDR_chart1_eng.pdf>

[13] Ibid.

the effect is often self-perpetuating: As water levels fall, springs dry up, streams cease to flow, rivers run dry, and lakes disappear. Hebei Province, for example, once had 1,052 lakes. Now, only 83 remain.[14]

According to estimates, China uses seven to 15 times more water per unit of economic output than developed economies. In the United States, water consumption per unit of GDP is actually falling as efficiency of water use in production increases. Therefore, while approximately one metric ton of water in the U.S. correlates to approximately $29 of GDP, the same amount of water in China translates to only $2 of GDP.[15] China's rate of industrial water reuse—i.e., treated industrial wastewater that is subsequently reused in other processes—meanwhile, stands at only 55%, far below the average rate of 80% in most advanced countries. At the same time, Chinese prices do not reflect this scarcity: They are 70-80% below prices in countries with adequate water supplies. According to the report issued by Deutsche Bank, such unrealistic water prices and lax pollution policies only serve to accelerate the depletion of already low water resources.[16]

To illustrate the state of water shortage in China, consider the North China Plain. The region accounts for approximately 28% of China's total land area (the size of Texas and New Mexico, combined) and only 14% of China's total water resources. Yet the North China Plain is home to 44% of China's population. This density of population coupled with dearth of water makes the North China Plain the most water-scarce region in the world on a per capita basis.[17]

Guangdong and the Textile Industry

Located in the Pearl River Delta (PRD) region in Southeast China, Guangdong was the first of China's provinces to push for free-market reforms. Since then, Guangdong has developed a massive industrial and manufacturing complex centered on the textile industry, including apparel manufacturing. Because textile manufacturing is one of China's dirtiest industries,[18] Guangdong faces increasingly polluted soil, air and, most pressingly, water. Indeed, according to the *Wall Street Journal*, people joke in China that one can tell what colors are in fashion by looking at the rivers.[19]

As factories continue to operate in the region, more and more pollutants are added to the Pearl River Delta as it meanders through industrial cities such as Dongguan and Shenzhen. In recent years, the region's large factories have been the focus of local environmental authorities, which forced many factories to change their water treatment processes to comply

[14] "Worsening Water Shortages Threaten China's Food Security." (October 4, 2001) Earth Policy Institute
[15] Deutsche Bank China Expert Series, March 2005: Presentation delivered by Dr. John McAlister at the Deutsche Bank Access China Conference on March 22, 2005. Retrieved April 18, 2008 from <http://www.cbiz.cn/download/aquabio.pdf>
[16] Ibid.
[17] Ibid.
[18] In addition to heavy metals and various carcinogens, fabric dyes may contain high levels of organic materials, and thread is often dipped in starch before it is woven into fabric. The breakdown of large amounts of organic compounds such as starch can suck all the oxygen out of a river, killing fish, and turning the water into a stagnant sludge.
[19] "China Pays Steep Price As Textile Exports Boom." (August 22, 2007) Wall Street Journal Retrieved April 18, 2008 from <http://online.wsj.com/public/article/SB118580938555882301.html>

with increasingly strict regulations. In spite of Guangdong Environmental Protection Bureau reports that nearly 84% of factories operating in the region meet local environmental policies, many small and medium size factories are still poorly controlled. Most noticeably, many of these plants dump their effluent directly into creeks and streams that feed into the Pearl River. Sewage networks and municipal water treatment plants are not capable to handle the aggregate discharge of the region, further causing environmental degradation to the entire region.[20]

Despite continued government promises to address the problem, Guangdong province recorded its worst pollution levels in decades in 2006. Large numbers of its citizens are suffering from pollution-related illnesses, and have little or no access to safe drinking water. It is estimated that 40% of Guangdong's rural population—or 22 million people—lack access to safe drinking water.[21]

Policy Trends

Since 1978 and the onset of reforms, the Chinese government has become increasingly concerned about water management. Today's leaders have publicly stated that China must change course on the environment. Although current environmental reforms have yet to yield results, this governmental focus on the environment represents a shift from past attitudes. Up until recently, the Chinese government's solution to the problem was mired in political quagmire. Although reining in economic growth to stem the pollution may have seemed critical to the population's survival, the country's economic policies privileged growth at all costs. Delivering prosperity and increasing the standard of living appeases the public, provides spoils for well-connected officials, and forestalls demand for political change. A major slowdown could incite social unrest, alienate business interests and threaten the party's rule.[22]

Chinese leadership today is beginning to recognize that pollution and environmental degradation pose their own threat to the nation's economic prosperity. Polluted air and water are inciting social unrest, while health care costs are on the rise. Severe water shortages are catalysts for the desertification of China's arable land, one of the country's most important strategic natural resources. The unconstrained expansion of energy-intensive industries is creating greater dependence on imported oil and dirty coal. All this means that environmental problems are becoming more difficult expensive to address the longer they go unresolved.[23]

China's current leadership has vowed to overhaul the "growth-first" policies of the Deng Xiaoping era and embrace a new model that provides for growth while protecting the environment. In his equivalent of a State of the Union address last year, Prime Minister Wen Jiabao made 48 references to "the environment," "pollution" and "environmental protection."

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20 Gallup, James. China Trip Report of EPA: Oct, 2007.
21 "The Apparel Water Quality Initiative in China: An Initiative of BSR's Environmental Research and Development Team." Business for Social Responsibility: 2007.
22 "As China Roars, Pollution Reaches Deadly Extremes." (August 26, 2007) The New York Times
23 Ibid.

Chinese national policy has moved toward a closer study of pollution and water, and a recently added amendment to China's Water Pollution Law stated that all cities with populations of more than 250,000 must build water treatment plants.[24] In the recently published "Eleventh Five-Year Plan," China calls for a departure from the "old, growth-at-any-cost model that has led to many rivers being polluted," and a greater focus on optimizing resources and protecting the environment.[25] Additionally, President Hu Jintao and Premier Wen Jiabao set new goals for environmental cleanup and sustainable development, and for the first time, local government leaders may be evaluated on environmental performance and energy efficiency accomplishments, in addition to the usual performance standard of GDP growth.[26]

In particular, the Chinese government has announced that it will invest ¥1.4 trillion ($175 billion) in environmental protection programs from 2006 through 2010, a threefold increase on previous commitments. Speaking at a televised conference of the State Council on pollution control, Chinese Vice Premier Zeng Peiyan said, "The environmental prices we have paid for rapid economic growth are too high. Excessive wastewater is discharged, health hazards caused by water pollution frequently occur, and many regions do not have a stable supply of drinking water."[27] In October 2005, China Water Resources Minister Wang Shucheng announced plans for the central government to invest $30 billion in urban water supply projects and $50 billion in wastewater projects over the next five years.[28]

Finally, the Chinese government has gradually been raising the price of water. Until 1985, water was supplied free of charge. While this was consistent with China's socialist system, it did nothing to encourage farmers, factories or families to make efficient use of water. Hence, the price hike is intended to encourage both conservation of water and investment in new projects.[29]

Multinational Involvement in Chinese Water Management

Amid criticisms of environmental mismanagement, the Chinese government and environmental activists are increasingly pointing to the flip side of the issue: the role multinational companies play in China's growing pollution problem by demanding low prices for Chinese-made products. One of the ways that Chinese factories have been able to keep costs low and meet sustained downward pricing pressure from their customers is to

[24] "Water Supply and Treatment in China: Industry Analysis." Research and Markets. Retrieved April 18, 2008 from <http://www.researchandmarkets.com/reportinfo.asp?report_id=343&t=e&cat_id=>
[25] "Eco-friendly production attracts broad interest in the textile industry." (June 2006) Journal for Asia on Textile and Apparel. Retrieved April 18, 2008 from <http://textile.2456.com/eng/epub/n_details.asp?epubiid=4&id=314>
[26] "The National Eleventh Five-year Plan for Environmental Protection (2006-2010)." English version release date March 5, 2008. Retrieved April 18, 2008 from < http://72.14.205.104/search?q=cache:nM-2jyX7escJ:www.chinaenvironmentallaw.com/wp-content/uploads/2008/03/the-national-eleventh-five-year-plan-for-environmental-protection.doc+The+National+Eleventh+Five-year+Plan+for+Environmental+Protection+(2006-2010)&hl=en&ct=clnk&cd=2&gl=us&client=firefox-a>
[27] "Efforts Urged to Curb Water Pollution." Gov.cn: Chinese Government's Official Web Portal. Retrieved April 18, 2008 from <http://english.gov.cn/2006-07/23/content_343473.htm>
[28] "China, parched and polluted, puts a price on water." (December 16, 2005) International Herald Tribune. Retrieved April 18, 2008 from < http://www.iht.com/articles/2005/12/16/business/rdevchin.php>
[29] Ibid.

simply dump their wastewater directly into rivers. Treating contaminated water can cost upwards of $0.13 per metric ton, so large factories processing high volumes of water can save hundreds of thousands of dollars a year by sending wastewater directly to rivers in violation of China's water-pollution laws.[30] This predicament was recently cast in stark relief when local authorities visited Hong Kong–based Fountain Set Holdings Ltd. and discovered a pipe buried underneath the factory floor that was dumping roughly 22,000 metric tons of contaminated water into a nearby river every day.[31]

However, as the scale of China's environmental degradation receives increasing media attention, global apparel brands, among other multinationals, are scrambling to prevent environmental issues from creating the same kind of consumer backlash as the anti-sweatshop campaigns of the past decade. As Liz Claiborne's vice president for ethics and compliance said, "After labor issues, the environment is the new frontier. We certainly don't want to be associated with a company that's polluting the waters."[32]

In recent years, large brands such as Nike, Inc., have begun to implement stricter environmental-compliance requirements for their supplier factories. In addition, many businesses interested in corporate social responsibility and environmental management programs have begun partnering with non-governmental organizations such as BSR on projects to improve wastewater discharge in apparel manufacturing plants in China. A prime example of such an initiative is the formation of the AWQWG, a coalition of global apparel brands intent on developing an industry standard for the environmental performance of their suppliers. The group's Water Quality Guidelines offer these mills and laundries standardized performance benchmarks for conservation and wastewater quality, with the goal of reducing overall environmental impact.

Survey Design & Implementation

Survey Design

Against this backdrop, the BSR MAP Team developed a comprehensive survey to systematically obtain reliable and consistent information during the team's factory visits. The objective of the survey was to allow the team to analyze and prioritize the issues affecting water use and wastewater treatment in apparel factories at the operational and managerial levels. The survey consisted of a robust set of questions addressed to factory managers and water specialists in four priority areas:

> *Practices*, including wastewater treatment processes in use; intake sources and modes of discharge; and monitoring and compliance systems;

[30] Ibid.
[31] "China Pays Steep Price As Textile Exports Boom." (August 22, 2007) Wall Street Journal
[32] Ibid.

Challenges, including government regulations; brand water management standards and buyer-seller relationships; industry trends; and other operational challenges;

Knowledge-level, including training programs for water specialists; technical knowledge of wastewater treatment techniques; awareness of local, regional and national regulations and regulatory trends; planning for future investments on water management;

Costs, including operational costs of wastewater treatment systems; prices of water intake and discharge; other financial considerations.

The team categorized the survey questions into these four priority areas in order to approach water management issues from multiple angles that would cumulatively provide a comprehensive picture of water management at the factories visited.

The survey was developed with guidance from BSR staff and various American and Chinese experts in water management. The team examined working documents from the AWQWG to gain in-depth understanding of BSR's current water initiative in China. They reviewed recent research findings from the Natural Resources Defense Council (NRDC). And they engaged in conversations with brand members of the AWQWG to gauge their perspectives on water issues in their supply chains and their commitment to effecting change regarding water pollution in China. These resources provided the necessary background and context for survey development and implementation.

Given its objective to identify not only patterns in water management but the often non-quantifiable factors that influence those patterns, the BSR MAP Team designed the survey to be predominantly qualitative in nature. The team included quantitative elements in the survey primarily to provide a standardized contextual background for each factory; these data do not reflect the precision required for an outright audit. Qualitative data were gathered for the purpose of exemplifying factory processes for the sake of developing strategic recommendations for both factories and brands.

Survey Implementation

The factories surveyed were selected in advance by the brands and were said to constitute a representative sample of factories in the Guangdong province. The BSR MAP team worked directly with several AWQWG brands to coordinate their factory visits. Because, generally, access to factories is difficult to obtain without prior relationship with the owner or factory manager, members of the AWQWG made introductions to selected factories on the team's behalf. In conjunction with the brand's introduction, the team also sent each factory a formal letter clarifying the nature of its visit and proposing an agenda. These introductions gave the team legitimacy, and motivated factory managers to grant the team access to their plants.

The team visited 11 factories throughout Guangdong province, shown in **Figure 1** below.

Figure 1: Factories surveyed in Guangdong province

Strategically, the team's survey approach allowed for open disclosure of factory information. Prior to their visits, the team learned that one of the challenges brands face when they try to monitor their factories is a lack of transparency and reliable information. Factories generally construe visits by brands as audits, and therefore a potential threat to their current operations. As a result, managers tend to be hesitant in sharing candid information. To allay the fears of factory managers when approaching them, the BSR MAP Team was careful to position itself in the least threatening light possible. The team stressed that it was composed of business students tasked to research water management practices and the competitive landscape of apparel factories. It made clear that information gathered would be used solely for research and educational purposes, and would not be used to determine a factory's compliance with government regulations. The team also promised that its research findings would be published in only aggregate form—i.e., factories would not be named or specifically cited in findings—and noted that all team members had signed a non-disclosure agreement to that effect.

The team believes that these assurances allowed factory managers to speak openly and honestly about their business practices without worrying about adverse consequences. At each factory visited, the team was able to interview key managers of business and water

functions. In some instances, factory owners and/or brand representatives were present, as well. In all cases, the team believes it received frank, candid information about factory processes and general management.

Factory visits typically began with a discussion with one or more senior factory managers about the production and water treatment processes of the plant, followed by a tour of the factory's manufacturing and wastewater treatment facilities accompanied by a factory water specialist. Manager and water specialists provided detailed explanations of water treatment processes and other technical details during these tours. Usually, when these tours concluded, the team would again meet with the factory manager for continued discussion of its observations and the current strategic challenges that the factory faced.

Survey Database

Upon completing its factory visits, the BSR MAP Team created a comprehensive database tabulating its survey data for analysis. The team categorized its primary data into four general areas: background; water management; regulation and monitoring; and strategic considerations. This structure highlighted general correlations across a range of factories, as well as specific trends within key categories. The general categories in the database are shown in **Figure 2** below.

Figure 2: Four key categories of data

Background	Water Management	Regulation and Monitoring	Strategic Considerations
Production	Source of water	Government monitoring	Greatest challenge
Processes employed	Intake details	Brand monitoring	Strategic considerations
Age (years)	Discharge details	Internal monitoring	Cost benefit analysis
Cost of construction	Pre-treatment	Perception of brand interest	General environmental trends
Employees (#)	Treatment processes	Consequences for failure	Perception of environmental impact
Labor utilization	Water treatment staff	Trends in future regulation	Training
Brands contracted	Discharge method		

Factory Profiles

Survey Sample

The BSR MAP Team surveyed a small but diverse set of factories, which ranged widely in their characteristics.[33]

Age – The factories visited ranged in age from as little as two years old, to as much as 20 years old. Over 44% of the factories were more than 10 years old.

Employees – The number of employees ranged from as few as 100 to as many as 5,500. The team found that factories generally appeared clean and well-maintained.

Output – The total monthly order output (pieces per month) ranged from 150,000 to 1,800,000. The factories generally operated at utilization rates between 60% and 80% of annual capacity.

Customer Base – The number of apparel companies that any one factory supplied ranged from five to over 100. This coincided with the observation that the greatest percentage of total factory output devoted to a single brand ranged broadly from 8% to 90%.

Product Mix – Factories visited produced either jeans and shirts, knit wool-based apparel and athletic apparel, with 90% of factories making only one category. Jeans/shirts factories comprised 64% of the team's sample; athletic apparel, 9%; and wooleries, 27%.

Water Usage and Sources

Laundering represented the most common water usage activity among the factories the team visited, occurring at 100% of the factories. Only 9% of factories performed dyeing operations.

Water usage within factories also varied considerably. The range of volume of water intake spanned from as low as 20 metric tons, to as high as 5,000 metric tons. Intake cost ranged from $0.06 to $0.32 per metric ton.

The primary source of water for factories was municipal tap, but a minority of factories also used water from nearby streams or rivers. An even smaller minority used ground water as their water source.

[33] All data and observations presented reflect the BSR MAP Team's primary research.

Wastewater Treatment

In all factories, wastewater underwent some type of treatment after use in production processes. Each treatment system utilized one or more of the following treatment processes: screening; settling; biological treatment; filtering; disinfection; and sludge handling.[34]

All factory wastewater treatment facilities had either been constructed or upgraded within the last 10 years. Facilities varied greatly in terms of construction costs, as well as costs of operation and maintenance. Construction costs ranged from $14,000 to $2 million, and operation costs ranged from $0.05 to $0.31 per metric ton of water treated. These figures include the costs of labor, chemicals, and energy used. The BSR MAP Team found no correlation between the costs of treatment and complexity of treatment system or volume of water treated.

The team found that wastewater treatment systems tended to be more complex for factories that used greater volumes of water—particular factories that used more than 1,000 metric tons per day. The team also found greater complexity when no municipal treatment was available. **Figure 3** below illustrates these correlations.

Figure 3: Comparing water treatment processes, intake volume and municipal treatment

FACTORY:	1	2	3	4	5	6	7	8	9	10	11
ADDTL MUNI TREATMENT (YES, NO, UNSURE	YES	n/a	NO	YES	YES	UNSURE	NO	UNSURE	NO	NO	NO
VOLUME OF INTAKE (metric tons / day)	20	150	n/a	250	600-1000	1000	1000	2000	3000	n/a	5000
TREATMENT PROCESSES											
Chemical Treatment (Coagulation, pH adjustment, etc.)	x		x	x	x	x	x	x	x	x	x
Physical Solids Removal (Screening, Settling, etc.)		x	x	x	x	x	x	x	x	x	x
Biological Treatment			x		x	x	x	x	x	x	x
Filtration			x				x	x	x	x	x
Disinfection	x					x				x	x
Sludge Treatment				x		x	x	x	x	x	x
Recycling				x	x	x			x	x	x

Nearly half (45.5%) of treated effluent water from wastewater treatment processes was discharged directly into a natural water body (river, stream and/or lake). Just over half (54.5%) of treated effluent water was discharged into a municipal collection system where it was expected to receive additional treatment. In some cases, municipal collection system included small streams and open channels that were designated for use as wastewater transmission systems. It was unclear whether water in these streams and channels is treated downstream at a municipal wastewater treatment facility.[35]

[34] See Appendix 3 for details on conventional wastewater treatment processes
[35] Interview with local environmental expert: April 2, 2008.

Wastewater Recycling

The team found that 54.5% of factories recycle a portion of their treated wastewater effluent. Of the factories that recycled, 83% recycled between 70% and 80% of their discharge water.

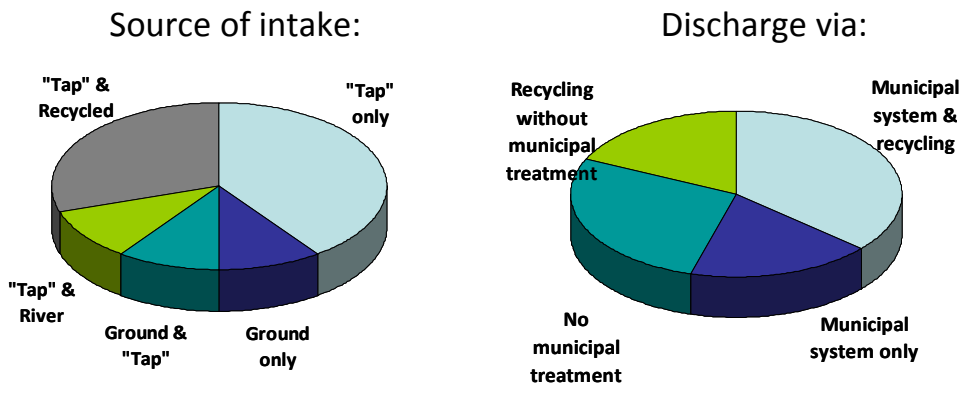
The team learned that the reasons for recycling wastewater vary. The majority of factories cited regulatory policy influences on both the local and regional scale as the driving force behind their recycling. In one example of regulatory influence, regulators limited the amount of water that a factory was permitted to draw from their water source. Its water cut short, the factory was forced to implement recycling in order to maintain its capacity to meet production demands. A smaller number of factories cited rising municipal water costs as the driving force behind their recycling; as the cost of their municipal water source rises, recycling becomes more economical.

Factories frequently referred to recycled water as "second water," and used it for landscaping, toilets and showers, and cleaning, but not for drinking or production processes. One third of factories that recycled provided additional treatment to their recycled water before reusing it. This additional treatment did not have any affect on the quality of wastewater effluent discharged from the plant, as it only applied to the recycled water.

Some recycling programs resulted in unexpected factory cost savings. In one factory, a manager pumped his treated wastewater into his rooftop garden in order to lower the temperature for workers in the factory, not realizing the economic benefit in terms of utility costs saved until later.

Sources of intake and means of discharge are summarized in **Figure 4** below.

Figure 4: Sources of intake and methods of discharge



Solid Waste Disposal

Factories also employed varied methods of disposing of waste sludge generated in their water treatment processes. In over half of the factories (54%) sludge was compressed and disposed

of through a municipal or contract waste disposal. In 36% of factories, the team found no solid waste handling at all. In these factories, sludge was not separated from wastewater; rather, it was discharged along with treated effluent. A small minority of factories (9%) incinerated their solid waste sludge.

A Varied Landscape: Government Regulation

The BSR MAP Team found that government regulation and enforcement is the main factor in determining water management practices. Interestingly, and in contrast to the team's expectations, all factories were certified by their local regulating agencies as being in compliance with water quality standards.

Water Quality Standards

A wide range of agency policies and legislative acts regulate water management practices in Chinese apparel factories. While there exists a set of national standards applicable nationwide, additional local and regional governmental regulations vary greatly from province to province and city to city. Additionally, regulations differ greatly depending on factory location, type, processes used, and size. According to a Chinese wastewater expert interviewed by the team, the U.S. and China maintain similar water quality standards, but a lack of enforcement coupled with an excessive scale of discharge mean that China is considerably more polluted than the U.S.

Compliance Monitoring and Enforcement

The team found great differences in government monitoring from factory to factory, both in terms of frequency of monitoring and of methods employed for monitoring. Monitoring frequency ranged from once-a-year to continuous, in which cases testing was an automated continuous part of the wastewater treatment process. Of those visited, 27% of factories employed continuous monitoring, 18% had monthly monitoring, 18% had quarterly monitoring, and the rest employed irregular annual or semi-annual monitoring.

Monitoring methods also differed greatly among factories. In one factory, for example, water test samples were taken from a mid-point in the production process and not from the actual place of discharge, meaning additional waste products could be dumped relatively easily into the water flow without being detected. In another, a continuous automatic monitoring system was set up to send an SMS text message to the mobile phone of the local environmental regulator in the event of a violation of wastewater quality standards.

As noted, all factories visited had received certification of their compliance with water standards by their regulating agency. The evidence of this was provided by the up-to-date compliance certificates and operating licenses that hung on the wall of every factory visited. Granting of this license was said to be contingent upon the factory's passing of various monitoring tests. However, based on conversations with factory managers, environmental

compliance appeared to be just one of many factors involved in the issuance and renewal of operating licenses, and it was implied that other factors may take precedence. One anecdote shared by a factory manager described a factory owned by the local government itself, whose license renewal review process was "more flexible" than other neighboring factories.

The most cited consequences of non-compliance were fines, immediate shut-down, or eventual non-renewal of operating license. Regarding fines, 63% of factories interviewed were aware of this consequence, yet they admitted that occasional fines were not a major impediment for their business. Indeed, the largest fine reported to the team was $1,500. But unlike fines, immediate shut-down or non-renewal of operating license seemed to be by far of the greatest importance. 73% of factories were aware of the potential for eventual or immediate shut-down as a consequence of non-compliance. And one factory manager reported that in his area the number of laundries had fallen from 80 to 20, the rest having been shut down, in some cases as a consequence of non-compliance. Nevertheless, no factory manager reported being concerned for their business, since all were certified as compliant.

"No Rationale For Improvement"

The BSR MAP Team found that current regulations and enforcement offer little incentive to improve water management at factory level. As a result, factory managers have no rationale for further improvements. Not only were factories in compliance with existing government regulations; they felt that compliance fulfills their environmental obligations. Factory managers felt no ownership of their wastewater discharge once it left their property, and very little accountability for its environmental effects. Many did not know whether their discharged water is further treated municipally.

While there was a sense among managers that water quality and management are important, is the BSR MAP Team perceived a disconnect between any sense of environmental accountability and individual action. While factory managers recognize the desire among the government and global apparel brands for improved water quality, they do not necessarily consider it their role to be involved in any way. Moreover, they do not consider it their responsibility to know whether their factory is contributing to the problem; rather, they perceive it the government's job to make that determination.

The factories surveyed feel they are well-positioned to meet future challenges, represented by stricter regulatory standards and enforcement measures. In fact, a number of factories reported that they currently exceed existing standards, so they still had "breathing room" in the event that regulations and enforcement became incrementally stricter.

The "Good Enough" Mentality: Water Management Training

The BSR MAP Team found that training plays a limited role in water management, and that factories consider the current level of training for water managers to be satisfactory.

Managers perceive training to be necessary insofar as it ensures compliance with regulations and continued operation of the factory. When asked about the likelihood of investing in additional training, one factory manager responded: "If our water specialists are maintaining our compliance, why would they need additional training?"

Beyond compliance, managers perceived no real need for additional training, and had little knowledge of potential economic benefits of continuous improvement programs. Indeed, training was not seen as a means of optimizing water management, or a way of improving operational efficiency and reducing costs.

Of the visited factories, none were planning on investing in additional water quality and management training in the foreseeable future. A greater need for training was perceived by factories that employed more complex processes, but only insofar as managers were able to run their more complex treatment systems. Several managers admitted that additional training would be "helpful" for their business; yet these managers are currently not willing or planning to invest in it.

Types of Training

As with regulation, the BSR MAP Team found that training varied from factory to factory according to both local regulations and water processes employed. At the moment, factories utilize two major sources of training: internal or on-the-job training; and training organized by the government. Only one factory reported receiving training from a brand. No factory reported receiving training from an external water management organization.

Of nine factories responding,[36] all reported using in-house, on-the-job as the primary training method for their water specialists. These trainings were generally informal; would take place on ongoing basis; and would be "taught" by either more experienced personnel or people who had benefited from government training.

Two-thirds of factories responding received government training. However, the BSR MAP Team found that government training was infrequent and scheduled on as-needed basis. These trainings, which lasted only one day, were typically held for lead water managers, as well as newly hired water specialists. The BSR MAP Team was unable to secure a copy of the government's training program.

Water Management Outsourcing

Several factories outsourced their water management function. This was not implemented as a cost-saving measure, however, but because factory managers did not know how to properly operate their own wastewater treatment facilities.

[36] Only nine of 11 factories surveyed responded to the BSR MAP Team's training questions.

Not a Priority: Water vs. Other Business Concerns

The BSR MAP Team found that water management is not considered a pressing issue by the factories at this moment and it does not represent a priority. Moreover, the apparel factories in Guangdong province currently face a multitude of strategic business challenges, all very important and with direct impact for company's net result. Under these circumstances, water management ranks low on factories' list of priorities. The major problems the factories are concerned with are presented below.

Rising Labor and Worker Retention Costs

63% of factories interviewed considered the increasing cost of labor—including both increases in wages as well as challenges in retaining workers—to be their most pressing concern. China's new labor law, which became effective January 1, 2008, is expected to further increase these costs.

Price Pressure

A quarter of factories surveyed identified as their most pressing problem the constant pressure coming from the brands for low prices. As their cost base continues to increase, not increasing selling prices deteriorates factories' operating margins.

Rising Prices of Material Inputs

12% of factories stated that increasing prices of utilities—including water intake—raw materials such as fabric and dyes, and chemicals used in the water management processes represent their most pressing issue. These costs put additional pressure on margins.

The Competitive Environment

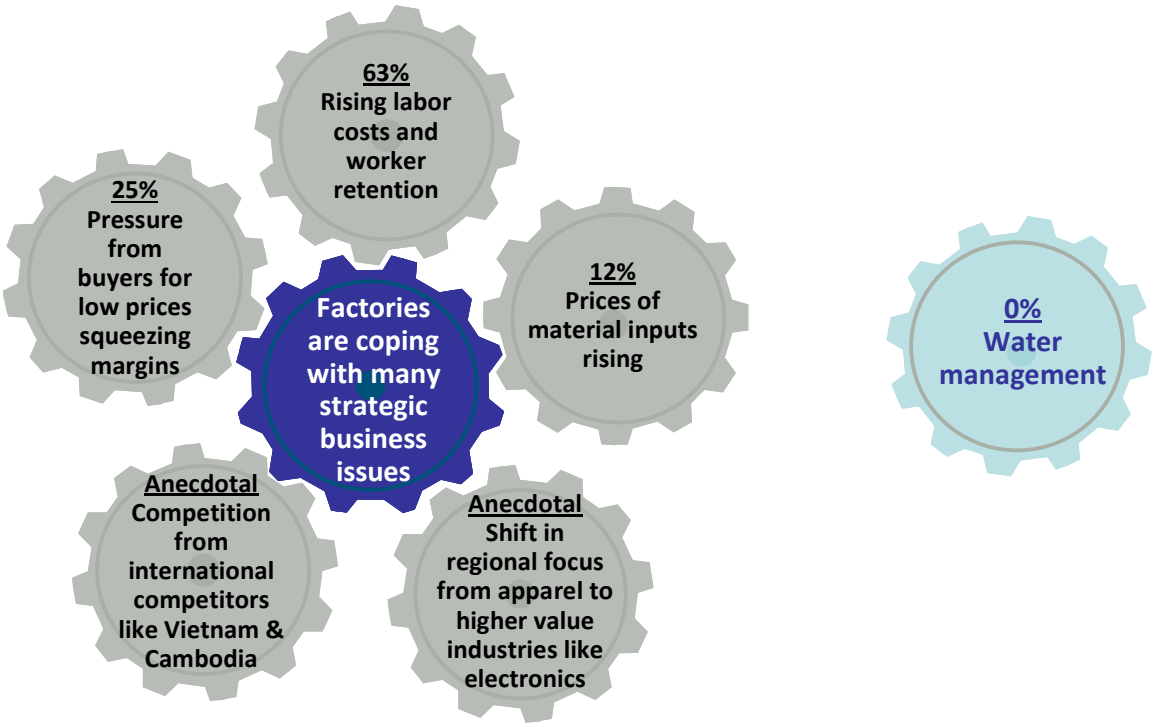
Chinese factories are now facing stiff competition from their Asian counterparts. Countires like Cambodia and Vietnam register lower labor costs, and a more relaxed regulatory environment, allowing them to compete with China on price.

Changing Regional Focus

Meanwhile, China's government is increasingly repositioning Guangdong province away from so-called "dirty" industries, including apparel and textile manufacturing, and toward higher value-added industries, like electronics, semiconductors and chemicals. Through stricter regulations and enforcement measures and economic policy shifts, the Chinese government is gradually moving the textile industry into the northern regions of the country.

These strategic issues are summarized in **Figure 5** below.

Figure 5: Strategic business issues affecting apparel factories in Guangdong



Communication Breakdown: Brand Involvement

The BSR MAP Team discovered a clear disconnect between brands' stated interest in environmental stewardship along their supply chains, and how this interest was actually received at factory level. The team found that current brand involvement with suppliers sends the message that brands are concerned with water management at the factory level only insofar as factories are certified as compliant with government regulations. Currently, factories do not perceive brand buyers to be concerned with the environmental impact of their operations as long as they maintain compliance.

Factories perceived brands' concerns as ranked below:

> *Safety of garments* – 82% of factories believed that the safety of wearers of their apparel was the brands' top concern.
>
> *Concern for the environment in general* – 55% of factories perceived this concern to be of medium importance for the brands, while the remaining 45% actually believed this was of low importance to brands.

Willingness to provide water management training and/or share costs of water management – All factories believed that brands had very little or no interest in either providing training or cost-sharing on water management.

Brand vs. Government Monitoring

Reflecting the perception of low brand concern over the environment, the BSR MAP Team found that monitoring by individual brands was less intensive and thorough than government monitoring. Brands generally did not conduct audits of water management operations, specifically; rather water management monitoring was conducted as part of a general, broader audit. The frequency of such audits was significantly lower than that of government audits, reaching at most four times a year. More influential still, most brands limited the water-focused elements of their audit to an inspection of recent government audit reports and a validation of the factory's water management compliance documents and operating license. One factory manager reported: "None of our brands set a standard tougher than local government regulations. Brands care about chemicals and how they affect worn clothing. Regarding water quality, brands rely on the government."

Brand Leverage

The team identified several specific levers of brand influence over factories, as well as several manifestations of seller power that factories have over brands. The following represent the most-cited levers of brand buyer-power:

High order of volume – Factories related that the high volume of orders from global brands was very important to their businesses. Moreover, the majority of factories work only with international buyers; only 27% worked with Chinese domestic buyers. Moreover, factories recognized that the Chinese domestic apparel market is highly fragmented and regional, with limited barriers to entry, meaning that no major domestic brand-buyer is expected to emerge and compete on scale with global brands.

Reliability of payments – Unlike domestic buyers, global brands were reportedly reliable in their payments. Factories considered this to be a strong advantage to working with global brands.

Long-term relationships – Many factories had worked with their buyers for many years, and considered this important to continuous future partnership. Most factories expressed a clear intent to maintain strong relationships with their regular buyers.

Buyer "blocs" via brand alliances – Although factories reported that their individual brand business was conducted bilaterally, the BSR MAP Team identified an opportunity for brands to exercise greater control over their factories via negotiating collectively with factories that supply multiple brands. Doing so would boost the influence of the above levers through increased order volume and coordination among the brands.

The BSR MAP Team also identified several factors that diminish brands' influence over suppliers. The most frequently identified weaknesses in brand buyer-power were:

Continuing depreciation of the American dollar – Most brands make payments in U.S. dollars. Thus, factory managers reported that the depreciating dollar was significantly affecting profitability margins.

Weakness of the American economy – Additionally, factories expressed deep concerned over the slowing U.S. economy, and reported that an American recession would be hugely detrimental to their business, since the U.S. is the main buyer of their output.

Consolidation of the apparel manufacturing industry in China – Due to a number of factors, including stricter regulations and enforcement, factories in China are running a higher risk of being put out of business, creating opportunities for healthy manufacturers to seize vacated market share. In addition, some larger manufacturers have launched aggressive acquisition campaigns to buy up smaller and underperforming factories.[37]

[37] BSR Apparel Water Quality Initiative Forum.

Conclusions & Recommendations

Upon completing its research, the BSR MAP Team issued a set of conclusions and recommendations to brand and factory managers at BSR's Apparel Water Quality Initiative Forum on April 7, 2008. The team designed each recommendation to provide some form of economic and/or strategic benefit, as well as improvements in water management. These recommendations are intended to inform and be integrated during the second and third phases of BSR's Apparel Water Quality Initiative.

Expectations vs. Reality: A Lack of Awareness

The background research undertaken by the BSR MAP Team painted a grim picture of the pollution problem in China. Findings from the scientific community and environmental groups unanimously pointed to serious environmental degradation and health damage in Southeastern China and its river deltas caused by polluted effluent from factories. This perception was reinforced throughout the team's conversation with BSR and various brands.

Upon starting the engagement, it was the team's understanding that brands are heavily concerned by China's environmental problems, and are actively taking steps to address the issue. In meetings with several brands, their representatives communicated a strong message on their organizations' awareness of the problem, and their dedication to exploring solutions for reducing their environmental impact along their supply chains.

Prior to conducting its factory visits, the team expected to find egregious regulatory violations of water quality standards during their inspections, as well as some degree of brand influence toward improving failing factory practices. In summary, the team expected:

> *Poor factory water management practices* and frequent non-compliance with government and brand water standards, leading to readily apparent environmental damage;
>
> *Brands to be greatly concerned* with the water management practices of their suppliers, and to prioritize water quality during their inspections and audits of supplier factories;
>
> *Brands' concern about water management to be clearly communicated* to suppliers, such that factory managers would share a sense of urgency over improving water management.

What the BSR MAP Team found during its factory visits differed considerably from its expectations, however. Instead of discovering obvious misconduct and an absence of water treatment, the team encountered 100% factory certification of compliance and ubiquitous wastewater treatment—albeit involving a wide variety of processes and apparent discharge quality from factory to factory.

On the issue of brand oversight, the team observed that factories generally do not receive thorough or frequent inspections from the brands, and that brands are currently less than effective in communicating their values and concerns about water management. Indeed, current brand practices are sending the message to factory managers that brands are not overly concerned about water use and treatment in supplier factories. Moreover, the team discovered a general absence of collaboration and knowledge-sharing between brands and factories.

The discrepancy between the team's expectations and reality suggested that the major obstacle to addressing the water management issue is the lack of awareness that a problem exists. The brands' lack of tangible action to implement and enforce their own water management guidelines communicated to the factories that water is low on their list of priorities. Furthermore, a host of competing strategic priorities such as rising labor costs and diminishing operating margins rank much higher in the minds of factory managers and push the water management issue to the wayside.

A Need for Collaboration: Brand Conclusions

In terms of water management and environmental impact, managers perceive their certification of compliance as sufficient to meet government and brand requirements. Thus, compliant-certified factories see no rationale for changing current practices. Furthermore, managers of apparel factories are coping with many strategic business issues, and do not consider water management to be a pressing issue.

The brands' values of and expectations for improved water efficiency and quality have not been expressed effectively to factory managers, and the current breakdown in brand-factory communication reinforces this perspective. From the factories' points of view, brands pay minimal attention to water treatment and discharge quality when inspecting factories. Brands' occasional requests for chemical content testing of factory water leads factories to believe that brands care only about water quality insofar as the chemicals used in manufacturing processes do not harm garment wearers; on broader environmental impact issues, the brands rely on government standards and enforcement. Brands have not pursued cost-sharing strategies. Only rarely have they discussed water management strategies and standards with factory managers. All of this reinforces the "good enough" and "isolationist" mentalities among factory managers.

Thus, the BSR MAP Team concludes that there is a clear need to increase brand involvement in water management in supplier factories, and for brands to work collaboratively on water issues. Moreover, the factories' perception that brands are disinterested in water quality can be easily reversed. With high order volumes, reliability of payments, and long-term relationships, brands have at their disposal a good deal of influence over factories through buyer power. A simple low-cost program improving communication of brands' interest in environmental protection would change factories' perceptions. This conclusion underpins the team's recommendations to brands.

Brand Recommendations

The BSR MAP Team's recommendations to brands are also designed for implementation now and in the future. The first two recommendations focus on collaboration between brands, and may be implemented now. The second two recommendations are longer-term in scope, and are designed to be most effective if implemented in conjunction with BSR's China Training Institute. All were also designed to complement the recommendations to factories.

Maintaining stability along their supply chains is critical to brands' continued competitiveness. While the BSR MAP Team notes that its recommendations to brands do not afford as many opportunities for immediate economic benefits as its recommendations to factories, implementation of the following recommendations will support medium- and long-term supply chain stability. Fulfilling corporate social responsibilities will prevent consumer backlash over environmental mismanagement. Environmental mismanagement not only tarnishes brands' integrity; it can also result in costly disruptions to brands' supply chains if brands are forced to suspend doing business with questionable suppliers.[38] Moreover, mismanagement can lead to supplier closures due to regulatory violations.

The BSR MAP Team recommends that brands do the following:

1. *Subscribe to and implement a set of unified, standardized wastewater guidelines.*

Currently, wastewater treatment and quality guidelines exist—for example, the AWQWG's guidelines. But brands have yet to collectively agree to and uphold a unified standard. Effective implementation of water quality guidelines has greatest strength when brands commit en masse. A single standard collectively upheld will solve the communication breakdown between brands and suppliers, and make clear to factories that brands do care about water management. Such guidelines will also provide a common, easily understood benchmark on water quality, and potentially simplify and streamline suppliers' compliance management. For brands, a unified, appropriate, published standard will ensure that they are fulfilling their CSR responsibilities. It will also eliminate the current burden on brands to develop their own set of compliance standards. And it will provide a level of consistency in monitoring and enforcement on behalf of all brands.

2. *Collaborate on inspections of factory wastewater systems.*

Through collaboration on inspections, brands will more reliably ensure that factories are meeting standards, and they will eliminate the cost of redundant audits. As a means of facilitating collaboration, brands should consider employing a third party to perform the

[38] Although its research scope was limited primarily to suppliers, the BSR MAP Team recommends further study of the economic impact of disruptions to brands' supply chains. At BSR's Apparel Water Quality Initiative Forum, breakout sessions following the team's presentation revealed concerns among brands and suppliers over consolidation in the apparel manufacturing industry, which may result in closures of supplier factories.

inspections. More generally, as with the recommendation to unify water guidelines, collaboration on inspections will leverage brand unity to increase influence over factories. Additionally, collaboration on inspections will reinforce brands' message to factories that they are seriously concerned about water management.

3. Encourage factories to train water managers.

Complementing its recommendation to factories to better train their managers, the BSR MAP Team recommends that brands facilitate supplier training. Supplier training will help ensure that water managers have up-to-date knowledge of water treatment best practices and that water management processes are optimized. Additionally, improving suppliers' operational efficiency will strengthen brand-factory relationships, as brands helps their suppliers cut costs.

The team further recommends that brands consider actively investing in the training of factory suppliers. Such financial investment will further strengthen brand-factory relationships, leading to longer-term cost-beneficial collaboration and reduced risk of supply chain disruption.

4. Share best practices, and facilitate sharing of best practices among factories.

As with factories, the BSR MAP Team recommends that brands share best practices with each other and with their factory suppliers. Currently, brands operate more or less independently on environmental issues. Appearing to the consumer more environmentally friendly than competing brands may afford short-term gains, but sharing best practices via a coalition of brands will ensure overall water quality. Sharing best practices will also lower supplier costs and help ensure that brands' supply chains remains strong.

These recommendations are summarized in **Figure 6** below.

Figure 6: Summary of recommendation to brands

CRITICAL ISSUE:	WATER GUIDELINES	COLLABORATION	TRAINING	BEST PRACTICES
Recommendation	Subscribing to and implementing a set of unified, standardized wastewater guidelines	Collaborating on inspections of factory wastewater systems	Encouraging factories to train water managers	Sharing best practices, and facilitating sharing among factories
		… which will …		
Water Quality & Efficiency	Require factories to meet a common benchmark for water quality	More reliably ensure that factories are meeting standards	Ensure that factory managers have up-to-date knowledge	Allow factories to more easily adapt current systems to improve water quality
Economic	Streamline suppliers' compliance management	Reduce cost of performing redundant inspections	Improve suppliers' operational efficiency	Lower costs along the supply chain
Strategic	Ensure that brands are meeting their CSR responsibilities	Leverage brand unity to increase influence	Strengthen long-term relationships with suppliers	Reduce risk of supply chain disruption

The "Isolationist" Mentality: Factory Conclusions

As the BSR MAP Team's survey data show, apparel factories in Guangdong differ greatly in terms of age, size, number of employees, customer mix, production capacity, use and treatment of water, and on many other dimensions. Moreover, factories operate in an extremely varied business landscape and a highly diverse regulatory and operational environment. Within this environment, factory managers are at a loss to see the utility of sharing best practices.

The BSR MAP Team concludes that these extreme differences in situation, coupled with a lack of knowledge sharing among factories and limited involvement by brand-buyers, lead to an "isolationist" mentality among factory managers. This mentality transcends their sense of environmental responsibility, and results in managers making decisions based on their factory's unique situation, without necessarily considering their broader environmental context and impact.

No factory manager reported any communication with fellow factory managers on their operations. (Accordingly, no factory manager reported and oversight of the fabric-makers or dye-houses from which they sourced their fabrics and yarns.) In part, this was due to a cautiousness about disclosing proprietary information on plant processes or strategies. Yet water management practices represent relatively standardized, well-understood processes, across all factories. Thus, the BSR MAP Team concludes that there is a no-cost opportunity

for managers to share information on water treatment practices without running the risk of divulging strategic information about plant business. This conclusion forms the basis for the team's recommendations to factories.

General managers are greatly concerned by labor, pricing, international competition, product output and quality, but pay little attention to improving their water treatment operations. Factory mangers have the perception that, once factory water treatment systems are installed, little monitoring and maintenance of the equipment is needed. Hence, they do not invest in additional training of their water treatment staff. Similarly, management of water treatment specialists maintains the status quo, "good enough" mentality. Since water discharge quality is meeting government standards, and managers feel that their facilities will remain compliant-certified even as regulations and enforcement become stricter, managers perceive no need for change.

In addition, factories are currently doing little to research operational improvements in water management. The BSR MAP Team's recommendations to factories are designed to not only improve the overall management and quality of water, but to identify potential areas where operational costs can be reduced through optimization. The team believes that its recommendations will help factories stay competitive in an environment where costs are rising and price pressures are extreme. Additionally, by implementing these recommendations, factories will remain positioned to address increasing water quality standards. As brands become more concerned with their suppliers' impacts on the environment, factories that implement these recommendations will also strengthen their long-term relationships with buyers.

Factory Recommendations

The BSR MAP Team's recommendations to factories are designed for implementation now and in the future. The team recommends that factories do the following:

1. *Seek out areas for improving water management efficiency.*

This recommendation may be implemented immediately. During its factory visits, the BSR MAP Team identified a number of "low hanging fruit"— opportunities to easily and cheaply improve operational efficiency in water treatment facilities. For example, several factories were applying chemicals to water treatment tanks without agitating the tank water. This resulted in excessive use of the chemicals—and wasted resources—because the chemicals, once diluted in water, have a short potency lifespan, and are thus less efficient without proper mixing. The investment in and installation of a simple mechanical stirrer would distribute the chemicals more effectively, requiring less chemical use. A simple cost-benefit analysis would show whether the cost-savings of lowered chemical use outweigh the cost of the stirrer. At another factory, pH was not monitored effectively, also resulting in the costly overuse of chemicals.

2. *Perform an analysis of the economic benefits of recycling treated factory wastewater.*

This recommendation may also be implemented immediately. Often, treated water can be easily reused for factory processes, as well as alternative uses. The factories surveyed who recycled wastewater cut their water intake and discharge costs substantially. Managers who used recycled water for dormitory washrooms witnessed cost-savings on intake. The manager who invested in a rooftop garden to lower the temperature for workers indoors achieved cost-savings in terms of his air conditioning bill. An analysis of the economic benefits of recycling will reveal these opportunities for cost-savings.

3. *Invest in the continued education of water managers.*

Currently, factory managers are satisfied with the level of training of their water managers. Likewise, water managers are satisfied with their own level of training. Yet operational efficiencies and proper maintenance of equipment may be being overlooked. Training of water mangers will help ensure that water managers have the best skills to improve water quality and best knowledge to improve operational efficiency. Continued training will lead to fewer mistakes, the proper maintenance of equipment, the proper use of chemicals, and cleaner water. It may also provide new ideas for water process optimization and recycling, further reducing operational costs and cutting water use.

4. *Develop a shared knowledge base of best practices among factories.*

To counteract the "isolationist" attitude of most factory managers, the BSR MAP Team recommends creating a shared knowledge base for factory managers. Sharing best practices will allow factories to continuously and collectively improve their water management systems, thus improving overall water quality. Knowledge-sharing will also help managers identify opportunities for process optimization, leading to reduced costs. The team notes factory managers will need to take into account the diversity of government environmental standards when sharing information, and that those located in the same region will be able to better anticipate and share information about regulatory changes.

These recommendations are summarized in **Figure 7** below.

Figure 7: Summary of recommendation to factories

CRITICAL ISSUE:	OPTIMIZATION	RECYCLING	TRAINING	BEST PRACTICES
Recommendation	Seeking out areas for improving water management efficiency	Performing an analysis of the economic benefits of recycling	Seeking out more opportunities for training for water managers	Developing a shared knowledge base of best practices among factories
		… which will …		
Water Quality & Efficiency	Use less water; ensure that water discharge meets standards	Lower water intake	Ensure that factory managers have the best skills to improve water quality	Allow factories to more easily adapt current systems, improving water quality
Economic	Reduce costs by improving operational efficiency	Reduce water intake costs; reduce other costs via alternate uses of recycled water	Reduce costs by improving operational efficiency	Identify areas for optimizing processes and reducing costs
Strategic	1. Stay competitive in a rapidly changing marketplace 2. Remain positioned to address changing water quality standards 3. Strengthen long-term relationships with buyers			

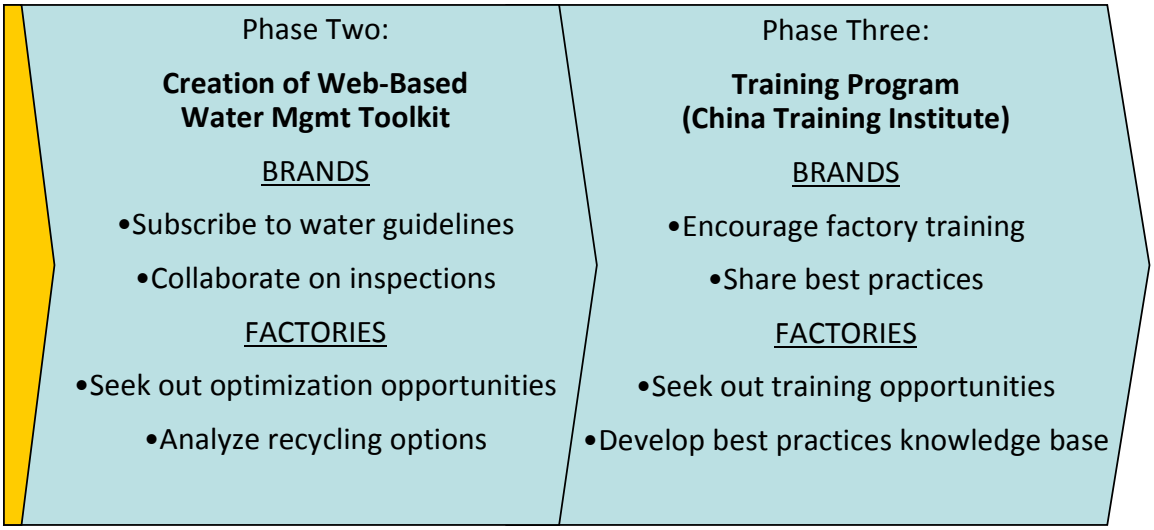
Integration of Recommendations

After presenting its recommendations to brand representatives and factory managers at BSR's Apparel Water Quality Initiative Forum, the BSR MAP Team was pleased to hear from managers that—despite their considerable experience in the sector, often spanning several decades—they were able to take away new ideas from the team's findings and recommendations. The team's presentation opened the discussion during subsequent breakout sessions. The team was also pleased that, during these sessions, factory representatives and brand managers who had not participated in the survey confirmed many of the team's observations and findings.

As mentioned, the team designed its recommendations to provide workable courses of action during the second and third phases of BSR's Apparel Water Quality Initiative. The team's first and second recommendations—for brands to finalize and subscribe to a set of water guidelines, and begin collaborating on factory inspections; and for factories to analyze optimization and recycling opportunities—complement BSR's plan to create a water management toolkit. The third and fourth recommendations—for brands to support the training of factory managers; for factories to seek out training opportunities; and for both to work together to share knowledge and best practices—support BSR's plan to develop and roll out a training program for factory managers and brands.

The BSR MAP Team's recommendations for implementation are summarized in **Figure 8** below.

Figure 8: Summary of recommended rollout of BSR MAP Team recommendations



The BSR MAP Team hopes that this report makes abundantly clear that strong opportunities to improve awareness on water efficiency and quality exist in the globalized apparel industry. The team is proud to offer recommendations that will not only lead to improvements in water management, but will offer economic and strategic value to global apparel brands and their factory suppliers, and will provide a foundation for BSR's Apparel Water Quality Initiative.

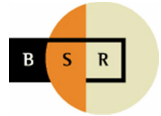
Appendices

Appendix 1

BSR MAP Team's Database

Factory	1	2	3	4	5	6	7	8	9	10	11
Region	Dongguan	Dongguan	Huiyang	Huizhou	Guangzhou	He Yuan	Guangzhou	Huangpu	Changpi	Dongguan	Zhu Hai
FACTORY BASICS											
MAKES											
woolery		x		x				x			
jeans	x		x				x		x	x	x
shirts	x					x					
PROCESSES											
weaving & knitting		x		x					x		
dyeing						x				x	
cutting & sewing				x			x		x		x
finishing	x					x	x		x	x	x
washing	x		x	x			x	x	x	x	x
packaging				x					x	x	
AGE (YEARS)											
1 to 2		x					x				
3 to 5						x					x
6 to 9										x	
10 to 14								x			
over 15	x		x						x		
EMPLOYEES											
under 250	x					x		x			
250 to 500											
500 to 1000			x							x	
1000 to 1500									x		
1500 and up		x			x						x
PRODUCTION											
# shifts			1						2	2	3

production capacity (million pieces)	.750-1		1.20	2.50	1.80		0.60	0.24	0.60	1.00
production output (pieces)	.350-7.00		1.20	1.80	1.80	1.20	0.15	0.24	0.6	0.70
utilization	60-80%		100%	70%	100%		25%	100%	100%	70%
BRANDS										
Gap	x (10%)		x				x (50-60%)	x	x (30%)	x
Levis			x						x (30%)	
Target										x
Express										x
H&M										x
JC Penney					x					
Adidas					x					
Li & Fung		x		x (33%)		x	x (30%)	x		
other foreign brands	x (30%)	x	x	x (67%)	x	x	x (5-6 others)	x	x (40%)	x
Chinese domestics	x (60%)					x				
GREATEST % OF BIZ FROM ONE BRAND										
0-20%	x									
20-35%				x				x	x	
35-50%			x							x
above 50%					x (90%)		x			
CONSTRUCTION COSTS										
cost of factory (million RMB)					12.00					40.00
cost of water treatment facilities (million RMB)	1.00	1.00	0.50	minimal	3.00	0.50		0.10	6.00	15.00
% total cost				minimal	25%					37.5%
WATER BASICS										
SOURCE OF WATER										
ground				x			x			
municipal "tap"	x	x	x		x	x	x	x	x	x
river/lake									x	
recycled		x	x		x			x	x	x
INTAKE										



perception of intake qual (1-10): 10 is highest		~7 to 8	9	9		8 to 9			9	>7 for river; ~8-9 for municipal	9 to 10
volume of intake (tons per day)		250	600-1000	150		2000	1000	20	1000	5000	3000
cost of intake (RMB per ton)		2.25 (includes 0.6/ton waste charge below	2.00	.60-.70		0.70	1.30	2.7 (includes discharge fee)	1.5	0.45-2.12	1.68
DISCHARGE											
perception of discharge qual (1-10): 10 is highest			9	6 to 7		8 to 9			8	7	8 to 9
volume of discharge (tons per day)		200	~300	150	30000	2000	1000	20	1000	~5000	500-1000
cost of discharge (RMB per ton)		0.60	0.60	0.00		0	0	see cost of intake	1.00	1.40	0.24
% of discharge recycled for factory use		0%	70%	0%	70%		0%	0%	0%	80%	recycled, but amount unknown
% of discharge recycled for domestic use		75%	0%	0%	0%	0%	0%	0%	15%	0%	recycled, but amount unknown
volume of solid waste "sludge" (tons per X)		50/day		minimal		22.5 /month		0			100/month
cost of solid waste disposal (per ton)				minimal		5,720 RMB / month	2.00-3.00	0		3000 RMB per month flat	70,000/month
PRE-TREATMENT											
softening		x	x			x			x		x
iron removal		x									
WATER MGMT STAFF											
# water technicians	2		4	1		2	8	3	6	15	10
govt training			x				x	x	x	x	x
on the job training	x		x	x		x	x	x	x	x	x

TREATMENT PROCESSES											
Chemical Treatment (Coagulation, pH adjustment, etc.)	x	x	x		x	x	x	x	x	x	x
Physical Solids Removal (Screening, Settling, etc.)	x	x	x	x	x	x	x		x	x	x
Biological Treatment	x		x		x	x	x		x	x	x
Filtration	x				x	x	x			x	x
Disinfection					x			x	x	x	
Sludge Treatment		x			x	x	x		x	x	x
Recycling		x	x		x				x	x	x
addtl muni treatment (YES, NO, UNSURE)	NO	YES	YES		NO	UNSURE	NO	YES	UNSURE	NO	NO
volume of intake (tons per day)		250	600-1000	150		2000	1000	20	1000	5000	3000
cost of chemicals use in treatment (RMB)		~1.00 / ton		0		94,380+/ month					50,000 / month
COST OF TOTAL TREATMENT PROCESSES		2.20 / ton		minimal		0.60 / ton		0.33 / ton		1.40 / ton	.42 / ton
WATER DISCHARGE VIA…											
Sewer / WW Collection System		x						x			
river	x		x	x	x	x	x		x	x	x
evaporation			x	x							
addtl muni treatment (YES, NO, UNSURE)	NO	YES	YES		NO	UNSURE	NO	YES	UNSURE	NO	NO
SOLID WASTE DISCHARGE VIA…											
muni garbage collection				x		x					x
contract disposal		x					x			x	
REGULATIONS & OVERSIGHT											
WHO MONITORS / REGULATES YOUR WATER MANAGEMENT											
manual government / EPA	x	x	x	x		x	x	x			
automatic government / EPA					x				x	x	x
brands / buyers	x		x				x			x	

manual internal	x		x		x	x	x		x	x	x
automatic internal											
GOVERNMENT MONITORING											
frequency of monitoring (per year)	12	1	10+	12	6	4	150	4	Auto	Auto	Auto
visual testing	x	x		x			x			x	
pH testing	x	x		x	x		x			x	x
auditing / other testing	x	x	x		x		x	x	x	x	x
BRAND MONITORING											
frequency of monitoring (per year)	2		2	0		4	2				4
visual testing	x						x			x	
pH testing	x						x			x	
auditing / other testing	x		x			x	x		x	x	x
INTERNAL MONITORING											
frequency of monitoring (per year)	365		365	0		~12	365		365	365	365
visual testing	x	x	x		x	x	x		x	x	
pH testing	x		x		x		x		x	x	x
auditing / other testing	x	x	x		x	x			x	x	x
PERCEPTION OF BRANDS' INTERESTS (1=low, 3=high)											
concern for environmment	1	2	2	1	2	2	2	1	1	2	1
concern for safety of clothing	3	3	3	3	3	3	2	3	1	3	3
willing to provide water mgmt training	1	1	1	1	1	1	1	1	1	1	1
willing to cost share on water mgmt	1	1	1	1	1	1	1	1	1	1	1
CONSEQUENCES OF GOVT TESTING FAILURE											
fines			x			x	x	x	x	x	x
immediate shut down			x			x	x		x		
non-renewal of license	x	x	x		x	x	x		x	x	
report without follow-up	x		x	x	x				x		
METHODS BEING USED TO											

REDUCE WATER COSTS										
reducing water intake		x							x	
increased recycling		x						x	x	x
internally processing waste					x					
other										
GENERAL STRATEGIC ISSUES										
WHICH OF THE FOLLOWING DO YOU CONSIDER THE GREATEST STRATEGIC COST ISSUE FACING YOUR BUSINESS?										
labor / labor retention	x		x	x		x				x
water / water treatment	x								x	
inputs / raw materials								x		
reduced buyer prices							x			
general mgmt / ohead										
WHICH OF THE FOLLOWING ARE YOU CONSIDERING DOING?										
diversifying customer base	x					x				
diversifying products										
moving						x				
reducing water management costs			x					x	x	
collaborating with other factories					x				x	
other		x	x			x	x			
Sludge Solids discharged to Boiler					x					
monitoring equipment out of service					x					

Appendix 2

Survey Questions to Factory Managers

Questions for Factory Manager

1. What factors—regulations, community perception, economics, buyer demands—affect your management of your water?
    - What factors are the most challenging for your factory?

2. How much of a priority is water management among all the factors that affect your business?

3. Do you have an Environmental Management System in place?

4. How is your water use regulated?
    - (Local, national, brand requirements)
    - Are there regulations that limit your water input and output?
    - Are there regulations that mandate how you treat and dispose of your wastewater?

5. How will future regulations affect your business?
    - What are you planning to do about it?

6. Is there any water management training provided?
    - Who gets it?
    - What's it like?
    - How much money do you spend on training?

7. What kind of training would you like to have?

8. Are the water management costs significant?
    - How much money do you spend on wastewater treatment?

9. Are you concerned about the amount you have to pay for water consumption and treatment?
    - If so, what are you doing to reduce the cost?

10. Do you currently have any plans to change your water management practices?
    - If so, what are they and why are you changing?

11. What is the role of the brands in your water management practices?
    - Do you partner with the brands on water management? (cost sharing, or other incentives such as long term contracts, etc.)

12. Do the brands request data from you about your water management?

- If so, what type of data are they interested in?

Questions for Water Specialist

1. What is your source of water (open bodies of water, private wells, publicly-owned wells, municipal supply, off-site reclaimed water, other)? *(determine if satisfied with quality)*

2. How do you monitor your water operations?
   - Does someone collect the data?
   - If so, how do they use the data?

3. How much water do you use (input)?

4. How much product do you make (per day/week/month/year)?
   - (Number of operational periods)

5. What types of processes that use water are performed at your facility(spinning, dyeing, weaving, finishing, cutting, other)?
   - What chemical are used in these processes?

6. How are chemicals disposed of?

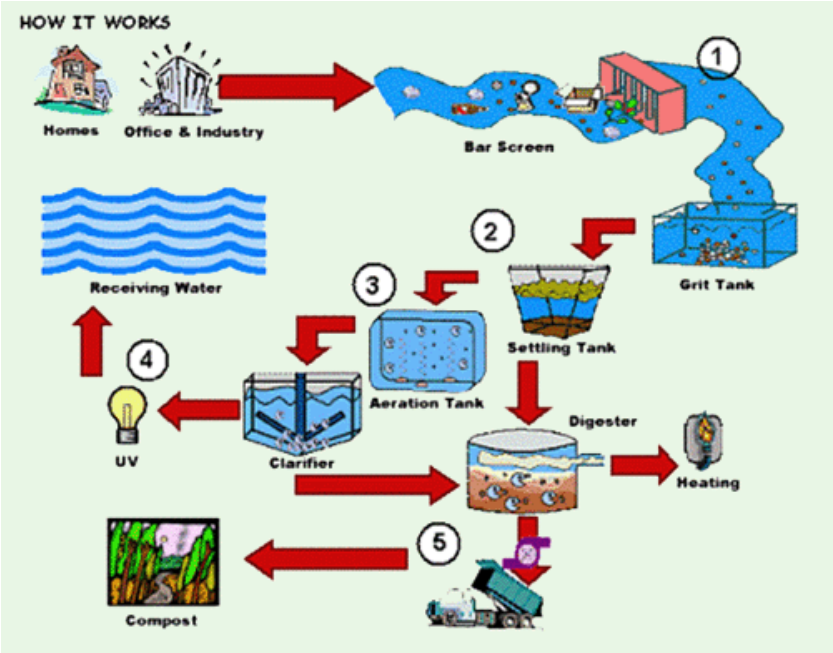
7. How much waste water do you generate (output)?

8. What wastewater treatment processes are used (neutralization, precipitation, coagulation, suspended solids separation, oil/water separation, biological, air stripping, granular activated carbon, ultra filtration, electro dialysis, chemical oxidation, ion exchange, reverse osmosis, carbon adsorption, UV/oxidation, dye recovery, ozonation, other)?

9. Where is your water discharged (lakes, river/stream, open sewers, storm drains, dry land, wetland, public water treatment facility, private water treatment facility, on site treatment facility, other)?

Appendix 3

General Wastewater Treatment Processes



Source: Liquid Waste Department, Regional District of Nanaimo, British Columbia[39]

1. **Preliminary treatment** - Bar screens are used to remove rags, sticks, plastic and other large foreign objects from the wastewater.
2. **Primary treatment** – Primary treatment allows for the physical separation of solids from the wastewater. Velocity of the wastewater is reduced, and screened wastewater flows into a settling tank where solid particles settle (by gravity) to the bottom of the tank. The settled particles are collected and discharged to further treatment and solids handling.
3. **Secondary treatment** - Secondary treatment is a biological treatment process where microorganisms consume organic matter in the wastewater as their food supply. As the micro-organisms' populations grow, they create solid organic material (sludge). This sludge is then discharged to further treatment and solids handling.
4. **Final treatment** - The wastewater that remains can be disinfected to kill harmful micro-organisms before being released into receiving waters. There are many methods of disinfection, including use of ultra-violet light radiation, but the most common disinfectant used in wastewater treatment is chlorine.
5. **Solids processing** – Micro-organisms convert solids from the settling tanks and sludge from secondary treatment into by-products such as methane gas and water. The result is a reduction of pathogens and the production of a wet soil-like material called "biosolids" that contain 95-97% water. Mechanical equipment such as belt filter presses or centrifuges are used to squeeze water from the biosolids before it is sent to some type of solid waste management, including composting, landfill covering, etc.

[39] Wastewater Treatment Diagram. Accessed April 2008 from < http://www.rdn.bc.ca/cms.asp?wpID=1164>

Appendix 4: Pictures of factory wastewater treatment facilities

Settling pools

Solids removal

Chemicals used for water treatment


Adding chemical

Aeration and biological treatment

Sludge compression

Automated (“continuous”) testing

Recycling treated water to a rooftop garden, lowering the temperature inside the factory below

Treated water in a reservoir

Water leaves the wastewater treatment facility

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