GREEN STOCKS INDUSTRY NEWSLETTER (ISSUE NO. 1)

－ WWTP INDUSTRY

Listed Chinese and Overseas Water Companies

Found in Frequent Breach of Discharge Standards

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Foreword

It's not news that many Wastewater Treatment Plants (WWTPs) in China just act as a conduit for wastewater, or merely sit idle after they've been constructed. However, previous news reports have often just reported stand-alone cases. In order to more systematically tackle this issue, we conducted research using data from the 'Pollution Map' database and classified and sorted the non-compliance records of WWTPs in China during the period 2008 to 2013.

There are 4961 environmental supervision records in the IPE database for WWTPs and these span the past six years. China has so far built 3622 WWTPs at city and county level, which means that on average, each WWTP has 1.4 environmental non-compliance records.

Further analysis also shows that violation issues are not only limited to small-scale WWTPs, or those in less developed areas. A number of large-scale listed water companies, both domestic and foreign, are among the poor performers, and some of these have even been found to be repeat violators with issues just as serious as other ordinary WWTPs. To our disappointment, most of the listed water companies have turned a blind eye to pollution allegations raised by the public. As of August 18th, only one listed company, Beijing Enterprise Water Group (BEWG), had provided a substantive response.

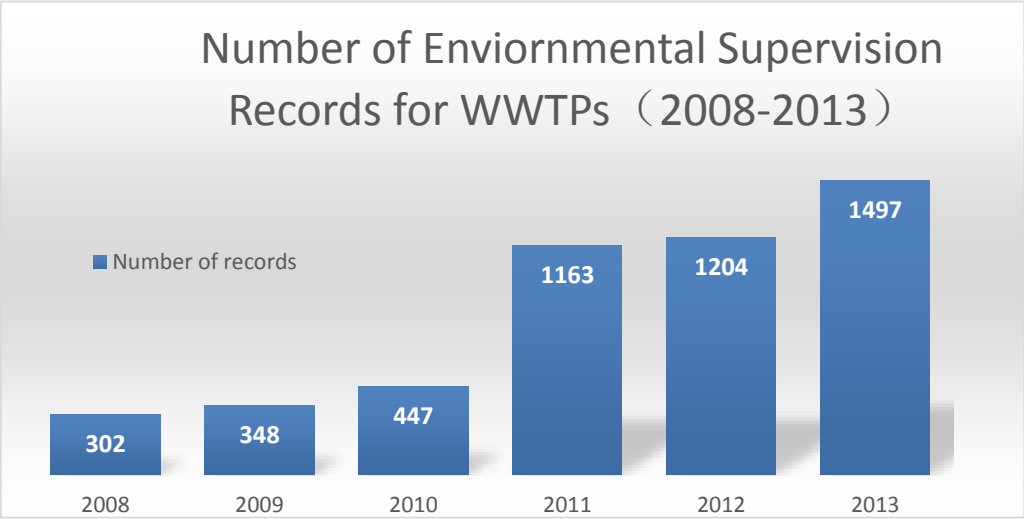
1. WWTPs: the No. 1 Source of Discharge Non-Compliances

To tackle the serious water pollution challenges that China faces, hundreds of billions of dollars has been invested in building over 3600 WWTPs. Following the implementation of the *Water Pollution Prevention Action Plan*, the Ministry of Environment (MEP) declared a total planned investment of over 2 trillion RMB in water pollution prevention. Whilst the market has been expectantly waiting for this feast of investment, latest research has shown that a large number of WWTPs repeatedly discharge wastewater that exceeds discharge standards, and thus many pollution control facilities have merely become centralized sources of pollution discharge.

The years 2008-2013 spanned two of the country's 'Five Year' planning periods – and both saw rapid development of WWTPs. By 2010, which was the final year of 11th Five Year Plan period, the total number of WWTPs at municipal, county and some key town-level projects, was three times the total number in the final year of the 10th Five Year Plan period.

Behind this remarkable figure lies another rather embarrassing one.

According to IPE's analysis, the total number of environmental supervision records for these 3600 WWTPs is a shockingly high 4961 records over the past six years, which means that on average, each WWTP has 1.4 environmental non-compliance records. Over this time period, the number of records has increased year on year in line with the increasing number of WWTPs. 2011 saw the steepest increase, up from 447 records in 2010 to 1163 records in 2011, a total increase of 160%.



（Data Source: IPE '*Pollution Map*' Database）

The sharp increase can largely be attributed to improved disclosure of environmental supervision information by the government. From 2011, provincial level Environmental Protection Bureaus

(EPBs) have been disclosing quarterly supervision records for key state-monitored enterprises, of which records for WWTPs are an important part. Around 30-40% of WWTP records are for effluent exceeding the discharge standard, making it the most common cause of violation for WWTPs. Other common violations include: treatment facilities operated improperly, online monitoring systems operated improperly, and failure to obtain environmental permits for projects.

WWTPs are breaching discharge standards at a higher rate than any of the other pollution sources. IPE analyzed the results of 2014 Q1 supervisory monitoring records from 14 representative provinces, including Jiangsu, Shandong and Hebei. The results showed that for over 2000 WWTPs, there was an average effluent exceedance rate of 17.7%, a higher rate than the average 9.5% exceedance rate for key state-monitored wastewater emitters. Enforcement and disclosure practices have been strengthened, which means the problem of WWTPs breaching discharge standards has become more and more prominent in some regions. For example, the latest list of *Regulatory Monitoring Reports for Key Pollution Sources in Jinan City,*[1]published by Shandong Jinan EPB in July 2014, shows that none of the 20 WWTPs in the city can fully meet the discharge standard, so the exceedance rate is 100%.

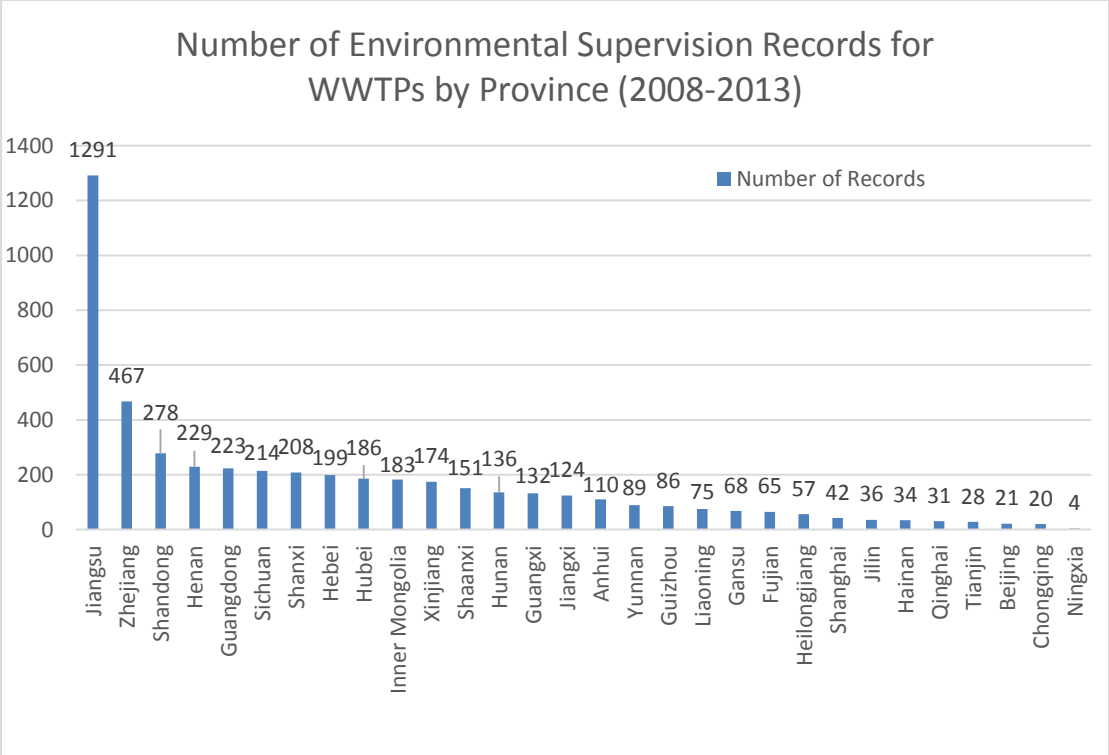
Table 1 – Supervisory Monitoring Records (Q1 2014) of Key State-monitored Facilities in 14 Representative Provinces

	Exceedance rate for Key Wastewater Emitters	Exceedance rate for WWTPs
Xinjiang	24.4%	78.6%
Beijing	0.0%	30.5%
Shandong	3.5%	26.4%
Hebei	7.6%	25.4%
Hubei	7.1%	16.1%
Guangxi	22.9%	12.4%
Zhejiang	34.0%	12.2%
Jiangsu	8.3%	10.8%
Jilin	0.0%	10.3%
Hunan	16.5%	9.8%
Shanxi	3.3%	8.5%
Sichuan	4.0%	6.0%
Anhui	1.0%	0.9%
Tianjin	0.0%	0.0%
Avg.	**9.5%**	**17.7%**

The highest number of supervision records came from Jiangsu, Zhejiang and Shandong, accounting for more than 40% of the total WWTP violation records over the six year period. These three provinces have several things in common: a dense population, developed industrial production, a

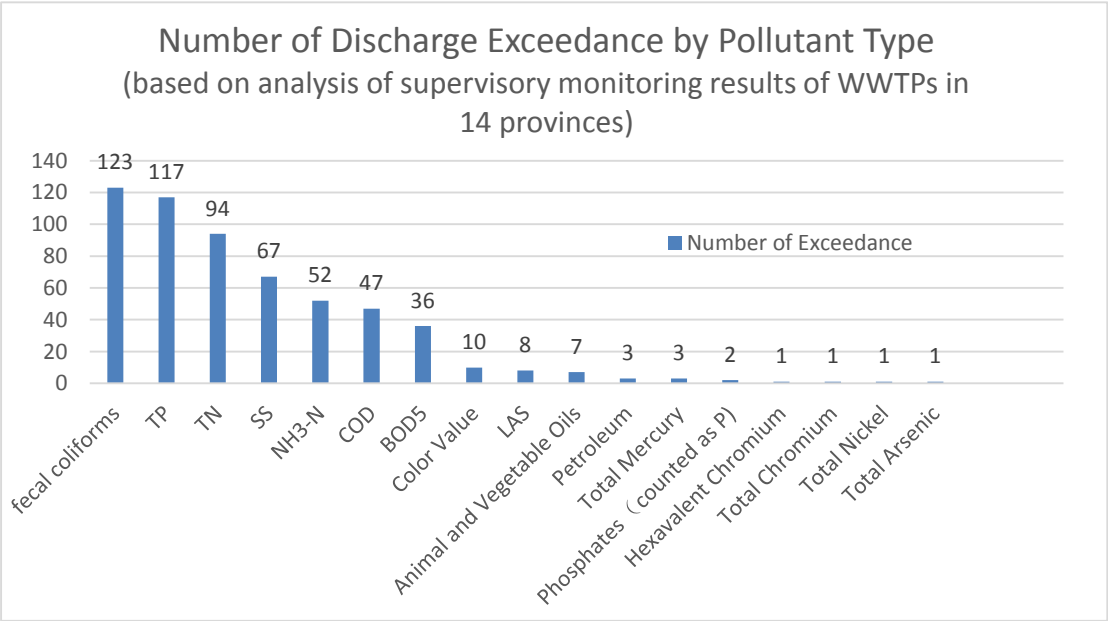
[1] http://119.163.120.18/jgml/003/003002/42349438033.htm <Jinan Key Pollution Source Supervisory Monitoring Report>, Jinan Environmental Protection Bureau, July 2014

large number of WWTPs, and a more advanced level of pollution source information disclosure. Take Jiangsu and Zhejiang provinces as examples, from 2008, both provinces started an annual credit ranking system based on the environmental performance of WWTPs. Every year around 20-30% of WWTPs in each province are classified as "having problems".



（Data Source: IPE '*Pollution Map*' Database）

Based on an analysis of monitoring results from WWTPs in 14 provinces we found that the pollutants that were most often responsible for exceedances were: fecal coliforms, total phosphorus, total nitrogen, suspended solids (SS) and ammonia nitrogen.



We found that a number of WWTPs still fail to effectively control chemical oxygen demand (COD) and ammonia nitrogen, the two most important parameters as defined by the 11th Five Year Plan's reduction targets. The problem is more pronounced in provinces such as Jiangsu, Hebei and Xinjiang. Mr. Zhai Qing, deputy minister of the MEP, once stated in a press conference that, "Experts estimate that the total amount of COD and ammonia nitrogen being released must be reduced by 30-50% in order to see a fundamental change in our environmental water quality." Even though there has been huge investment in WWTPs it has not resulted in the effective reduction of total amount of pollutants released to the environment, which will greatly impact the results of the implementation of the *Water Pollution Prevention Action Plan*.

Total phosphorus, total nitrogen, and ammonia nitrogen were found to have been responsible for discharge exceedances a total of 263 times, accounting for 43.5% of the total number of exceedances. This result indicates issues of poor efficiency and reliability in nitrogen and phosphorus removal in WWTP's secondary treatment processes. Considering the fact that the monitoring period was in Q1, the lower water temperature in winter time might have also affected the effectiveness of nitrogen removal processes.

Many lakes and rivers in China are threatened by eutrophication problems, including areas such as Lake Tai, Lake Chao and Lake Dianchi, which have all seen repeated outbreaks of blue-green algae. Algal blooms also often occur in coastal waters. The excessive discharge of nitrogen and phosphorous-containing substances into water is the main cause of eutrophication.

The frequent instances where fecal coliform and SS breached discharge standards indicates a gap in the advanced treatment processes in some WWTPs.

Instances of some toxic and harmful substances being discharged in breach of discharge standards were less common. For example, the heavy metals nickel, chromium, mercury, and arsenic, and toxic substances such as cyanide and aniline. These pollutants are mostly discharged by industrial WWTPs. Despite these pollutants breaching discharge standards less regularly, the pollutants themselves can cause significant harm and serious water pollution incidents.

For example, in Q1 2014, effluent from a number of WWTPs was found to have heavy metal concentrations in breach of discharge standards. One WWTP, Jiangsu Jinlin Environmental Science Co. Ltd, receives and treats electroplating wastewater discharged from an industrial park located in Wuxi city. It was found that total nickel concentration in the effluent was 15 times over the discharge standard.[2] Huaiyang WWTP, located in Yuanshi County, Hebei Province, was found to have discharged hexavalent chromium at six times the discharge standard, and total chromium was found to have been discharged at 2.6 times the discharge standard.[3] The Shijiazhuang Economic Technology Development Zone WWTP was found to have discharged total mercury at 2.5 times the discharge standard.[4]

[2] http://www.ipe.org.cn/pollution/com_detail.aspx?id=164806
[3] http://www.ipe.org.cn/pollution/com_detail.aspx?id=167176
[4] http://www.ipe.org.cn/pollution/com_detail.aspx?id=167179

In Xiaoshan, a city in Zhejiang province with a high concentration of textile dye houses, two WWTPs, Xiaoshan Linjiang WWTP[5] and Xiaoshan WWTP (Dangwan Plant),[6] both receive wastewater discharged from textile manufacturing. These two WWTPs were found to have aniline, which is a specific pollutant from dyeing and printing processes, in wastewater that breached discharge standards.

All of the aforementioned WWTPs have one thing in common: they all receive wastewater from industrial parks. The high concentrations of complex substances that make up this industrial wastewater often exceed the intake levels that the WWTPs were designed to receive, which might well affect the effectiveness of treatment processes. WWTPs discharge high volumes of wastewater, and pollutants like heavy metals and POPs that may be contained in this wastewater are non-biodegradable and bio-accumulative, and so can cause long term harm to human health, aquatic environments, and can also degrade soil, groundwater and coastal water quality. For these reasons it is extremely important that we pay attention to the violations caused by industrial WWTPs.

[5] http://www.ipe.org.cn/pollution/com_detail_1.aspx?id=165915
[6] http://www.ipe.org.cn/pollution/com_detail_1.aspx?id=165919

2. Listed Water Treatment Companies are Frequently Breaching Discharge Regulations

It is worth noting that behind many of the WWTPs that repeatedly appear on the black list are plenty of famous listed water treatment companies.

The IPE's 'Green Stocks' database shows that some large scale listed water treatment companies have many supervision records for breaching discharge standards. Amongst these are many leading foreign invested companies from the water services industry, including Hyflux Group and Veolia. Others include China Everbright Group and Shanghai Industrial Investment Co., Ltd., which are both listed in Hong Kong.

10 large scale listed water treatment companies have a total of 249 supervision records spanning from 2007 to the present. The wastewater treatment capacity of these 10 listed companies is among the highest nationwide, so the environmental risk posed by them continuously failing to meet standards should not be underestimated.

Table 2: Number of violations for large scale listed water treatment companies

Stock Code	Short Name of Listed Company	Listing Location	No. of Env. Supervision Records
257.HK	China Everbright International	Hong Kong	46
600.SI	Hyflux	Singapore	43
363.HK	Shanghai Industrial Holdings	Hong Kong	30
600008.SH	Capital Water	Shanghai	30
VIE.PA	Veolia	Paris	20
371.HK	Beijing Enterprises Water Group (BEWG)	Hong Kong	20
600874.SH	Tianjin Capital Environmental Protection Group	Shanghai	19
SCIL.SI	Sembcorp	Singapore	17
000826.SZ	Sound Environment	Shenzhen	12
601158.SH	Chongqing Water	Shanghai	12

(Data source: IPE Green Stocks Database: http://www.ipe.org.cn/gca/greeninvest.aspx)

Taking the Singapore listed company Hyflux as an example, the 'Green Stocks' database shows that this company, a very highly regarded Asian water treatment company, actually has no less than 43 environmental violation records spread across all its subsidiaries in China.[7]

[7] A report titled "Wastewater Treatment Plants: Leading Water Treatment Companies are Specialists in Breaching Discharge Regulations" published on August 7th in Southern Weekend stated that Hyflux's subsidiaries had a total

Hyflux operates many WWTPs in the Yangtze River Delta region, but its plants in Wuxi, Changshu, and Taizhou have multiple instances where discharge standards have not been met. Furthermore, its plants in Yangzhou and Nantong also have poor environmental records.

Table 3 – Details on Hyflux Subsidiaries' Violation Records

Subsidiary Name	Location	Year	Reason for their record
Hyflux NewSpring (Tiantai) Co. Ltd	Taizhou	2014,2012, 2011,2008	2014: Fined 336,000 RMB due to improper use of the water treatment equipment; 2011, 2012: Results of supervision monitoring showed discharge standards were being breached on multiple occasions.
Hyflux NewSpring (Changshu) Co., Ltd	Suzhou	2014,2013, 2012,2009, 2008	2013: Fined 350,000 RMB due to discharge of wastewater pollutants exceeding the standard; 2012-2014: Online monitoring data shows that COD and ammonia nitrogen levels breached discharge standards multiple times.
Hyflux NewSpring (Leping) Co., Ltd	Jingdezhen	2014,2013	Did not met environmental standards and were ordered to carry out corrective actions within a designated time frame. Total phosphorous discharge at the main discharge outlet was 1.18 times over the discharge standard.
Hyflux NewSpring (Wuxi) Co., Ltd	Wuxi	2014,2013, 2012,2011, 2008	2014, Jan-June: Online monitoring data shows that COD, ammonia nitrogen and total phosphorus breached discharge standards multiple times; 2011-2014: Quarterly supervision monitoring results breached discharge standards multiple times.
Hyflux NewSpring (Taizhou) Co., Ltd	Taizhou	2013,2012, 2011,2010, 2009	2013: Quarterly supervision monitoring results breached discharge standards multiple times.
Hyflux NewSpring (Yangzhou) Co., Ltd	Yangzhou	2013,2012, 2009,2008	Rated as "Yellow" in the environmental credit rating system
Hyflux NewSpring Wastewater Treatment (Mingguang) Co., Ltd	Chuzhou	2013,2012	Sample taken at the final discharge outlet of this company showed that total phosphorus measured was 1.92mg/l, which was 2.84 times the discharge standard.

of 33 environmental records. According to the 'Green Stocks' database, as of August 12th, Hyflux actually had 43 records.

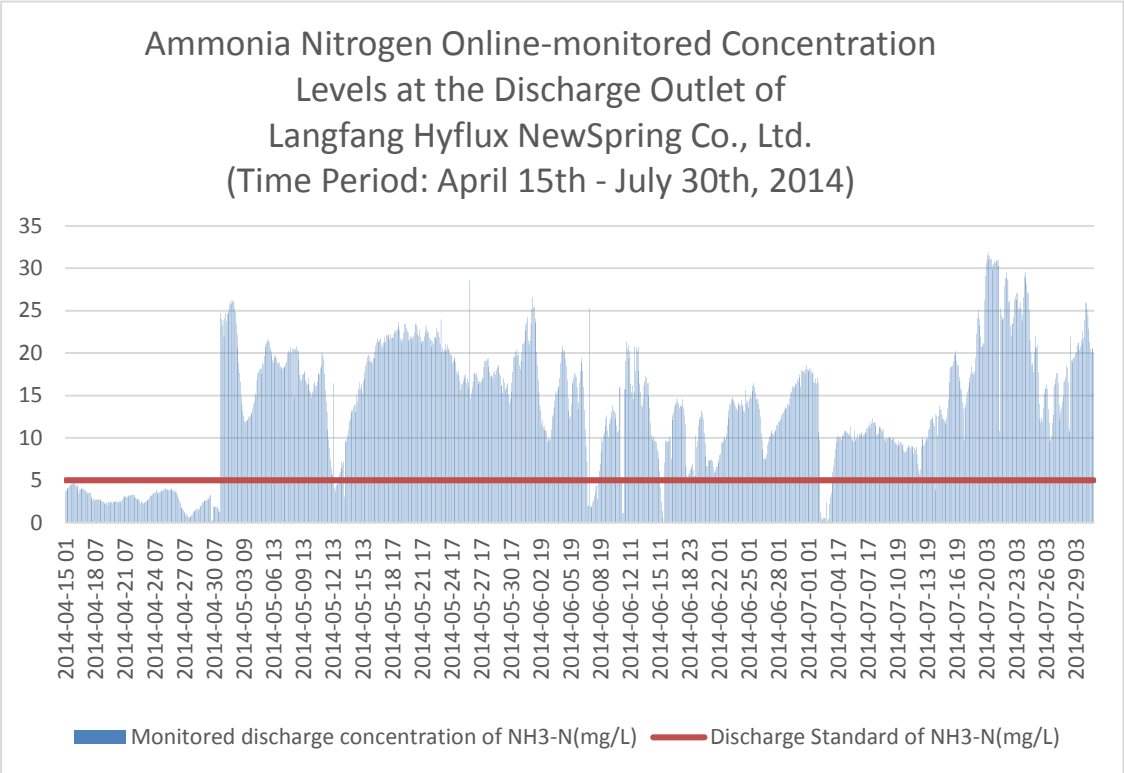
Langfang Hyflux NewSpring Co., Ltd	Langfang	2012	2012: SS, COD and ammonia nitrogen levels at the wastewater discharge outlet all breached discharge standards. Was fined and ordered by provincial EPB to carry out corrective actions within a designated time frame.
Hyflux NewSpring Sewage Disposal (Rudong) Co., Ltd	Nantong	2012	2012: COD maximum concentration breached discharge standards.

The performance of the Hyflux WWTP in the Jiangxi Jingdezhen Leping Industrial Park is particularly surprising. According to media reports such as one published on the website Legal Daily, there are many highly polluting chemical and pharmaceutical companies operating in the Leping Industrial Park. The centralized WWTP for this industrial park was built by Hyflux in 2007, but for the two years after it was built, Hyflux were unable to properly run it. At the time, to the surprise of media and investigators who went to the site and asked to look at their effluent records, the workers there, "when faced with a water discharge record sheet, were discussing how to fill it in".[8]

According to a record in the 'Pollution Map' database, the WWTP from the aforementioned industrial park was put under MEP supervision[9] in 2013 because, "there were prominent problems with the construction and the running of the WWTP". It was also ordered to carry out corrective actions in a designated time frame in 2014 because, "total phosphorus levels at the main discharge outlet were in breach of the discharge standard".[10]

There are also questions surrounding the discharge data from Langfang Hyflux NewSpring Co., Ltd. in Hebei Province. The 2014, Q2 WWTP supervision record released by the EPB shows that on April 28th the ammonia nitrogen concentration was 1.2mg/l, which was within the 5mg/l discharge standard. However, from May 1st, only three days after the environmental protection supervision and enforcement period, the concentration of ammonia nitrogen from the plant rose rapidly to 24mg/l, more than four times the discharge standard. These kinds of discharge levels were frequently observed over a three month period from May to July 2014.

[8] http://news.qq.com/a/20091207/000718.htm
[9] http://www.ipe.org.cn/pollution/com_detail.aspx?id=133861
[10] http://www.ipe.org.cn/pollution/com_detail.aspx?id=140447



(Data Source: Hebei key state monitored enterprise self-monitoring data disclosure platform[11])

Another internationally renowned water services company, Veolia, has 20 environmental supervision records for some of its Chinese WWTPs. Furthermore, Veolia's WWTPs in Haikou, Urumqi, Shenzhen, and Handan all use the Level II discharge standard, which is a more relaxed standard compared to that used by other WWTPs in the same area.

For example, two WWTPs, both located in Baishamen in Haikou and both run by listed companies, one by Veolia and the other by Beijing Enterprises Water Group, use two different discharge standards. According to the relevant national discharge standards,[12] urban WWTPs that discharge into category II coastal waters should adhere to the Level I B Standard. So why is that Veolia Water (Baishamen WWTP), which discharges into the Qiongzhou Strait (category II coastal water), use the more relaxed Level II discharge standard?

[11] http://121.28.49.84:8003/#

[12] Discharge standard of pollutants for municipal wastewater treatment plant. (GB 18918-2002)

Table 4 – Comparison of discharge standards used at five different WWTPs in Haikou

Name of WWTP	Discharges to:	Discharge Standard	COD (mg/L)	Ammonia Nitrogen (mg/L)	SS
Haikou Veolia Water (Baishamen WWTP)	Qiongzhou Strait (South China Sea)	Level II Standard	100	25	30
Beijing Enterprises Water Group (Baishamen WWTP)	Qiongzhou Strait (South China Sea)	Level I B Standard	60	8	20
Beijing Enterprises Water Group (Haikou Changliu WWTP)	Qiongzhou Strait (South China Sea)	Level I B Standard	60	8	20
Haikou Changfeng Water Services Co., Ltd. (Shiziling WWTP)	Wuyuan River	Level I A Standard	50	5	10
Haikou Changfeng Water Services Co., Ltd. (Guilinyang WWTP)	Guilinyang Bay	Level I A Standard	50	5	10

According to the *Discharge standard of pollutants for municipal wastewater treatment plants*, even the most stringent standard, the Level I A discharge standard, when compared to the *Environmental quality standards for surface water*, is equivalent to worse than category V surface water quality (the category V water quality is mainly used for agricultural water use areas and bodies of water fit for general sightseeing purposes. The worst category of surface water quality, which is termed 'worse than category V', is classified as polluted water that cannot be directly used and should not be touched). Furthermore, the Level II standard is even more relaxed and approximately equivalent to between 2.5 and 12.5 times worse than the Level V surface water quality standard (comparisons made using COD and ammonia nitrogen standard limit values).

Even when adhering to the more relaxed Level II discharge standard, Urumqi Hedong Veolia Water Co. Ltd.[13] and Shenzhen Water Group Nanshan Sewage Treatment Plant[14] still had records for breaching discharge standards in 2012 and 2013.

[13] http://www.ipe.org.cn/pollution/com_detail.aspx?id=149499
[14] http://www.ipe.org.cn/pollution/com_detail.aspx?id=142827

3. Limited Responses from Listed Companies

In August 2014, we sent letters to the 10 listed water companies below. We also followed-up to ensure that they had received the letter. Based on this round of communication, we were disappointed to see that most leading listed water companies turned a blind eye to allegations of polluting behavior raised by the public. As of August 18th, only Beijing Enterprise Water Group (BEWG) had given a substantive response.

Table 5 Details of communications with listed water companies (Updated by 18th August 2014)

Name of Listed company	Details of communication	Officially respond to NGO letter? (Yes/No)
BEWG	Fax sent and confirmed as having been received. Three days after the letter was received, BEWG phoned IPE to ask what the purpose of the letter was, and stated the relevant department would follow up. Ten days after letter was sent, BEWG responded officially and stated that senior management pay great attention to the issues and the company has a responsibility to manage WWTPs correctly. They thanked us for the information as the situation of subsidiary WWTPs was not clear beforehand. BEWG is now investigating internally and will make contact with IPE shortly.	Yes
China Everbright International	Phoned after fax and email sent. The company said they will check the email.	No
Hyflux	Faxed to Hyflux Shanghai who confirmed receipt of the letter.	No
Shanghai Industrial Holdings	Emailed, letter confirmed as having been received.	No
Veolia	Phoned the contact number on Veolia China website several times and no one answered. Finally successfully emailed to Veolia China's management.	No
Capital Water	Emailed and phoned. Capital Water said there is a dedicated person in charge of the public email address and they will respond if the email is of interest.	No
Tianjin Capital Environmental Protection Group	Emailed. Letter confirmed as having been received.	No
Sembcorp	Faxed to Sembcorp China. Letter confirmed as having been	No

	received.	
Sound Environment	Emailed to the address as shown on its official website and called. The company said they would check the email system and if not received they will call back.	No
Chongqing Water	Emailed. Letter confirmed as having been received.	No

4. Full Transparency, Clear Responsibilities

In early 2014, the number of violation records for WWTPs across the country remained very high. Government and industry are currently holding discussions to try to come up with solutions. However, the core issue is still a lack of motivation for wastewater treatment enterprises to improve. This is both because of generally weak law enforcement, which means the cost of breaking the law is very low, and because there is a natural monopoly in the wastewater treatment industry. For these reasons, achieving full transparency for WWTP operations is of upmost importance.

Quarterly supervisory monitoring reports for pollution sources is now regularly disclosed by most of the key environmental protection cities in China. From the beginning of this year the formal commencement of the disclosure of real-time online monitoring data was also an important breakthrough. The next step is to use this disclosed information as a base and develop mobile apps, such as the 'Water Pollution Map', to allow for better public engagement and supervision.

Besides transparency, a process to clarify the responsibilities for various parties is equally important, especially for those WWTPs that receive industrial wastewater discharge. Take the case mentioned above of the Hyflux-run WWTP in the Leping Industrial Park, the plant manager has told the media that most of the enterprises in the industrial park are discharging their wastewater effluent directly to the WWTP without proper pre-treatment as required by their contracts. The influent has caused a serious corrosion problems to the equipment and pipelines of the WWTP and paralyzed the whole operation.

It's a similar story at Xiaoshan Dangwan WWTP and Xiaoshan Linjiang WWTP. Both receive wastewater from dyeing and finishing operations, which often breach discharge standards. However, as all influents to the WWTP are mixed together, it's difficult to tell which enterprise should be held accountable. Led by a number of NGOs, the 'Green Supply Chain Program', has engaged with Sanyuan Holdings Group - a company that runs a group of large scale dye-houses locally. Sanyuan is now looking into possible ways of renting the Xiaoshan Dangwan WWTP as its pre-treatment facility and has committed to upgrading its wastewater pre-treatment facility in order to meet the discharge standards.[15] We are following progress closely and hope this innovative approach will help delineate clear responsibilities for different parties, and help them meet discharge standards for centralized WWTPs in industrial parks.

The operation of a large number of WWTPs has led to a massive increase in sludge being produced. At present, the environmental regulatory records of WWTPs are mostly focused on 'effluent meeting discharge standards', but lack a systematic analysis on sludge transfer and disposal. In reality, media reports have exposed several cases of 'unmanaged storage and dumping of non de-toxified sludge'. Sludge disposal is always regarded as a complex topic and due to a large amount of industrial wastewater discharged into municipal WWTPs, a large amount of sludge, containing

[15] http://www.ipe.org.cn/pollution/com_detail.aspx?id=152267

toxics such as heavy metals, turns into hazardous waste, which further increases the difficulty of disposal. In the long run, it is necessary to establish a Pollutant Release and Transfer Register (PRTR) to allow for full disclosure in the various steps of sludge generation, transfer and disposal, in order to prevent serious secondary pollution.

IPE 'Green Stocks' Database and Industry Newsletter

Since 2011, the IPE, in partnership with professional institute, has been developing tools for promoting green investment. The IPE 'Green Stocks' Database was officially launched in June 2013. By August 2014, the 'Green Stocks' Database consists of more than 5200 environmental supervision records involving with 1075 listed companies, both domestic and aboard.
Please visit our website to learn more: http://www.ipe.org.cn/gca/greeninvest.aspx

The first issue of IPE 'Green Stocks' Newsletter, the WWTP Industry, was published in August 2014. The IPE Green Stocks Newsletter provides regular update to financial investors on topics of environmental data and performance analysis, ranking of major listed companies by industry.

A Brief Introduction of IPE

The Institute of Public and Environmental Affairs ('IPE') is a not for profit environmental organization registered in Beijing in May 2006. IPE develops and runs a nation-wide 'Pollution Map' database to monitor corporate environmental performance and to facilitate public participation in environmental governance. IPE's aim is to expand environmental information disclosure to allow communities to fully understand the hazards and risks in the surrounding environment.

Take a look on the IPE Reports：http://www.ipe.org.cn/about/report.aspx
Contact US：ipe@ipe.org.cn