TOXIC THREADS

Toxic Threads: Putting Pollution on Parade

How textile manufacturers are hiding their toxic trail

GREENPEACE

Contents

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Terminology used in this report

Bioaccumulation: The mechanism by which chemicals accumulate in living organisms and get passed along the food chain.

Hormone disruptors: Chemicals known to interfere with hormone systems of organisms. For nonylphenol, the most widely recognised hazard is the ability to mimic natural oestrogen hormones. This can lead to altered sexual development in some organisms, most notably the feminisation of fish*.

Persistence: The property of a chemical whereby it does not degrade in the environment, or degrades very slowly.

Surfactants: Chemicals used to lower the surface tension of liquids. They include wetting agents, detergents, emulsifiers, foaming agents and dispersants used in a variety of industrial and consumer applications including textile manufacture.

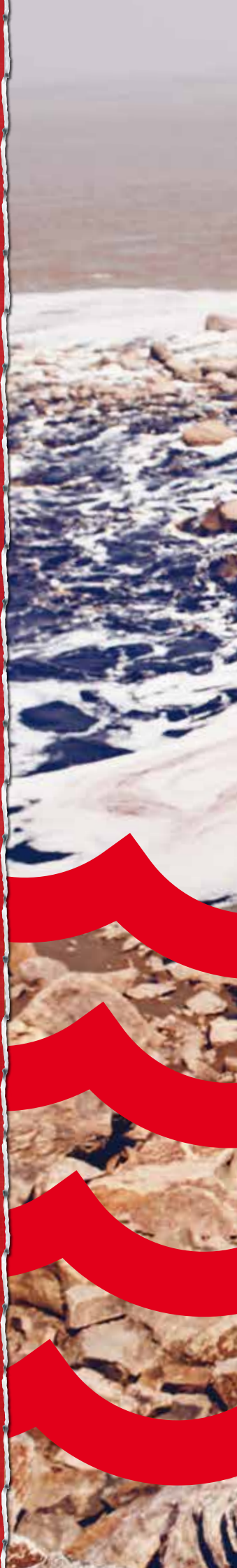
**Jobling S, Reynolds T, White R, Parker MG & Sumpter JP (1995). A variety of environmentally persistent chemicals, including some phthalate plasticisers, are weakly estrogenic. Environmental Health Perspectives 103(6): 582-587; Jobling S, Sheahan D, Osborne JA, Matthiessen P & Sumpter JP (1996). Inhibition of testicular growth in rainbow trout (Oncorhynchus mykiss) exposed to estrogenic alkylphenolic chemicals. Environmental Toxicology and Chemistry 15(2): 194-202.*

Note to the reader

Shaoxing. All the data presented in this report in relation to Shaoxing, refers to Shaoxing County rather than the city of Shaoxing.

Global North and Global South. Throughout this report we refer to the terms "Global North" and "Global South" to describe two distinct groups of countries. The term "Global South" is used to describe developing and emerging countries, including those facing the challenges of often-rapid industrial development or industrial restructuring, such as Russia. Most of the Global South is located in South and Central America, Asia and Africa. The term "Global North" is used for developed countries, predominantly located in North America and Europe, with high human development, according to the UN Human Development Index.* Most, but not all, of these countries are located in the northern hemisphere.

** United Nations Development Programme (UNDP). (2005). Human Development Report 2005. International cooperation at a crossroads. Aid, trade and security in an unequal world. Available at: http://hdr.undp.org/en/media/HDR05_complete.pdf*



Brands have a duty to not only focus on international supply chain enforcement, but also to engage fully in public disclosure with regards to their use of hazardous chemicals.

images: (1) Smoke billows from chimneys belonging to dyeing factories in the Shaoxing Binhai Industrial Zone; (2) Raw fabrics are piled up in front of a factory, ready to be dyed; (3) Canals next to the factories and the wastewater discharge pipe are filled with black water.
All images © Qiu Bo / Greenpeace

TOXIC THREADS

#1

Textiles and toxic chemicals

A new investigation by Greenpeace International has found a wide range of hazardous substances in the effluent of communal wastewater treatment plants (WWTPs) from two industrial zones in China, as well as in a nearby river after a pollution accident.

Following on from previous research in China (see Box 1), Greenpeace has investigated the manufacture of textiles where the immediate impact from the discharge of effluent into waterways from production is most visible. This new research focused on the discharge of hazardous chemicals from two industrial zones in Zhejiang Province, where a high proportion of textile manufacturers are located.

Unlike the facilities in the previous investigation, these factories don't discharge their hazardous chemicals through their own dedicated pipelines. Instead, the facilities in these industrial zones generally send their effluent to centralised WWTPs. This practice, implemented by the Chinese authorities in an attempt to make the pollution from industrial discharges more manageable, is commonly used by textile manufacturers and other industries in China. Unfortunately this makes tracing the responsibility for the use and discharge of hazardous chemicals to individual facilities extremely complicated.

All of the samples in this study[1] contained a diverse range of chemicals, many of which have known hazardous properties. Many can be related to the manufacture of textiles. Many also have uses in other industrial sectors that may also discharge effluents to WWTPs. Their occurrence is consistent with the presence of many textile manufacturing and related facilities in the two industrial zones, and has parallels to Greenpeace's previous studies of textile manufacturing wastewaters in China, and is also consistent with other potential non-textile related sources. **This raises the question of the exact sources of these chemicals.**

Greenpeace expects brands and their suppliers to come forward if these chemicals are being used in the manufacturing of their products, and to work with Greenpeace to commit to zero discharge.

The hazardous chemicals found either in a sample of WWTP effluent from at least one of the locations, or from the "Red River" pollution incident (see Box 3), include:

- **Chlorinated anilines**, compounds related to the manufacture and use of dyes, many of which are toxic to a wide range of organisms, including aquatic life, and some – identified at the Linjiang site – are known or suspected carcinogens.
- **Perfluorooctanoic acid (PFOA)**, as well as a number of hazardous **chlorinated** chemicals, were also present. PFOA is a highly persistent and bioaccumulative toxic chemical that can arise from the use of **perfluorinated chemicals (PFCs)** in textile manufacture or other industrial uses.
- In addition, **TMDD**, which is persistent in the aquatic environment and moderately toxic to aquatic life, was found at the Binhai site.
- Other chemicals found at the Linjiang site included **nitrobenzene**, which is carcinogenic in animals and possibly humans as well, and **chloronitrobenzenes (CNBs)**; some chemicals that are derived from CNBs for use in dye manufacture are also carcinogenic in animals and possibly humans;
- The water sample from the river in the Binhai industrial zone impacted by the pollution incident contained several toxic chemicals, including **n-alkyl anilines**, one of which is known to be toxic to aquatic life with long-lasting effects, as well as **brominated** and **chlorinated anilines**, toxic **brominated benzenes** and traces of **chlorinated benzenes**.

image Greenpeace investigators sample the polluted river adjacent to Shaoxing Binhai industrial zone. © Greenpeace

Many international brands source their products from facilities within such industrial zones. However, identifying whether individual suppliers who have facilities within the zones are releasing hazardous substances in their effluent is almost impossible. This provides a perfect smokescreen for unacceptable environmental practices at individual facilities, including the use and discharge of hazardous chemicals.

To solve this problem, transparency of information, between suppliers and brands, as well as full supplier engagement through hazardous substance-use inventories, is needed to enact and enforce corporate and governmental policies to eliminate the releases of hazardous substances and their substitution with safer alternatives. In addition, it is equally vital to have **full facility-level public disclosure, in line with the right-to-know principle**. This will create wider and deeper awareness within local populations, provide much needed information for civil society organisations and local citizens[2], and build societal awareness and informed pressure for comprehensive chemical management laws.

Companies therefore have a duty to not only focus on internal supply chain enforcement, but also to engage fully in public disclosure, which results in progress towards zero discharges of hazardous chemicals. This approach must have as its core the principle of substitution, such that hazardous chemicals are progressively replaced with safer alternatives.

Box 1: Fashion – a dirty business

This study follows four recent Greenpeace International reports – *Dirty Laundry, Dirty Laundry 2: Hung Out to Dry, Dirty Laundry Reloaded*, and *Toxic Threads: The Big Fashion Stitch-Up* – which investigated the discharge of hazardous substances from textile manufacturing and their presence in clothing and footwear.

Dirty Laundry found a range of hazardous substances being discharged into the Yangtze and Pearl River deltas from two textile manufacturers in China[1], with commercial links to many major clothing brands. The subsequent reports tested for the presence of hazardous substances in clothing products. These reports demonstrated the release of hazardous chemicals at two points in the textiles chain. Firstly, that the presence of hazardous chemicals in finished products shows they were used in the manufacturing facilities, which would have consequently led to their release in the country of production – as was indeed found for two facilities, as reported in *Dirty Laundry Reloaded*. Secondly, that these substances continue to pollute the environment and waterways around the world, wherever a product is sold to a customer and is subsequently washed. The study found that NPE residues in clothes are readily washed out when laundered.

image Numerous bottles of dyestuff piled up in an industrial zone in Shaoxing, Zhejiang © Qiu Bo / Greenpeace

image A dyeing factory in Shaoxing, Binhai industrial zone. Workers work alternative shifts every day for 12 hours a shift, without having any weekends. All images © Qiu Bo / Greenpeace

The production and export of textiles is concentrated in the eastern and south-eastern coastal areas.

Shaoxing County is reported to have more than 9,000 textile mills and one third of China's dyeing and printing capacity.

#2

Investigating pollution from “textile town”

The textile industry is an important sector of China’s economy, with more than 50,000 textile mills in the country.[5] The production and export of textiles is concentrated in the eastern and south-eastern coastal areas, including Guangdong, Zhejiang, Jiangsu, Shanghai and Shandong.[6] Across China, there are 164 textile industry clusters where companies specialise in manufacturing certain products.[7] A good example is Shaoxing County, in Zhejiang Province, which is reported to have more than 9,000 textile mills and 30% of China’s dyeing and printing capacity.[8] We suspect that the textile industry is substantially contributing to the extensive pollution of rivers and waterways in the Shaoxing County – also due to its use of hazardous chemicals[9] (see Box 2). Therefore, Greenpeace chose to focus on the discharge of effluent from two major industrial zones, one in Shaoxing and the other in nearby Xiaoshan.[10]

The scale of the textile industry in Shaoxing

It is said that Shaoxing – also known as “textile town” – is “a city built on cloth”. The textile industry in Shaoxing County[11] is the largest textile industrial cluster in China[12], producing over 17 billion metres of dyed fabric and over 130 million items of clothing in 2010.[13] Manufacturing products and processes include chemical fibres, weaving, dyeing, garments, and home textiles. This is reported to currently make up 58.5% of the local industrial economy, and is an industrial pillar for Shaoxing,[14] with the biggest textile trade centre in Asia – China Textile City – also based in Shaoxing.[15]

The main industrial complexes lie in the north of Shaoxing on the banks of the Qiantang River. The largest is the Binhai industrial zone. Further to the northwest lies the Linjiang industrial zone in Xiaoshan District, Hangzhou. Both industrial zones also contain other types of industry.

The Greenpeace International investigation focussed on two locations where wastewater is being discharged into the river adjacent to these industrial zones, as well as a location within the Binhai industrial zone where there was a river pollution incident. A number of samples were taken from these three locations in May 2012 and sent to the Greenpeace Research Laboratories at the University of Exeter, UK, for chemical analysis[16].

Qualitative analysis was used to detect the presence, though not the concentrations, of semi-volatile and volatile organic compounds. The concentrations of a range of metals and metalloids were also determined. In addition, certain subsamples were analysed for the concentration of a range of perfluorinated chemicals (PFCs) that cannot be identified using the utilised qualitative analysis method; these were quantified at an accredited independent laboratory.

Textile facilities – and other industrial facilities - in both industrial parks discharge their effluent into WWTPs, after some basic pre-treatment to meet a standard[17] to prevent it exceeding the WWTP capacity. However, many factories cannot meet this standard, and some also discharge wastewater illegally into nearby rivers.[18] There are 70 surface water-monitoring points in Shaoxing, and 51.7% do not meet the water quality targets.[19] The Head of Shaoxing County has admitted that, for a long time, the dyeing industry in Shaoxing has made the cloth beautiful but the clean water black[20]. To address the pollution, the local government has strengthened its inspection of illegal discharges, closed down small and inefficient factories in 2010 and moved dye factories into the Binhai industrial zone[21]. However, this has proven to be insufficient, as toxic chemicals are still being discharged into the environment via the Binhai industrial zone’s communal WWTP.

images Scientists at the Greenpeace Research Laboratories at the University of Exeter, UK, analyse water samples taken from the industrial zones

The Binhai industrial zone

The Binhai industrial zone, designed to be a centre for international textiles manufacturing, is one of the largest in Zhejiang Province, covering an area of 100 sq km. The main industries are textiles, petrochemicals, polyester fibres, biomedical and farm products processing.[22] Five billion metres of dyed fabric are produced every year in the Binhai industrial zone, equivalent to one-tenth of China's dyed fabric.[23]

The zone is comprised of multiple large industrial facilities, which discharge into the Shaoxing Water Treatment Development Co, Ltd WWTP (Shaoxing WWTP), which may also treat wastewater generated from several surrounding villages. Greenpeace investigations of the Binhai industrial zone included sampling the discharge of the huge pipe from Shaoxing WWTP on 28 May 2012. This WWTP discharges into the Qiantang River; a significant proportion of wastewater is derived from textile/apparel "wet" processes – for example, dyeing and printing.[24]

The Shaoxing WWTP is the largest in China in terms of volume of water treated each day.[25] It treats wastewater from all the facilities in the industrial zone.[26] Its capacity is 1.1 million tonnes of wastewater a day, and the total length of pipeline associated with the plant is 290km.[27] The outlet for treated wastewater is a large discharge pipe built out into the Qiantang River.[28] The discharge of large volumes of wastewater via the submerged pipe results in a surface "boil" immediately above the submerged outfall. On the day that Greenpeace took two samples of effluent from this surface boil, there was black wastewater coming from under the river surface.

Key findings

The samples from the outfall of the communal WWTP in the Binhai industrial zone contained a diverse range of chemicals, many of which have known hazardous properties.

These included:-

- A range of **chlorinated anilines**, compounds related to the manufacture and use of dyes, many of which are toxic to a wide range of organisms, including aquatic life;
- A perfluorinated chemical (PFC), **perfluorooctanoic acid (PFOA)**, with concentrations within the range previously reported for effluents from industrial wastewater treatment plants. This highly persistent and bioaccumulative toxic chemical can arise from the use of PFCs in textile manufacture, as well as from many other industrial applications;
- **TMDD**, a surfactant associated with the use of dye formulations (among other industrial applications) that is persistent in the aquatic environment and moderately toxic to aquatic life;
- Trace levels of a number of hazardous chlorinated chemicals of uncertain source, including **1,2-dichloroethane (ethylene dichloride, EDC)** and a **tetrachlorophenol** – both of which are carcinogenic to animals and possibly carcinogenic to humans;
- **Dibutylphthalate (DBP)**, a chemical with numerous industrial uses, including the manufacture of textiles. DBP is a widespread environmental contaminant that is toxic to reproduction;
- **Benzothiazolamines** (including some chlorinated derivatives); these were prominent compounds among the complex mixture of chemicals identified in the sample. These chemicals are commonly associated with the manufacture and use of dyes, although there is limited information on their toxicity.

In addition to identified chemicals, a significant proportion and, in some cases, most of the chemicals isolated from each of these samples could not be reliably identified using the state of the art chemical databases together with verification by expert interpretation. This raises questions not only about their identity but also their potential health and environmental impacts. Other chemicals were also found for which there is little or no information on their toxicity.

The Linjiang industrial zone

Four kilometres northwest of the discharge pipe from Binhai WWTP, on the same bank of the Qiantang River, a black swirl of wastewater about 50 metres in diameter is being discharged, creating a lagoon of wastewater. There is no sign of the source of the wastewater, but it originates from the Xiaoshan Linjiang WWTP, which is within the Linjiang industrial zone (Xiaoshan District, Hangzhou), adjacent to the lagoon. It treats industrial wastewater from most facilities in the Linjiang industrial zone, the Jiangdong industrial zone, and sanitary wastewater from five nearby towns and villages.[29]

The Linjiang industrial zone, located in the Xiaoshan District of Hangzhou, is made up of industries such as textiles, automobiles and construction materials, with the textile industry being a substantial component.[30] In the Linjiang industrial zone almost all the factories deliver their wastewater to the Linjiang WWTP for treatment.[31] Therefore it can be expected that wastewater from the majority of the textile facilities is treated at this WWTP.

Jiangdong industrial zone, also located in Xiaoshan District, is focussing on industries such as machinery, textiles, IT and new materials as its priority[32]. All the wastewater from Jiangdong industrial zone will also be delivered to Linjiang WWTP for treatment[33].

Greenpeace's investigations of Linjiang Industrial Zone included sampling the discharge of the Linjiang WWTP from the huge black swirl, on 28 May 2012. A significant proportion of waste-water is derived from textile/apparel "wet" processes (e.g. dyeing and printing).[34]

Key findings

The sample of wastewater from the Linjiang WWTP also contained a diverse range of chemicals, many of which have known hazardous properties[35].

These included:

- A range of **chlorinated anilines**, as for the Binhai industrial zone. Some chlorinated anilines identified at the Linjiang site are carcinogenic,[36] and as such are listed under regulations in China[37] (among other countries) that prohibit the use of azo dyes that can degrade to form carcinogenic amines;
- A perfluorinated chemical (PFC), **perfluorooctanoic acid (PFOA)**, with a concentration similar to that in the Binhai industrial zone samples. Three other perfluorinated chemicals[38] were also detected at the Linjiang site, though in these cases at concentrations below those typically reported for industrial and municipal effluents;
- **Chloronitrobenzenes (CNBs)** and **nitrobenzene**, both widely used toxic industrial chemicals with many applications, including dye manufacture. Both nitrobenzene, and some chemicals that are derived from CNBs for use in dye manufacture, are carcinogenic in animals and possibly to humans;
- A range of **chlorinated benzenes** (three dichlorobenzenes, and trace levels of tri- and penta-chlorobenzene), widely recognised hazardous chemicals with many industrial uses, including some related to the manufacture of textiles. They are persistent organic pollutants that can remain in the environment for a prolonged time and are well known environmental contaminants; their most common effects are liver and kidney damage, and 1,4-dichlorobenzene is carcinogenic in animals through inhalation;
- Trace levels of a number of hazardous chlorinated chemicals of uncertain source, including **1,2-dichloroethane (EDC)** – as also found in the Binhai samples, and which is carcinogenic to animals and possibly humans – and **chloroethane**, which is harmful to aquatic life with long-lasting effects and a suspected carcinogen.

Box 2: Pollution of the Qiantang River estuary and Hangzhou Bay

Shaoxing, one of China's cities of "Cultural and Historical Interest", is located in Zhejiang Province, on the southern edge of the Yangtze River Delta, on the south bank of Qiantang River.

It is one of China's most developed and prosperous cities, famous for its china, wine and silk, as well as its great number of canals and lakes. The Qiantang River is the biggest river in Zhejiang Province, and flows into Hangzhou Bay, and ultimately the East China Sea. The river and bay are famous for the world's largest tidal bore. Every year, millions of people flock to watch the tide on the 18th day of the 8th lunar month (at around the autumn equinox).

However, according to a recent report on China's oceans, Hangzhou Bay is one of the most polluted coastal areas in China, though there is no specific information on hazardous chemicals.[39] The East China Sea is reported as being polluted with persistent toxic chemicals, the major source of which is industrial discharge.[40] The situation prompted Greenpeace to investigate potential sources of pollution of hazardous chemicals in Hangzhou Bay.

Figure 1. The Binhai and Linjiang industrial zones, showing the three sampling locations.

Box 3: The "Red River" pollution incident

Besides the ongoing pollution associated with the textile manufacturing industry, there are many one-off incidents that also impact the local waters. On 8 May 2012, it was reported that a pollution incident had occurred in a river in Xiner village, in the Binhai industrial zone. According to surveys by the Shaoxing Environmental Pollution Bureau, it was caused by a dye manufacturer, the Zhejiang Deou Chemical Manufacture Co. Ltd. It was reported that the discharge pipe of this factory had burst, and that the wastewater had flowed directly into a small river that is part of the Qiantang River delta, polluting between 300 and 400 metres of river. The pipe of a Shaoxing chemical factory had burst and the river was red.[41] A sample of the river water was collected within 48 hours of the accidental spill, at 00.30am on 10 May 2012. The colour of the river water was no longer red at that time.

Key findings

The water sample from the river impacted by the pollution incident contained a number of chemicals similar to those identified in the wastewater discharges as previously described. Several of these chemicals are toxic to aquatic life with long lasting effects, including:

- A range of substituted **anilines**, compounds related to the manufacture and use of dyes. N-alkyl anilines predominated (one of which is known to be toxic to aquatic life with long-lasting effects), as well as some **toxic brominated anilines**, with a **toxic chlorinated aniline** as a minor component;
- A range of **brominated benzenes** with hazardous properties;
- In addition, a similar range of **chlorinated benzenes** to that found at the Linjiang site (di-, tri- and tetra-chlorobenzenes), albeit at trace levels.

Box 4: Details about two of the hazardous substances found in the samples[42]

Anilines: Halogenated anilines (also called halogenated benzenamines), along with other substituted anilines, are used in many applications including in manufacture of dyes (including azo dyes), rubbers and plastics, pesticides, herbicides and pharmaceuticals. Aniline and many of its chlorinated derivatives are readily soluble in water and are toxic to wide range of aquatic organisms; the toxicity of many of these chemicals to mammals is also well known, including reproductive toxicity or neurotoxicity for some and some are also carcinogenic. Three of the anilines identified in this study (chloroaniline, chlorotoluidine and *o*-anisidine), are among the carcinogenic amines listed in regulations in various countries, including China and EU member states, which prohibit the use in textiles of azo dyes that can degrade to form unacceptable concentrations of certain carcinogenic amines.

Perfluorinated chemicals (PFCs): PFCs are manmade chemicals that are generally highly resistant to chemical, biological and thermal degradation, used as water, grease and stain-repellent finishes on textile and paper products, as well as solvents and surfactants in industry, in cosmetics and plastic products and in fire-fighting foams. The stable properties of PFCs are also a major environmental downside, because of their long persistence in the environment once they are released. Some PFCs (PFOS and PFOA) have been reported as contaminants throughout the environment, including in freshwater, groundwater and seawater sediments and soils. Numerous studies have also reported the presence of PFCs in tissues of aquatic invertebrates, amphibians, fish, birds, and mammals including humans. Laboratory studies have shown that some PFCs can cause adverse impacts during development and during adulthood in animals; some PFCs have also been shown to act as hormone (endocrine) disruptors.

images: (1) A dyeing plant in Shaoxing, Zhejiang; (2) A dyeing factory in Shaoxing Binhai Industrial Zone: a plant with 5 dyeing machines will need about 250kg of dyestuff. Along with other additives, about 2,500kg of dyestuff paste circulates in the plant every day.

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#3

Global production, local pollution

As much as 70% of China's rivers, lakes, and reservoirs are affected by water pollution.[43] Escalating demand for water and the growing effects of climate change are worsening China's existing water shortage problem, which is exacerbated by water pollution. A quarter of the country's population have no access to clean drinking water.[44] If there is no action to tackle this problem, severe water shortfalls are likely for many regions across China.

According to data from MEP (Ministry of Environmental Protection of the People's Republic of China), industry accounted for 38.5% of the volume of wastewater discharged into water in 2010.[45]

General indicators show that pollution is abating slowly[46], despite the fact that water pollution is recognised by the Chinese authorities as a cause for serious concern.

In February 2012, Premier Wen Jiabao said that: "Water pollution is mainly resulting from industrial and sewage wastewater, and is now in very serious situation. It will become a disaster if we continue not paying attention to it or not dealing with it".[47]

This concern is shared by many people in China who have shown resistance to polluting industry. The public care about their local environment, and want the right to know about emissions from factories. There are reports of increased environmental awareness and frustration about inaction on pollution, with as many as 90,000 mass incidents sparked by environmental concerns in 2011.[48]

The scale of the textile industry in China

China became the largest exporter of textiles in the world in 1995, and it has maintained that position ever since.[49] As the major centre for textiles manufacturing, China is a key player in the growth of "fast fashion", where new fashion trends are manufactured in increasingly short cycles in response to customer preferences. However, this leads to increased volumes of clothing being made, sold and thrown away, magnifying the human and environmental costs of our clothes at every stage of their life cycle.

According to the 2011/2012 China Textile Industry Report, growth in the total value of all exported textile products has slowed to only 0.49%.[50] However, the value of exported printed and dyed products has increased by 31.26% year on year. Wet processing, such as printing and dyeing, can be highly polluting[51], and uses large quantities of water.[52]

The textile industry is built upon the use of a large number of chemicals, and China is now the largest consumer of textile chemicals, with 42% of global consumption.[53] Together with the chemical industry, it is reported to be one of the most polluting sectors in the country.[54] Yet, beyond very general pollution parameters – such as chemical oxygen demand[55] – there is very limited information about the discharge of individual hazardous substances into wastewater by Chinese textile manufacturers, or indeed by any industrial sector. Although textile industry associations in China are now addressing some aspects of the pollution problem, eliminating toxic chemicals from both production and products is not yet a major issue on the industry association's agenda.[56]

Regulation and enforcement inadequacies

The existing system for controlling industrial discharges was created as part of the Water Pollution Control Law,[57] which consists of a comprehensive system of ambient quality standards and technology-based effluent standards. However, these are inadequately enforced.[58] The system does not adequately and systematically address hazardous pollutants, some of which – even in very low concentrations – can endanger aquatic ecosystems and human health. Cleaner production standards require industries to reduce the use of toxic materials and list some key hazardous substances for clean production auditing, which relate to specific industries.

There are intrinsic problems associated with the pollution control approach and its emphasis on wastewater treatment plants. While these are effective at cleaning up certain types of pollution – such as sewage or other biological wastes – they cannot cope with many hazardous chemicals. **Some hazardous chemicals will pass through the treatment process unchanged, and be discharged to surface waters where they can enter the food chain and build up in downstream sediments**. Others can be converted into other more hazardous substances that are also discharged and/or can accumulate in other wastes generated during the treatment process. Hazardous wastes in the form of treatment plant sludge are therefore created, which in turn are disposed of, into landfills or through incineration, releasing the hazardous substances or their by-products into the environment.[59,60]

To date there is no mandatory regulation in China that requires industries to eliminate the discharge to water of a specific list of toxic chemicals.[61] However, there has recently been some improvement. On 17 October 2012, the Ministry of Environmental Protection (MEP), released its regulation "Measures for the registration of hazardous chemicals for environmental management", which will come into effect on 1 March 2013. This is the first ever regulation to manage the production and release of existing chemicals with environmental hazards in China.[62] This means that enterprises using and producing chemicals listed in the regulation will need to register and report such chemicals in the near future. The environmental hazardous chemicals list, set out in the Measures, is regarded as China's first step to register and eventually eliminate chemicals with intrinsic environmental and health hazards.[63] Moreover, the Measures require enterprises to provide information about chemicals, which should be made publically available via the Pollutants Release and Transfer Report outlined in the Measures.

image: Shaoxing, Zhejiang: A fabrics shop in Keqiao, where "China Textile City", the largest textile trade centre in Asia, is located.
Image © Qiu Bo / Greenpeace

image Shaoxing Water Treatment Development Co Ltd, Zhejiang: all wastewater from the Binhai industrial zone is sent here for centralised treatment. Image © Qiu Bo / Greenpeace

The dispersal of hazardous chemicals into water systems can only be addressed by the rapid and transparent elimination of their use at source.

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#4

Tracking the toxic discharges

All of the samples contained a diverse range of chemicals, many of which have known hazardous properties. Their presence in the wastewaters sampled is consistent with the fact that many textile manufacturing and related facilities are located within the two industrial zones investigated in this study. Many of the chemicals identified also have other industrial uses, therefore the possibility that other types of industrial activities contributed to their presence in the samples can't be ruled out.

While this small number of samples is clearly not representative of wastewaters released from industrial zones throughout China, or even of the textile manufacturing sector, they do provide an illustrative snapshot of what is likely to be a much wider problem of the discharge of industrial effluents containing a wide array of harmful contaminants.

Hiding in the crowd

Given the lack of information on the individual sources contributing effluent directed to communal WWTPs within the industrial zones, it is not possible to know which facility or facilities may be responsible for each of the various hazardous chemicals identified within discharged wastewaters. This situation is further exacerbated by the lack of publicly available information on the location of some outfalls through which wastewaters are discharged to the environment, even for large outfalls carrying mixed effluents from communal WWTPs within major industrial zones.

The construction of communal WWTPs within industrial zones is intended to improve the quality of the effluents being discharged into waterways in China, and certain pollutants within wastewaters can be treated in WWTPs. However, this method of pollution control does not prevent many hazardous substances[64] discharged by manufacturers from reaching the environment, and at the same time makes it impossible to identify the individual sources of any hazardous substance within the wastewater without additional use and release data for all individual facilities. Although monitoring the release of hazardous chemicals passing through common effluent treatment plants is possible – and is vital in highlighting what is likely to be a widespread problem - without knowing the individual sources, it is difficult to use this information to bring about changes in chemical use and management within individual companies.

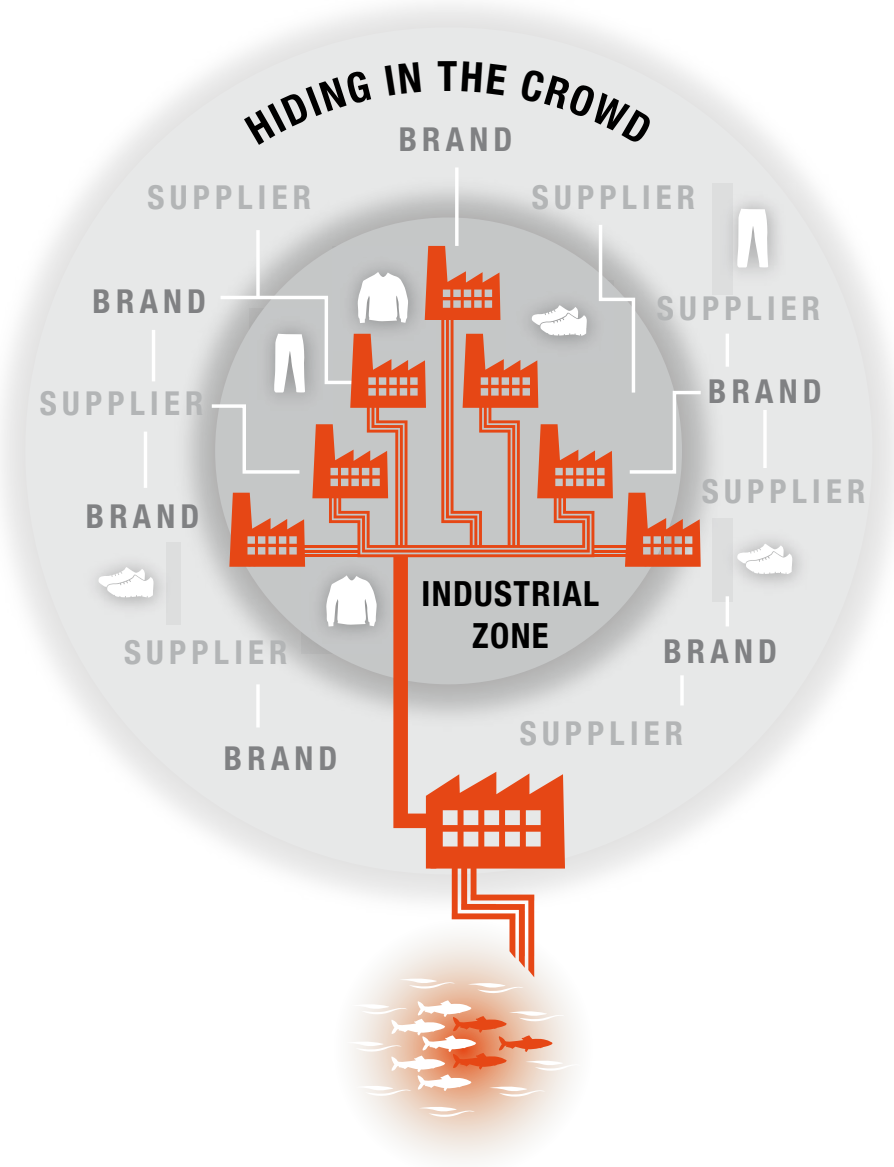
To solve this problem it is necessary to focus on documenting and progressively reducing the upstream use of hazardous chemicals at each manufacturing facility and for each process used. Ultimately, this will enable a shift towards less hazardous or preferably non-hazardous alternatives, including within the textile industry. **Making information on the current use and release of hazardous chemicals by individual facilities publicly available will be an important contribution towards that goal**.

Until such time as the use and discharge of hazardous chemicals is eliminated, communal WWTPs will remain an inefficient tool for adequate protection of the aquatic environment from this type of chemical pollution.

The role of fashion retail brands

Facilities manufacturing textiles within the Binhai and Linjiang industrial zones can be expected to supply many different companies, which are likely to include international clothing brands. While a few disclose their lists of suppliers, for most brands it is not possible to access this basic information. Even for those that do disclose their suppliers, it is impossible to attribute the chemicals discharged to any individual supplier when a communal WWTP is used to treat their effluents unless they would disclose information about the inputs they provide into such WWTP.

To further pinpoint the substances used in the manufacture of an individual brand's products by its supplier, when it may be making products for several different brands, is an additional challenge that must be addressed by the brands themselves as part of a comprehensive process to progressively eliminate hazardous substances and achieve Zero Discharges.



Box 5: Global brands and their links to "textile town".

In an attempt to shed some light on the global brands supplied from these industrial zones, Greenpeace contacted the following companies: **Abercrombie & Fitch, Adidas, Benetton, Bestseller, C&A, Coop (Swiss retailer), Esprit, Gap, G Star Raw, Guess, H&M, Levi Strauss, Limited Brands (multiple brands including Victoria's Secret), LVMH, M&S, Mango, Metersbonwe, Migros (Swiss retailer), Nike, PPR (multiple brands including Puma), PVH (multiple brands including Calvin Klein and Tommy Hilfiger), Uniqlo, VFC (multiple brands including NorthFace), WalMart, Zara (Inditex), and Li Ning.**

Letters were sent by courier – to ensure delivery by 25 September 2012 – to their respective senior management teams, via their indicated head offices.[65] Each company was informed that a Greenpeace International investigation was underway at the Binhai and Linjiang industrial zones, and we asked them to comment as to whether they had current or past business relationships with any suppliers based there.

Among the companies who responded before the stated deadline (and within an additional extended period of two weeks), with information deemed to be relevant was **Levi Strauss & Co.** As one of the few brands that provides a global list of its suppliers, it acknowledged that **Zhejiang Huili Dyeing & Finishing Co Ltd**, a supplier based in the Linjiang industrial zone, is on its supplier list.

Another brand that provided some supply chain transparency is **Inditex (Zara)**. It acknowledged that the following companies in the Binhai industrial zone are on its internal supplier list:

"...We have not found any direct business relationship with any supplier in this area. However, we have found the following information regarding factories in second tier of production:

- ***Shaoxing Binhai Hat Co Ltd** – Last registered order by one of our suppliers: June 2011.*
- ***Shaoxing Nanrun Import and Export Co Ltd** – Fabric supplier. One past order registered by one of our suppliers XX* [sic] *years ago.*
- ***Shaoxing Bailiheng Dyeing Co Ltd**. Located at Binhai Industry Park, Shaoxing - Printing. Recent order by one of our suppliers...."*

Migros, Puma, WalMart, G Star Raw, Esprit, Li Ning, Uniqlo, Mango, and Limited Brands indicated no business relationships, past or present with these locations.

The information provided does not give any indication on hazardous chemicals used or released from these facilities. But research has shown that Zhejiang Huili Dyeing & Finishing Co Ltd discharges wastewater into the Linjiang WWTP, and Shaoxing Bailiheng Dyeing Co Ltd discharges wastewater into the Shaoxing WWTP.

Via a separate evidence stream, **Saint Year Holdings** (having two facilities located near the Linjiang industrial zone that both discharge into the Linjiang WWTP[66]) claims on its website[67] to be a long-term supplier of **M&S, H&M, Next, Limited, Express, Nike, Adidas, Esprit, and Toray** (among other brands) via **Hangzhou Xinsheng Printing & Dyeing Co Ltd** (Dangwan Town, Xiaoshan, Hangzhou City, China), and also via its website[68] as a long-term supplier of **Calvin Klein, Levi's, JC Penney, Liz Claiborne, Gap, Target Store, Esprit, and Adidas** (among other brands) via **Hangzhou Jimay Printing & Dyeing Co Ltd** (Dangwan Town, Xiaoshan, Hangzhou City, China).

These specific facilities are connected to the Linjiang WWTP to treat their industrial wastewater. The information provided above does not give any indication on hazardous chemicals used or released from these specific facilities.

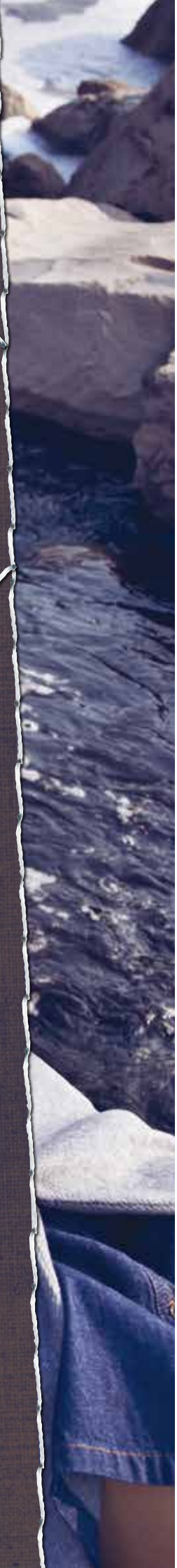
The dispersal of hazardous chemicals into water systems, both when clothes are manufactured and after they are sold – such as when chemical residues in the products are washed out[69] – can only be addressed by the rapid and transparent elimination of their use at source.

As shown by this study, the use of communal WWTPs, which mix effluent from many different sources, makes the hazardous substances discharged by individual suppliers of clothing brands hard to identify. **Transparency via public disclosure of the current use and release of hazardous chemicals by individual facilities is therefore a vital first step towards identifying where the most hazardous substances are being used and discharged, as well as the possible strategies towards eliminating their use.**

Progressively replacing hazardous substances with less hazardous, and preferably non-hazardous, alternatives will help bring about the rapid reduction and ultimate cessation in their discharges, emissions and losses, and eventually reduce the burden of hazardous substances in the local and global environment.

image: Freshly dyed fabrics are being sorted in a dyeing factory. Image © Qiu Bo / Greenpeace

As the deadline for achieving zero discharges draws nearer, the need for comprehensive elimination plans grows increasingly urgent.



TOXIC THREADS

#5

Detoxing China's waters

The textile industry has an important role in the industrialisation and development of many countries in the Global South, China in particular. Transparency of information, between suppliers and brands, as well as full supplier engagement through hazardous substance use inventories, is important to enforce policies to eliminate the use of hazardous substances and their substitution with safer alternatives.

However **full facility-level public disclosure in line with the right-to-know principle** is vital to create wider and deeper awareness for local populations, provide information for civil society organisations and build societal awareness and pressure for the need for comprehensive chemical management laws.

"Right-to-know" is defined as practices that allow members of the public access to information – in this case, specifically about the use and releases of hazardous chemicals. Implementing right-to-know requires full facility-level public disclosure (that is to say, reporting) – for example, on the internet or equivalent easily-accessible formats in the local language – the quantities of hazardous chemicals used and discharged to the environment (see Box 6). This is in line with best practice in pollutant release and transfer registers (PRTRs) worldwide.

PRTRs have been shown to be effective in reducing the release of hazardous substances. For example, the Japanese PRTR, which was introduced in 2001 and covers 462 designated chemical substances (Class I) in 23 sectors and 34,830 facilities, shows a reduction of 24.5% in total annual releases (and waste transfers) of hazardous substances between 2001 and 2008. However, there was no significant reduction for facilities releasing smaller quantities of designated chemical substances (Class II), which are not required to disclose their releases publicly.[70]

This is a priority for facilities located in industrial zones such as Binhai and Linjiang that use communal WWTPs and discharge pipes. It should eventually be made common practice for all facilities.

Following Greenpeace's Detox campaign in 2011, a number of sportswear and fashion brands took up the Greenpeace Detox challenge[71] and made individual commitments[72] to zero discharge of hazardous substances by 1 January 2020.[73]

As the deadline for achieving zero discharges draws nearer, the need for comprehensive elimination plans grows increasingly urgent. As a priority, these need to address at minimum the use of hazardous substances highlighted by Greenpeace.[74] Other brands need to join this Detox paradigm shift to eliminate hazardous chemicals, through credible individual Detox commitments to zero discharges of hazardous substances, along with a programme that can deliver results on the ground.

Commitments with the necessary integrity should have a credible approach (a clear shift from the end-of-pipe and risk management approach) and concrete steps to follow through (see Box 6).

Box 6: Key steps to Detox the textile chain

To effectively resolve the pollution of our waters with hazardous chemicals, all brands should:

- Adopt a credible commitment to phase out the use, from their global supply chain and all products, of all toxic chemicals by 1 January 2020 . Credible means based on the unambiguous adoption of three fundamental principles – precaution[75], complete elimination (zero discharges)[76] and right-to-know[77].
- Walk the talk by committing to disclose the discharge of hazardous chemicals by their global supply chains. The data should clearly identify the location of facilities and their respective discharges - chemical-by-chemical, facility-by-facility, at least year-by-year but preferably more frequently (quarterly, for example). The data should be made public – on the internet or equivalent easily-accessible formats in the local language (for example, by using credible public information platforms[78]).
- Set up a list of hazardous chemicals derived from a screening tool based on intrinsic properties, and set clear ambitious deadlines (with a fixed date) for elimination of priority substances.

Six of the brands that took up the Greenpeace Detox Challenge – the sportswear brands Puma, Nike, Adidas and Li-Ning, and the fashion brands H&M and C&A – are now collaborating on the further development and implementation of both their individual and collective implementation plans towards zero discharge of hazardous chemicals,[79] which set out the steps they intend to take to achieve their commitments. Through their collective "draft joint roadmap" others are invited to partner in this endeavour. Unfortunately, the roadmap has so far failed to set clear dates and timelines to achieve full **elimination** of all uses of widely used hazardous chemicals. It also does not make a clear commitment to concrete deliverables such as the **disclosure** of hazardous chemical discharges at the manufacturing factories locally and online.

image The huge black swirl on the bank of Qiantang River is the discharge outlet of Linjiang WWTP. Image © Qiu Bo / Greenpeace

For the Chinese government:

Governments need to adopt a political commitment to zero discharge of all hazardous substances within one generation, based on the precautionary principle and including a preventive approach to chemicals management with substitution and producer responsibility at its core, and implementation plans with clear targets and timelines.

Such a comprehensive chemical policy will need to include an extensive list of priority hazardous chemicals, which is regularly updated, based on their intrinsic properties and including clear timelines for their phase out.

Although the focus of this report is on the textile industry, the production and use of all hazardous chemicals by all industries needs to be addressed. The Chinese government needs to put in place comprehensive chemical management policies so that chemicals of concern can be regulated and ultimately eliminated. Legislative measures can, in turn, strengthen company policies by ensuring continuous improvement of practice as new information on hazardous chemicals becomes available. It also creates a level playing field, enabling safer alternatives to gain a stronger foothold in the market and making them more cost-effective.

Starting from the principle of producer responsibility, comprehensive chemicals management frameworks should be devised as a matter of urgency. These should aim to prevent ongoing releases of hazardous chemicals to the environment which may have serious impacts on the environment and on people's health and livelihoods, and may require difficult and costly clean-up in the future.

The information that manufacturers provide in their Hazardous Chemicals Release and Transfer Report (as required by Article 20[80] of the "Measures for the registration of hazardous chemicals for environmental management") should be made publicly available in a centralised government database (similar to the US Toxic Release Inventory), or other public platform such as the water pollution map created by the NGO the Institute of Public and Environmental Affairs.[81] In addition to the publicly available register of releases, the points of discharge need to be clearly declared and identified *in situ*.[82]

Locating factories in industrial zones with communal WWTPs may be a solution for certain pollutants that can be treated by such facilities, but is not a solution for hazardous pollutants that are not fully degraded through this treatment, such as some of those shown here being used by the textile industry, which will persist in the environment following their release. For the many facilities already located within industrial zones, it is urgent that the individual manufacturers identify emissions of all hazardous substances, (not just those on their water discharge permits) from each individual facility before their discharge to the communal WWTP. This information needs to be publically available, in particular to the local community **using easily accessible and credible public information platforms (such as the internet)** and if hazardous substances are being used or released, there needs to be a plan for their elimination.

www.greenpeace.org/detox

Endnotes

1 Brigden K, Labunska I, House E, Santillo D & Johnston P (2012). Greenpeace Research Laboratories Technical Report 07/2012. http://www. greenpeace.org/international/putting-pollution-on-parade

2 See for example the recent report: Sustainable Apparel's Critical Blind Spot (2012). p.6. http://www.ipe.org.cn/Upload/Report-Textiles-Phase-II-EN.pdf

3 Greenpeace (2011a) Dirty Laundry: Unravelling the corporate connections to toxic water pollution in China. July 2011. http://www.greenpeace.org/international/en/campaigns/toxics/water/Dirty-Laundry-report/

Greenpeace (2011b), Dirty Laundry 2: Hung Out to Dry. Unravelling the toxic trail from pipes to products, August 2011. http://www.greenpeace.org/international/en/publications/reports/Dirty-Laundry-2/

Greenpeace (2012a). Dirty Laundry: Reloaded. How big brands are making consumers unwitting accomplices in the toxic water cycle, March 2012. http://www.greenpeace.org/international/en/publications/Campaign-reports/Toxics-reports/Dirty-Laundry-Reloaded/

Greenpeace (2012b). Toxic Threads: The Big Fashion Stitch-Up. http://www.greenpeace.org/international/big-fashion-stitch-up

4 Greenpeace (2011a) op cit. Previous research also found that persistent hazardous chemicals such as perfluorinated chemicals and alkylphenols, that Greenpeace found in wastewaters discharged from textile manufacturing sites are widely present in the environment, including within the Yangtze River ecosystem. A Greenpeace study found bioaccumulation of these chemicals in two fish species. The two species sampled are on the daily menu of local communities.

Brigden K, Allsopp M & Santillo D (2010). Swimming in chemicals: Perfluorinated chemicals, alkylphenols and metals in fish from the upper, middle and lower sections of the Yangtze River, China, Amsterdam: Greenpeace International. http://www.greenpeace.to/publications/swimming-in-chemicals.pdf

5 Greer L, Keane SE & Lin X (2010). NRDC's ten best practices for textile mills to save money and reduce pollution: a practical guide for responsible sourcing, New York Natural Resources Defense Council, p3. http://www.nrdc.org/international/cleanbydesign/files/rsifullguide.pdf

6 Zhang Y (2009). Chemical Information in Two Textile Supply Chains, A case study of producers in China, Chalmers University of Technology, Goteborg, Sweden, Report No. 2009:10, p.19.

7 China Textile Magazine (2010). Expansion of textile industrial cluster in China. March 2010. http://chinatextile.360fashion.net/2010/03/expansion-of-textile-industria.php

8 http://www.chinairn.com/news/20120629/687069.html

9 Large quantities of water are used in textile manufacturing, as well as numerous process chemicals. Some chemicals used and/or released have low hazard, but can cause environmental impacts where released in very large quantities (such as inorganic salts with low toxicity). Other substances are readily and rapidly broken down in the environment but have hazardous properties that can result in dramatic and acute effects in the short term on receiving waterways to which they are discharged. For other hazardous chemicals that are not readily broken down, or are able to bioaccumulate (build up in the bodies of organisms exposed to them), the effects following their discharge can be more long-lasting and cumulative.

10 Xiaoshan District is one of the districts of Hangzhou City and borders with Shaoxing County.

11 Shaoxing is a city and includes several counties, one of them is Shaoxing County (also known as Shaoxing).

12 http://www.zgqfc.gov.cn/html/marketinfo/

13 Shaoxing County national economy and social development journal (2010). http://www.sxxtjj.com/editor/UploadPath/file/201103030922070103.doc

14 http://www.chinairn.com/news/20120629/687069.html

15 http://www.zgqfc.gov.cn/html/marketinfo/aboutqfc.html

16 For full details of methodology and results see Brigden K et al (2012) op cit.

17 This standard will update to meet the level III standard of the "Discharge standard of water pollutant for dyeing and finishing of textile industry" (GB 4287-92) from 1 July 2012. http://www.sx.gov.cn/art/2012/6/6/art_8913_274454.html

18 Records of illegal discharges can be found in IPE database. http://www.ipe.org.cn/pollution/

19 Shaoxing environmental situation report (2011). http://www.sxepb.gov.cn/art/2012/6/1/art_4735_277713.html

20 http://www.ccin.com.cn/ccin/3094/3096/index.shtml

21 Ibid.

22 Information from the Binhai industrial zone website. http://www.bhsx.com/about.asp

23 A web report stating "there are the cleanest dyeing facilities here", and reporting on the capacity and the environmental protection progress of the Binhai industrial zone. http://www.bhsx.com/show.asp?ClassId=2&NewsId=1969&ListUrl=list1.asp

24 The National Circular Economy Implementation Plan for Binhai Industrial Zone (2008-2012) indicates that in 2007 the dyeing and printing wastewater comprised 62.8% of the total wastewater discharge of the whole facilities in the industrial zone.

25 Du Lili, Gao Luling, Wang Xiqing (2009). Design of Taiwater Discharge System in Third-Phase Project of Shaoxing Wastewater Treatment Plant. China Waste & Wastewater, 2009, Vol 25 (18). http://d.wanfangdata.com.cn/periodical_zgjsps200918007.aspx

26 http://www.bhsx.com/environment_8.asp

27 Du Lili, GaoLuling, Wang Xiqing (2009) op cit.

28 Ibid.

29 http://www.hangzhou.gov.cn/main/zwdt/ztzj/stjx/wrzz/xsws/T150485.shtml

30 Special Report on "The 11th five-year development plan for Xiaoshan District of Hangzhou". http://www.xs.zj.cn/zw/ztzl/115plan/dongtai/t20060807_27021.htm

31 Greenpeace investigation.

32 http://www.xetz.gov.cn/gb/jd/index.htm

33 http://news.h2o-china.com/html/2012/04/1401334643501_1.shtml

34 Greenpeace Investigation.

35 For more precise information on the hazardous properties and detailed references to scientific literature, see Brigden K et al (2012) op cit.

36 Three of these anilines have been shown to be carcinogenic in animal experiments, and in addition they are listed as either known or suspected to be carcinogenic to humans; the International Agency for Research on Cancer (IARC) lists chloromethylaniline (also known as chlorotoluidine) as probably carcinogenic to humans (group 2A, IARC 2012) and chloroaniline as possibly carcinogenic to humans (group 2B, IARC 2012); 2-methoxy-aniline (also known as o-anisidine) alone has not been conclusively demonstrated as carcinogenic in humans through epidemiological studies, partly because it is manufactured and used together with other amines that are known human carcinogens, making it difficult to demonstrate that o-dianisidine contributed to cancers seen in workers. In addition, the US Department of Health and Human Service lists o-dianisidine as reasonably anticipated to be a human carcinogen based on sufficient evidence of carcinogenicity in experimental animals (DHHS 2011).

IARC (2012) Agents Classified by the IARC Monographs, Volumes 1–105, International Agency for Research on Cancer (IARC).
http://monographs.iarc.fr/ENG/Classification/ClassificationsCASOrder.pdf

US DHHS (2011) Report on Carcinogens. 12th edition. US Department of Health and Human Services, Public Health Service, National Toxicology Program.
http://ntp.niehs.nih.gov/ntp/roc/twelfth/roc12.pdf

37 China's GB18401-2010. National general safety technical code for textile products forbids the use of azo dyes that can degrade to form carcinogenic amines.

38 Perfluorinatedcarboxylic acids (PFCAs)

39 State Oceanic Administration (2011). 2011 Report on Environmental Conditions in China's Oceans.
http://www.soa.gov.cn/soa/hygb/hjgb/webinfo/2012/06/1340488547415825.htm

40 It is reported that experts have stated that untreated wastewater emissions are an important reason for the pollution problem in the East China Sea.
http://news.sina.com.cn/green/news/roll/2012-07-25/104124841721.shtml

41 http://news.qq.com/a/20120508/001056.htm

42 Background information and references for all of the chemicals found in this study are provided in Brigden K et al (2012) op cit.

43 People's Daily (2005). "70% of Rivers and lakes in China are polluted as a result of eight major causes" (Chinese text)
http://env.people.com.cn/GB/1073/3883624.html

44 National Development and Reform Commission (2011). Development and Reform Commission reports that ¼ of China's residents have no clean drinking water, 9 March 2011, Economic Information Daily.
http://politics.people.com.cn/GB/1027/14096289.html

45 Ministry of Environmental Protection of People's Republic of China (2010). Statistical bulletin on national environment.
http://zls.mep.gov.cn/hjtj/qghjtjgb/201201/t20120118_222703.htm

46 Pollution is abating, but in very small steps, Chemical Oxygen Demand discharges in 2011 are reduced by 2.04% compared to 2010, other data are also in <5% range. [ref]: (in Chinese)
http://jcs.mep.gov.cn/hjzl/zkgb/2011zkgb/201206/t20120606_231039.htm

47 China News (2012)
http://finance.chinanews.com/ny/2012/02-06/3648084_2.shtml

48 See: http://chinawaterrisk.org/resources/analysis-reviews/the-rise-of-protests-and-reputational-risk/ for a summary of recent protests.

49 Finnish Environment Institute (2010). Releases from the use of products. Case Study 10, Releases from the use phase of textile and leather products, p.4.
http://www.ymparisto.fi/download.asp?contentid=124343&lan=fi

50 Sustainable Apparel's Critical Blind Spot (2012) op cit.

51 The majority of chemical use in textile finishing processes occurs during wet processing, such as dyeing, washing, printing and fabric finishing, see: Lacasse K & Baumann W (2004). Textile chemicals, Environmental data and facts, Berlin, London, Springer, p.81.

52 Greer L et al (2010) op cit.

53 UNEP (2012). Global Chemicals Outlook; Towards sound management of Chemicals, synthesis report for decision makers, UNEP, September 2012, GPS Publishing, p.17.
http://www.unep.org/pdf/GCO_Synthesis%20Report_CBDTIE_UNEP_September5_2012.pdf

54 Business for Social Responsibility (2008) Water management in China's apparel and textile factories, p.2.
http://www.bsr.org/en/our-insights/report-view/water-management-in-chinas-apparel-and-textile-factories

55 Chemical Oxygen Demand (COD) is a commonly used method to indirectly measure the quantity of organic compounds in wastewater or surface water without providing information on the identity of individual chemicals present.

56 In its "12th Five-Year Plan" for the textile industry, CNTAC (China National Textile and Apparel Council) pays more attention to environmental protection and emission environmental protection and emission reduction. In 2011 CNTAC set up the Environmental Protection and Resource Conservation Promotion Committee to give full play to the industry association's role in guiding, coordinating and promoting a low-carbon, green and recycling-oriented pattern of economic development in the industry. See: 2011/2012 Social Responsibility of Chinese Textile and Apparel Industry Annual Report

57 Law of the People's Republic of China on Prevention and Control of Water Pollution, 87th Order of Chinese President. The latest version was approved on 28 February 2008 by National Peoples Congres (NPC)'s Standing Committee and came into force on 1 June 2008. It was originally enacted in 1984.
www.gov.cn/flfg/2008-02/28/content_905050.htm

58 Greenpeace China (2010). Poisoning the Pearl. pp. 37 – 40.
http://www.greenpeace.org/eastasia/publications/reports/toxics/2010/pearl-river-report-2009-2nd/

59 Allsopp M, Costner P & Johnston P (2001). Incineration and human health: State of knowledge of the impacts of waste incinerators on human health. Amsterdam: Greenpeace International.
http://www.greenpeace.to/publications/euincin.pdf

60 Labunska I, Brigden K, Santillo D, Kiselev A & Johnston P (2010). Russian Refuse 2: An update on PBDEs and other contaminants detected in St-Petersburg area, Russia. Technical Note 04/2010, Exeter: Greenpeace Research Laboratories.
http://www.greenpeace.to/publications/russian-refuse-2-english%5B1%5D.pdf

61 There is a cleaner production standard for the textile industry "HJ/T 185-2006 Cleaner Production Standard – Textile Industry (dyeing and finishing of cotton)", published by MEP. There is also a list of key hazardous substances for clean production auditing, which list some hazardous wastes, such as "dyes and paints waste"; for each hazardous substance/waste, there are related industries. In addition, the Ministry of Industry and Information Technology (MIIT) has published a "Clean Production Technology promotion plan for Textile, Dyeing and Finishing industry", which suggests several technologies to save the use of chemicals or water. However, none of the above measures is mandatory and although general reference to hazardous chemicals is made, there are no specific lists of chemicals to be avoided or eliminated. The State Council has also asked the Textile industry to eliminate some outdated technologies.

62 http://www.mep.gov.cn/gkml/hbb/bl/201210/t20121016_238481.htm

63 The eight basic intrinsic properties of hazardousness – persistence; bioaccumulation; toxicity (PBT or vPvB); carcinogenic, mutagenic and reprotoxic (CMR); endocrine disruption (EDC); and equivalent concern.\

64 Or partial breakdown products that may also be hazardous.

65 Fedex has written confirmation all the brands indicated received these couriered packages by 25 September 2012, with the exception of Li Ning that received its couriered package on 28 September 2012. Each of these Fedex packages was comprised of a separate letter to each of the respective brand's CEO, CSR Director, Communications Director and Supply Chain Director.

66 Greenpeace investigation.

67 http://www.saintyear.com/English/Related1.aspx?Nid=249 Accessed 31 October 2012.

68 http://www.saintyear.com/English/Related1.aspx?Nid=253 accessed 31 October 2012

69 Greenpeace International (2012a) op cit.

70 Nakachi S (2010). The Pollutant Release and Transfer Register (PRTR) in Japan and Korean Toxic Releases Inventory (TRI) – an evaluation of their operation, Tokyo: Toxic Watch Network http://www.toxwatch.net/en/pdf/PRTR_JAPAN_1206.pdf

71 http://www.greenpeace.org/international/en/campaigns/toxics/water/detox/

72 See:

Puma:
http://about.puma.com/?page_id=10

Nike:
http://nikeinc.com/news/nike-roadmap-toward-zero-discharge-of-hazardous-chemicals

Adidas:
http://www.adidas-group.com/en/sustainability/assets/statements/aG_Individual%20Roadmap_November%2018_2011.pdf

H&M:
http://about.hm.com/gb/corporateresponsibility/environment/hmengageswithgreenpeace__Greenpeace.nhtml

C&A will publish its publish its individual action plan on 20-Jan-2012.

Li-Ning will first focus on implementing the joint roadmap and is committed to publishing its to publishing its individual action plan but a deadline has not yet been defined.

73 See http://www.roadmaptozero.com/pdf/Joint_Roadmap_November_2011.pdf: (1) page 5: '... in a span of only 8 years…" and (2) point 3.1 :"The first year of the roadmap, 2012,… The 2020 timeline is incredibly ambitious given the scope and global nature of what has to be achieved, in a span of only 8 years…"

74 Greenpeace has identified a preliminary list of well recognised hazardous chemicals for the textile industry as follows:
1. Alkylphenols
2. Phthalates
3. Brominated and chlorinated flame retardants
4. Azo dyes
5. Organotin compounds
6. Perfluorinated chemicals
7.Chlorobenzenes
8.Chlorinated solvents
9.Chlorophenols
10. Short-chain chlorinated paraffins
11. Heavy metals, cadmium, lead, mercury and chromium (VI).

75 This means "caution practiced in the context of uncertainty". An action (for example, use of a chemical substance and/or process) should not be taken where there are reasonable indications of hazard even if the consequences are uncertain.

76 "Zero" means zero use of all hazardous substances, via all pathways of release, ie. discharges, emissions and losses, from global supply-chains and all products. "Elimination" means "not detectable", to the limits of current technology, and where only naturally occurring (where relevant) background levels are acceptable.

77 All local communities sharing their local environment with the production of apparel/footwear and/or the products produced, all workers within this global supplier chain, and public in general have a right to know on an ongoing basis, precisely what substances are being released, from precisely what facilities during production, and from the products themselves.

78 For example, IPE in China.
http://www.ipe.org.cn/En/pollution/index.aspx

79 The Joint Roadmap is available on the companies' websites:

Puma:
http://about.puma.com/?page_id=10

Nike:
http://nikeinc.com/news/adidas-group-ca-hm-li-ning-nike-and-puma-partner-to-reach-zero-discharge-by-2020

Adidas:
http://www.adidas-group.com/en/sustainability/statements/2011/Joint_Roadmap_Zero_Discharge_Nov_2011.aspx

H&M:
http://about.hm.com/gb/corporateresponsibility/environment/actionplantohelpleadourindustrytozerodischarge__Action_plan_zero_discharge.nhtml

C&A:
http://www.c-and-a.com/uk/en/corporate/fileadmin/templates/master/img/fashion_updates/International_Press_Releases/111118_StatementJointRoadmap-EN.pdf

Li-Ning:
http://www.li-ning.com/info/info.html?swf=news.swf (If accessing in China), for the commitment and the company's statement in Chinese.

80 http://www.mep.gov.cn/gkml/hbb/bl/201210/t20121016_238481.htm

81 http://www.ipe.org.cn/En/pollution/index.aspx

82 In the form of sign-posting with full information on the location of the company or WWTP discharging, (with details of common users of WWTPs and upstream identification of discharge points from these users into the WWTP system), enabling traceability.

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Greenpeace is an independent global campaigning organisation that acts to change attitudes and behaviour, to protect and conserve the environment and to promote peace.

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