Tackling Industrial Water Pollution

INTRODUCTION

Though the manufacturing sector has been a key driver of growth across Asia, it is also the source of critical environmental problems, including the surge of water resource use and water pollution. Further, estimates suggest that the industrial sector of the region will see the largest increase (of 65 per cent) in water use by 2030 compared to any other sector in the economy.¹ Combining with projected population growth this can exacerbate water-access problems in Asia.² Within this context and given the People's Republic of China's (PRC) prominent position as a global industrial hub, the PRC offers a valuable case study in managing and enforcing environmental controls in the face of rapid industrialisation. This is especially relevant for countries in the region seeking to undergo similar structural change in terms of industrial development but with lower impact on the environment. This policy brief outlines the context of the PRC, the PRC's key policies, case studies from the city of Shaoxing and Shandong Province (the PRC's hub for the textile industry and paper and pulp industry respectively), and some key policy recommendations. This policy brief is a key input for work carried out by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), in collaboration with Tsinghua University,³ to strengthen the capacity of regional governments to implement policy for improving water and resource use in key industrial sectors.

ESSC

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Environment and Development

FROM



THE CHINA CONTEXT

Today the People's Republic of China hosts one fifth of the global population (and growing) and contributes to almost 50 per cent of Asia's manufacturing output. However, the PRC commands little over 6 per cent of the total global water resources, presenting serious concerns for fresh water supply. While the PRC experiences water scarcity, the industrial revolution has done little to aid the situation. Within the PRC, authorities have gone to great lengths to curb water use, water pollution and introduce environmental safeguards to address the associated hazards of industrialisation (see section 2 and 3 for a discussion of policy experience from China). The PRC carried out some of the most comprehensive environmental and water quality assessments in Asia. The most recent comprehensive water quality survey was carried out between 2006 and 2014 in the North China Plain by the Institute of Hydro-geology & Environmental Geology at the China Academy of Geological Sciences. It was reported that China's water quality had deteriorated so greatly that over 70 per cent of shallow & deep groundwater was severely polluted that it classified as Grade IV+ (unfit for human touch)⁴. This figure is alarming as 70 per cent of China's 1.3 billion population, plus over 60 per cent of China's cities primarily rely on groundwater as drinking water source.5

The investigation that followed this survey concluded not only that the PRC relied heavily on scarce water resources, but also highlighted the level of negligence by the industrial sector to implement sufficient environmental safeguards to protect the much-needed water resources. While it was recognized that previous policy measures implemented since 2006 had been effective, it was only to a limited extent, mainly due to the rapid expansion and changes that occurred in industry and agriculture, which led to more complex and intensified pollution issues, not previously anticipated by policy makers. As a result, in April 2014 the Chinese central government declared a war against pollution at the annual National People's Congress and approved an amendment to the Environmental Protection Law enacted in the 1980s. The new amendment was designed to address and strengthen environmental governance by way of enabling the executive branches and enforcement arms to hold polluters more accountable for their actions.

Entering into force in January 2015, the amendment addressed the issue of enforcement by strengthening the coherence between specialised regulations to enable more effective governance of the entire landscape of environmental laws and protections in the PRC. Comparing with the previous provisions, the amendment repositioned and empowered the strategical importance of the environmental protection agenda, forcing greater liability and accountability of polluters. For example, the amended Environmental Protection Law gave the local environmental protection bureau and associated institutions the authority to conduct on-site inspections, and where they found noncompliance or risk for any serious pollution, the executive branch had the power to issue penalties for non-compliance,⁶ suspend, shut down, or detain the polluting facilities.⁷ To account for corruption and ensure local government enforcement of environmental protection, targets and indicators incorporated public performance were into appraisals for local governors (Article 26). This pushed the PRC authorities to implement stronger measures against environmental pollution, namely targeting the PRC's top water consuming and water polluting industries: the food product, pulp and paper, textile, and chemical manufacturing industries. This led to what is known today as Water Ten, a package of stronger, more integrated and interdisciplinary policy mechanisms (discussed in detail in section 4). As a result, in 2016 alone 22,730 cases in total were reported, with 44 per cent of cases resulting in the seizure of equipment or facilities.8

THE POLICY CONTEXT

It is important to understand the structure of the PRC government. The PRC operates with a democratic centralist government, state power is exercised through the Communist Party, the Central People's Government (State Council) and their provincial and local representation. Government administration operates in three tiers: the provincial level (provinces, autonomous regions, directly-controlled municipalities and special administrative regions), prefectural level (prefecturemunicipalities, prefectures, autonomous level prefectures and leagues), county (districts, countylevel municipalities, counties, autonomous counties, banners and autonomous banners) and township level.9 The centralist nature of the PRC government espouses a force of unity amongst government when governing, this sense of unity has been key to the success of the PRC's ability to coordinate within, amongst and between ministries and officers of government to achieve the inevitably multifaceted goal of environmental protection. Notably the policy package of Water Ten fully embodies this centralist nature, a policy turning point away from a patchy and permissive environmental management system to a more integrated and accountable one focusing on not only end results, but supply chains and the ecological relationships between the environment and industry.

The industrial water management system in the PRC is spread over two phases (see Figure 1). The first phase is "before-process", which means the management before construction and production. The second phase is "in-process", which means the management during production. Before initiating an industrial development, the enterprises must pass an environmental impact assessment to qualify for a permit. In this phase, the government can also consider whether the project is prohibited according to the Instruction on Elimination of Backward Capacity.¹⁰ After receiving a permit, the enterprises must follow the "Three Simultaneity" principle during the building process, implying the facilities for pollution control must be designed, constructed and used at the same time with the main facility. Therefore, in this phase, the ways of management

mainly follow the principle of pollution prevention.

In the production process, the Cleaner Production Promotion Law encourages enterprises to adopt cleaner technologies, use environmentally friendly materials, and produce greener products. Required by this law, enterprises in key industries, e.g. textile industry, must perform cleaner production auditing to guide the production process towards cleaner production. Accordingly, the national aovernment releases Guidance Cleaner on Production Technologies in Key Industries almost annually. End-of-pipe treatment involves emission standards and the Environmental Emission Permits System, comprising of an environmental tax, pollution discharge permit and emissions trading system.

The PRC's policy instruments can be divided into three distinct categories: information, market-based and command/control. When put in practice, these policy instruments act on two levels, with affirmative actions and restraining actions. Information instruments refer to policies which include the government's attempts to influence people through communication, transfer of knowledge and advocacy through the distribution of government-led inventory, data collection and guidebook compilation to industries and consumers. Market-based mechanisms include grants, loans, taxes, fines and other user charges. They embody the 'polluter pays' approach, which dictates that those who produce pollution should bear the costs of managing it. Lastly, command/control instruments are used to define, monitor and manage polluting behaviours and practices, which are applied in the form of permits, licenses and rules. The result of regulation mostly depends on the authority and ability of the government to exercise direct command and control over the industry. Further, affirmative actions like financial incentives, for example, are used when the government wishes to encourage specific behaviour. Contrastingly, restraining actions are used to punish behaviours that do not conform with the government's agenda. Section 3 elaborates on some of these policy instruments, along with some lessons learned from these policy experiences.





Source: Tsinghua University Study

LESSONS FROM CHINESE POLICY EXPERIENCES

Before evaluating the PRC policy experience, a notable concept consistent in the PRC's environmental policymaking is the polluter pays principle. The polluter pays principle aims to correct market failure and its resulting social injustice by shifting pollution costs from the public at large to polluting enterprises, while at the same time reducing the amount of pollution produced.¹¹ The polluter pays principle began life as a principle of economics, but it now carries normative force as a legal principle. This means that to control pollution a national or subnational government must, as a matter of law, implement the principle whenever it is possible and appropriate to do so. In particular, governments must find ways to quantify the pollution from industrial facilities - society's largest polluting entities - and make them pay for its environmental cost.¹² The Chinese policy evolution is steadily progressing from identifying polluters to measuring pollution and enforcing the polluter pays principle. All policy instruments from environmental tax, pollution permits, and water pricing, to industrial parks act in a concerted effort to identify and monitor polluters in an effort to ensure those who pollute, pay. This section discusses some of the selected instruments used by China to limit water pollution and promote sustainable use of water by the industrial sector over the years and lessons learned.

Subsidies for promoting water reuse: The recycling of water has been promoted by the Chinese government through various approaches at both provincial and municipal levels. For industrial users, the price gap between regular water and recycled water makes using recycled water a smart economic alternative. In a city like Beijing, for example, where industrial water prices are exceptionally high at 9.5 RMB/tonne, the cost of the recycled water price is very appealing at just 3.5 RMB/tonne for industrial water users.13 However, the economics of wastewater treatment and recycling can be prohibitive in some other parts. The cost of treating recycled water continues to be higher than its final selling price in most cities in China, and so considerable government funding is required to support such a policy approach. In fact, without government subsidies water treatment companies in China could not survive financially due to the high costs of treating water for reuse. The average selling price of recycled water for industrial use in China is 1.19 RMB/tonne while the cost of treating recycled water is 2.11 RMB/tonne.¹⁴ Although this policy approach has its advantages in terms of discouraging freshwater consumption, it is at the same time economically unsustainable and not viable without substantive government support.

Pollution discharge permit: The pollution discharge permit system stipulates that a pollutant-discharging entity must lawfully obtain a pollutant discharge permit and discharge pollutants in accordance with the provisions set out in the permit. Enterprises must apply for and obtain a pollutants discharge permit. From 1990 to 2014, China has operated under a permit system that issues permits for the discharging of industrial pollutants into waterways,

Box 1- Case Study Shaoxing:

Encouraging a circular economy

The government encouraged textile enterprises to adopt circular economy practices, especially with regards to water treatment and water reuse. In 2015, the local government invested a 35-million-yuan subsidy to incentivize water reuse. If a factory was equipped with a water reuse system, it was eligible for a subsidy of 260 yuan/tonne of reused water.²⁶ The subsidy agenda encouraged the practice of water reuse and the implementation of digital automatic monitoring systems of pollutant emissions. These combined efforts resulted in the decrease of the total effluent discharge from 0.9 million tons to 0.54 million tons.²⁷ Print and dyeing enterprises in the district invested a total of 1.3 billion yuan, and 210 enterprises have built sewage pre-treatment facilities. In addition, 65 enterprises have built water reuse facilities. More than 100 enterprises use membrane treatment technology to recycle wastewater, and the recycling rate is over 40 per cent.

Source: Tsinghua University Study

as well as for the drawing of water for industrial purposes. However, due to lack of legal support the permit system was only weakly enforced. In 2015, the PRC launched the Integrated Reform Plan for Promoting Ecological Progress, which emphasized improving the pollutant emissions permit system. It was stated that a unified and fair business emissions permit system covering all fixed pollution sources will be established quickly nationwide. Subsequently, a permit system aimed at all industries was implemented at provincial and municipal levels.¹⁵ Any firm or organization is required to apply for and receive a license before releasing any pollutant into a designated area. For enterprises, regulation centred on "one-license" has effectively lightened the burden, as there would no longer be repeated declarations. Practice has proved that standardized and refined environmental management will not lead to an increase in the burden of enterprises, but will save resources and reduce energy consumption. For government staff, the process of issuing pollutant emission permits could help them clarify the basic equipment, process flow, and pollutant emission position of each industry. These clear and accessible contents, including the technological characteristics of each enterprise, have been specified in the emission permit, which will greatly improve the efficiency and transparency of management. For environmental management efforts, the permit

provides solid legal support. As requirements of enterprises for environmental protection will be concentrated on the discharge permit, they will improve the fine level of environmental management and standardize environmental law enforcement and supervision. For environmental protection tax (see section below), the implementation of the emission permit system provides great convenience. Enterprises would pay taxes according to the implementation report of pollutant discharge permits. The data are clear, the methods are unified, and the collection process of taxation is made concise and efficient. This permit is complimented by other policy tools, such as the setting of quotas to monitor the water consumption of high water-consuming license holders. In addition to these permits, the Chinese government also imposes strict regulatory measures on industry including the shutdown of any factory that violates national industrial policy. As stipulated by Water Ten, any factory that does not comply with relevant national policy, standards or industrial regulation within a certain time frame would be shut down, with targeted industries including paper and pulp, leather, textile dyeing, coking, sulphur and arsenic smelting, oil refineries and pesticide production. This includes the use of any machine or technology listed as 'environmentally non-compliant technology or equipment' by State Council and the Bureau for Environmental Protection. This policy

Box 2- Case Study Shandong Province:

From phased control of pollution to development of a basin comprehensive emission standard

The phased emission control of Shandong province is noteworthy. Shandong divided the eight-year process of tightening emission standard into four stages. Take the emission limit applied on CODCr (Chemical oxygen demand) contained in bleached straw pulp effluent as an example. Before 1 May 2003, the CODCr emission standard was 450 mg/L, the corresponding emission standard was modified in gradual stages, as a result in 1 January 2010 on, the CODCr emission control limit reached a level of 120 mg/L. However, if only environmental benefits were considered without considering the adaptive capacity of enterprises, most of the pulp and paper enterprises would have gone bankrupt, bringing huge economic loss and social instability. The phased approach helped avoid this problem, as the enterprises were given a clear path of legislation and were given plenty of time to take positive steps, including increasing polluting control input, optimizing producing processes, and adjusting raw material structure to achieve compliance. Meanwhile, with phased control on industrial wastewater emission, the industry's entry barrier had been raised. According to statistics, six years after the implementation of the phased standard, the number of straw pulp enterprises had decreased by 80 per cent, while the overall economic output of the industry had increased substantially, and the pulp and paper industry embarked on a healthy development path.²⁸ At the same, the province gradually moved from implementing the industry-specific emission standards to implementing basin-wide comprehensive emission standards, which all enterprises in the basin should obey. This resulted in substantial reduction in the presence of high polluting industries in the region.²⁹

Source: Tsinghua University Study

is implemented at the national level with local government responsible for its enforcement.

The pollution discharge permit system is based on information disclosure and has greatly widened transparency in terms of manufacturing capacity, discharge data, and corporate reporting on environmental information. The permit system has helped achieve more coordinated and aligned inter-department and inter-ministerial cooperation by making data available in a unified form. Further, the permit system has given a unified standard and lays foundation for the environmental tax system. However, the permit system is not without its challenges. Its design is complicated as it deals with a complex mix of sources of pollutions and industrial sectors. The permit system is not flexible enough to integrate the specific requirements for different subregions and often the voice of smaller firms is not adequately heard in the design and implementation of the permit systems. The roles and responsibilities and the processes for implementing the permit system need to be further streamlined by the government to lower its administrative cost, whereas companies need to ensure accurate reporting of their emission levels and the operation status of their facilities.

Discharge fee: The purpose of the discharge fee policy is to charge companies across all industries for any pollutants discharged into the environment if contamination exceeds national or local standards. The discharge fee is as an adaptation of the polluter pays principle. According to this policy, the polluter is required to pay a pollutant discharge fee if they are responsible for discharging any of the top three nationally recognized contaminants in their wastewater.¹⁶ However, the discharge fee policy that was implemented at a national level by the State Council in 1984 was subsequently abolished in 2017.

The many problems associated with the discharge fee system were exposed during the decades following implementation. Firstly, the discharge fee was too low to effectively incentivize factories to change their polluting behaviours.¹⁷ The cost of treating wastewater in the chemical and dyeing industries is 6.99 RMB/kg and 3.81 RMB/kg respectively, while the discharge fee is only 0.9 RMB/kg, meaning companies benefit more financially by simply paying the discharge fee rather than treating their wastewater. A secondary problem was that the environmental capacity of a factory or industrial area

was not being holistically evaluated before discharge fees were applied and collected.¹⁸ Therefore, even if factories were meeting the discharge standard, their pollution emissions might still have been exceeding the environmental capacity in terms of water pollution. As a result, environmental degradation continued unabated, despite the introduction of the discharge fee. Lastly, poor implementation of the policy at the local level, including issues like corruption, resulted in insufficient fee collection,19 also because the policy stipulated that the amount of the discharge fee was subject to the affordability of the polluter. That is to say, for discharging the same amount of pollutants, a poor polluter could pay a lesser discharge fee than a more affluent polluter. As a result, the actual amount collected by the authorities varied greatly from the amount anticipated. Ultimately, this critical policy fault meant that the public were covering the costs of the environmental damages caused by profit-seeking enterprises and so those sources responsible for emitting the pollutants were not sufficiently incentivized to change their polluting behaviours.

Environmental tax: The environmental protection tax law replaced the discharge fee system officially in early 2018. The environmental protection tax system was developed based on lessons learned from the discharge fee system. As explained earlier, the environmental tax system is linked to the emission permit system. Enterprises would pay taxes according to the implementation report of pollutant discharge permits. The emission permits give clear data on the pollutant emission levels. The methods are unified, hence the collection process of taxation (unlike pollution levy) is made more efficient and transparent. The law stipulates that the environmental tax pricing range for emitting water pollutants is 1.4 RMB to 14 RMB per unit pollutant with the exact tax rate to be chosen by provincial governments, given the disparity in water resource between provinces. The environmental tax system strengthens the tax net and increases the cost of production for all manufacturers that emit taxable emissions prescribed under the law.²⁰

Beijing has the highest environmental tax bracket of all municipalities and provinces, with neighbouring provinces the next highest when compared with other regions. On the other hand, the western provinces, as less developed provinces, have the lowest tax rate of 1.4 RMB per unit pollutant. Interestingly, while some provinces are discouraging

the presence of highly-polluting industries by higher tax rates, less developed regions are attempting to attract investments from those industries through setting lower environmental taxes. A feasible approach would be to adjust the national geographic composition of the industrial sector, but until this happens factories will continue to relocate and operate out of more remote, rural areas where environmental taxes are lowest. Another downside of the environmental tax policy is that its approach to incentivizing positive behaviours is unclear. The law is not specific regarding under what conditions companies should receive tax concessions,²¹ hence more clearly defined incentives may help quicken the transition to more environment-friendly production methods.

Tiered water pricing: In China, tiered water pricing is widely used to control water consumption levels, for both domestic and non-domestic use. For nondomestic use additional fees are demanded for any water consumption above a designated limit. For example, in urban areas in Julin Province that face water scarcity or that use groundwater as a key water source, non-domestic users that consume 0 to 10 per cent more than the allocated limit will be charged surplus fees for excess amounts of water used, and above this, further charges apply. Since relevant industries affected by this policy must consider higher water fees in production costs, they are forced to re-examine the amount of water consumed on a regular basis. Thus, tiered water pricing is an effective approach to controlling water consumption and usage behaviours, especially in those provinces lacking abundant water sources.

That being said, the tiered water pricing system also has its challenges.²² Firstly, a lack of national standards to regulate local policy makes

protection law). Thirdly, there is a lack of disparity in the fee structures applied to regular industries and more heavily polluting industries. If a different fee structure was applied to more polluting industries, such as the tiered water pricing system, it could be a great tool for guiding companies seeking a transition to more environmentally friendly, resource conserving technologies.

Industrial parks: Industrial parks are characterized as a clustering of industries designed to meet compatible demands of different organizations within one location. It usually includes an administrative authority, making provisions for continuing management, enforcing restrictions on tenants and detailed planning with respect to lot sizes, access, and facilities.²³ Generally, there are selection criteria for industrial parks in China, which include but are not limited to (1) abundant water resources and (2) enough environmental carrying capacity. It is known that water resources are the key to developing industrial parks as such parks are also large consumers of water due to their industrial density. If there are not enough water resources available, the government will not allow development of an industrial park at such conditions. Further, now if new or old developments inside the industrial park do not meet any new environmental standards, the development will be fined or shut down. Although many measures for protecting the environment have been adopted by industries, pollution is still unavoidable. Therefore, a certain environmental carrying capacity within and around the park is necessary so that some pollution can be "carried" by the local environment. Usually, an environmental impact assessment done by the developers is a prerequisite for developing a new industrial park.

The industrial park minimizes the problems

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