

KEY POINTS

- The PRC's rapid industrialization resulted in considerable environmental degradation and it is vital that mitigation and protection activities rapidly scale up to sufficiently address current environmental challenges.
- To meet the soaring demand for environmental protection, a joint government and private sector participation is needed—bringing huge opportunities and equally big challenges for specialist national and international environmental protection firms.
- Incentivizing private sector supply of ecological protection would require collaborative effort across various government agencies—in establishing useful market information to attract private investments into the environmental protection industry.
- The PRC should promote policy reforms that would enable fast tracking of transformation from command-and-control measures as well as subsidies to more market-based environmental conservation and compensation mechanisms.

Leveraging Private Sector Participation to Boost Environmental Protection in the People's Republic of China

In the People's Republic of China (PRC), environmental degradation has emerged as a flashpoint in the country's next stage of development. The government has a strategy to tackle its pollution problems, most prominently enshrined in its 13th Five-Year Plan (FYP). This plan presents huge opportunities and equally big challenges for firms looking to capitalize on its soaring demand for environmental technologies. The PRC's environmental protection industry has been developing rapidly in recent years, covering the entire value chain from the engineering of a wide range of technologies down to equipment manufacturing and provision of related services. To incentivize higher private sector participation, various government agencies will have to collaborate in designing more market-based environmental policies and regulations. Greater support for technological innovations and encouragement of public-private partnerships will open more opportunities for both local and international private market participants. The PRC should also continue to develop its green finance initiative to attract private investments into the environmental protection industry.

INTRODUCTION

High levels of industrial expansion in the PRC may have given rise to its rapid economic growth but came at the cost of excessive exploitation of its natural resources, resulting in environmental degradation. Industry has become a major user of fossil fuel energy, a source of pollution, through greenhouse gas emission and waste generation, which adversely impacts human health. The manner of resource usage affects short-term economic costs and touches long-term prospects for socioeconomic sustainability. These negative repercussions emanating from the PRC's move toward industrialization have become a growing concern for both the Government of the PRC and the general public.

Evaluating the PRC's position with respect to "green growth" shows a muddled picture of progress, according to a recent study commissioned by the Organisation for Economic Co-operation and Development (OECD). On one hand, significant progress had been achieved in environmental protection—with policies concerning pollution and climate issues becoming more rigorous, economic instruments such as environmentally related taxation increasingly used, and results starting to converge

with those seen in OECD countries. Figures released by the Ministry of Ecology and Environment (MEE, formerly the Ministry of Environmental Protection) showed that in 2018, there was a decrease in the total nationwide chemical oxygen demand (by 3.1%) and emissions of ammonia nitrogen (by 2.7%), sulfur dioxide (by 6.7%), and nitrogen oxides (by 4.9%). On the other hand, progress in ecological conservation tends to be overwhelmed by the continuous growth in industrial production. Pressures exerted on the environment are still high, with factor productivity levels for carbon energy and natural materials remaining low compared to OECD and other emerging economies. While stringent regulations are in place, enforcement remains a challenge. This means that the environmental impact of the PRC industry is greater than it should have been (Linster and Yang 2018).

The PRC recognizes the need to transition to an environmentally sustainable growth model. The 13th FYP for 2016–2020 reflects a shift in the PRC's growth model from industrial-driven production to the promotion of environmental sustainability. The government's strategy to tackle pollution problems is most prominently enshrined in the 13th FYP, serving as a policy blueprint that spans all industries. This environmental plan, coupled with the rapid growth within the clean tech and environmental industries over the past decade, presents huge opportunities and equally big challenges for firms looking to capitalize on the PRC's soaring demand for environmental protection technologies (Hostetter 2019).

Demand- and supply-side considerations determine the level of innovation and development in environmental protection. Increased market demand for environmental protection lowers economic and political risks and minimizes market barriers affecting the entry of firms in environment-related industries. This leads to the formation of large-scale environmental industries contributing to sustainable economic growth. Moreover, the formation of an effective supply structure for environmental products and services may match the political and social requirements of environmental improvements (Liu et al. 2005).

DEFINING THE ENVIRONMENTAL PROTECTION INDUSTRY

The environmental protection industry (EPI) is viewed in many ways worldwide. It is recognized as “eco-business” in Japan, “environmental protection industry” in the PRC, and “environmental industry” in the United States. In the European Union and in other OECD countries, it is referred to as “environmental industry” or as “environmental goods and services industry.” EPIs started to gain traction in the 1970s along with the increasing focus of developed countries on ecological and environmental issues. As a clear exception to the traditional resource consumption and environmental pollution of the industrial sectors, the pollution control products and environmental services of EPIs directly bring environmental gains, contributing to environmental compensation, rehabilitation, and re-use. Unlike conventional industries, EPI firms fall under a wide

range of industrial classifications, bringing difficulties in collecting and analyzing EPI statistics and comparing EPI development across countries (Liu et al. 2005).

The environmental market in the PRC covers the entire value chain from the engineering of a wide range of technologies, down to equipment manufacturing and provision of related services. This includes the provision of equipment and services for environmental pollution control, the removal of pollutants, waste treatment, energy conservation, and clean production, as well as the collection, safe disposal, recycling, and recovery of waste resources. It also covers services related to the protection of resources and the natural ecology (Hong Kong Trade Development Council [HKTDC] 2019).

RECOGNIZING THE ENORMOUS DEMAND FOR ENVIRONMENTAL PROTECTION

Given the considerable environmental degradation caused by the PRC's rapid industrialization, it is imperative that mitigation and protection activities rapidly increase in scale to sufficiently remedy the current environmental challenges. Since the 1990s, environmental problems in the PRC have attracted worldwide concern as the negative outcomes have far-reaching effects both nationally and internationally. There has been a huge growth in demand for cost-effective solutions to these problems, creating a huge market for environmental protection goods and services.

Demand for environmentally sound technologies, products, and services in the PRC is determined and shaped by various forces emanating from governmental promotion, industrial environmental performance requirements, and public pressure. In their study, Liu et al. (2005) broadly classified the PRC's EPI market into five clusters:

- governmental purchase programs or projects for ecological remediation and pollution control at the national and regional levels;
- municipal infrastructure development for public health and urban development;
- industrial need for pollution control, cleaner production, and optimal usage of resources or materials;
- household consumption focused on better physical health, comfort, and environmental preferences; and
- global market demand.

A large portion of the total market demand is mainly focused on two clusters—provision of urban infrastructure and industrial need for environmental improvement. These clusters are dominantly served in the PRC because emerging urban infrastructure and industry management take priority within government programs, while private environmental consumption has only been recently promoted and the international market demand for environmental industries from the PRC is yet to gain full traction.

Central and local government investments to environmental protection are the major drivers and financial source for urban

infrastructure construction and public sanitary improvement. Despite the gradual increase in public sector environmental investments, the PRC's investment as a share of gross domestic product (GDP) has been uneven—only averaging 1.1% from 1997 to 2017—and is lower than the 2% average in industrialized countries. Estimates show that without further boost to the government's financing pattern, the capital shortage for ecological conservation infrastructure would reach 30% to 60% of the needed investment, thereby posing a threat of substantial economic losses in the next couple of years.

The central government, though, is determined to accelerate the pace of environmental protection as the 13th FYP calls for a total cumulative investment of CNY17 trillion in green industries from 2016 to 2020. The government estimates the environmental protection field—which covers goods and services to measure, prevent, limit, or correct air, water, and soil pollution as well as problems related to waste, noise, and ecosystems—will be the focus for over half this amount (CNY8.6 trillion). This has resulted in the increase of EPI from approximately CNY55 billion in 2004 to CNY1.7 trillion in 2018. These figures encompass spending across the entire value chain, from equipment production to engineering services and construction (Hostetter 2019). To enable a sufficient magnitude of EPI in the PRC, government financial support should be augmented by private capital sources in the next few years. This brings an inordinate number of opportunities for specialist national and international environmental protection firms.

CHALLENGES TO ENVIRONMENTAL PROTECTION SUPPLY

The hefty and immediate demand for environmental protection in the PRC has seen extensive government intervention, especially at the municipal level. However, this effort still falls short of the market requirements. There is an obvious need to encourage rapid entry of private participants in the EPI. Several critical factors hindering the speed and scale of private stakeholder participation in environmental protection markets will have to be addressed.

Rigidities in market entry. With about 20,000 environmental protection companies currently registered, EPIs in the PRC are characterized as relatively small-scale and widely dispersed. Township and village enterprises (TVEs) account for a major share in this industry. Based on the surveys made by the China Association of Environmental Protection Industry (CAEPI), about 90% of environmental protection enterprises in the PRC are in the fields of prevention and control of water and air pollution and treatment and utilization of solid waste resources, and only about 4% are considered large-scale companies with revenues of more than CNY400 million (CAEPI 2018). Most sub-industries have a low degree of concentration and there is a lack of clear market leaders. By comparison, EPIs in developed countries are more concentrated, so much so that markets are dominated by large integrated enterprises.

Underdeveloped market mechanisms and regional protectionism undermines the capacity of globally recognized EPI players to serve the PRC market. The opportunities for international environmental technology companies in the PRC market are clear, with many western firms, including start-ups with strong competencies in the field, finding success in the local market. These companies have generally been equipment suppliers and engineering and design service providers coming from Europe. However, increased entry and profitability are diminishing recently, owing to a combination of restrictions on market access and preferential treatment for domestic players. Partnerships with local companies are essential to overcoming these challenges. In some cases—such as electricity generation projects—taking a majority stake is discouraged or banned. Thus, working with a local firm is mandatory for market access. This predicament necessitates a thorough partner search with clearly defined benchmarking criteria to avoid mistakes that companies make in selecting channel partners. Success for international firms will always hinge on a combination of a clear go-to-market strategy, an ability to establish partnerships with suitable local companies, and persistence in an industry where time horizons are typically measured over years rather than months (Hostetter 2019).

Inadequate market information. Participation of private entities is also being hampered by a lack of credible and transparent data and rigorous market monitoring mechanisms. Environmental indicators are sparsely used in decision making and monitoring of progress toward the FYP targets, including the regular performance evaluation of local leaders. Efforts should be strengthened in consolidating the PRC's environmental monitoring systems and improving the information base and data quality for integrated environmental-economic policies. The changes recently introduced in the country's supervisory and monitoring system are expected to make pollution control more effective and make it easier to assure the quality of data reported by provinces and local authorities to the central government (Linster and Yang 2018).

Insufficient information on the potential gains from environmental protection disincentivize polluting companies. Even under public and government pressure, most traditional industries hesitate to improve their environmental performance because environmental costs cannot be fully measured in advance and pollution charges are not fully returned to the polluting industries that paid them (Liu et al. 2005).

Skewed technology adoption and transfer. The PRC needs to increase its capacity to commercialize scientific and technical research and development (R&D) results. Adequate policies should promote the translation of research results into environmental improvement systems for industrial and commercial use. This should significantly increase the private supply of advanced environmental equipment, products, and services. The PRC still needs to improve its success rate in applying domestic R&D results and in its ability to absorb and assimilate imported environmental technologies.

The quality of most environmental equipment, products, and services in the PRC remains relatively low, with a few large companies being able to match international standards. There is a prevailing practice of repeated investment in R&D for low-technology equipment and mass production of standard, low-quality technologies, and even simple imitation, are prevalent among local firms, particularly among TVEs. Most environmental companies in the PRC provide products that are designed only for “end-of-pipe” pollution control of industries, rather than focusing on ecological rehabilitation, environmental management and services of engineering projects, and information and consultation (Liu et al. 2005).

Only about 4% of the PRC’s environmental technologies are deployed overseas, whereas about 8% of American, European, and Japanese patents are deployed in the PRC. The PRC is still in the start-up stage in exporting environmental technology. Meanwhile, multinational companies have been actively pursuing the local market through exports of their products, technology transfer, and the establishment of joint ventures with local businesses. Most of the processing equipment used in the PRC is imported from overseas. One example of overseas involvement in the PRC’s environmental industry is the partnership between Suez Group of France and NWS Holdings of the PRC to provide services in hazardous waste incineration and wastewater treatment. Another example is the Veolia Group of France, which has established an office in the PRC to offer environmental services by harnessing technology (HKTDC 2019).

On the brighter side, the PRC has shown resolve in fast-tracking environmentally related technologies. The number of applications for environmental technology patents in the PRC accounted for 44% of the world total from 2008 to 2017, a larger proportion than that of any other country (HKTDC 2019). Looking at the technology domain, every one-in-five environmental inventions during the past decade occurred in environmental management, notably air and water pollution abatement; a small fraction concerned water-related adaptation, such as water conservation; while the vast majority (76%) were related to climate change mitigation, particularly in building energy efficient lighting; renewable energy generation; and the development of enabling technologies like battery storage, fuel cells, and smart grids (Linster and Yang 2018).

Constraints to financing environmental protection investments. Realizing the PRC’s environmental sustainability ambitions require “green finance”—the full range of financial services that support the environmental transformation of the economy and the efficient use of resources—the scale of the capital required is immense: an estimated CNY3 trillion–CNY4 trillion (\$433 billion–\$577 billion equivalent) each year in green investments from 2016 to 2020, according to research by the MEE and the China Council for International Cooperation on Environment and Development.

Despite a steady increase in the PRC’s public spending on environmental conservation, there remains a large funding

shortfall to meet the investment needed to rectify the environmental degradation of the last few decades. As the PRC’s economic growth is projected to slow, the government will likely be hard-pressed to increase investment to the levels required to ensure adequate protection and restoration. Against this backdrop, encouraging the flow of resources from the private sector into ecological protection is a priority (Zhu and Townshend 2013).

The PRC’s construction of a green financial system has a “top-down” nature (in contrast to the western “bottom-up” approach, which rests on market innovation), based on government guidance, as epitomized by the 2016 guidelines for establishing the green financial system and programmatic documents released by several finance-related ministries and commissions, including the People’s Bank of China (PBOC). The PBOC has taken several steps to promote green financial development through a combination of macro-prudential and monetary policy. Since the third quarter of 2017, the PBOC has begun to incorporate green finance into the macro-prudential assessment system, including through positive incentives for commercial banks to increase their stock of green credit and boost green deposits to supplement green credit (Yao 2018).

A range of practical challenges needs to be overcome to drive momentum for the PRC’s green finance progress. For one, funds are still not flowing in enough volume because positive environmental externalities are not yet fully internalized in market prices. At present, due to imperfect national laws and regulations, green benefits cannot be included in investment income and environmental damage is not fully reflected in investment costs. The lack of consensus on a definition of ‘green’ is also holding back progress. The PRC has two sets of green bond standards and two sets of green credit standards—with various departments having separate standards for green agriculture, green buildings, and green manufacturing and technology, but there is no coordination between them. Another is that disclosure of environmental performance information remains insufficient. Within the financial sector, environmental risk analysis capabilities need to be developed. At the same time, due to the lack of tools for environmental risk identification and quantification, some financial institutions underestimate the risks that polluting industry investments may bring. Moreover, most practitioners lack professional knowledge of green industries. All these mean awareness of green finance—or of broader environmental, social, and governance factors—has yet to become mainstream.

EVOLVING POLICY INSTRUMENTS FOR ENVIRONMENTAL SUSTAINABILITY

Shift to market-based mechanisms. Environmental policies in the PRC have been characterized by a broad use of command-and-control measures as well as subsidies—instruments that were important for achieving the environmental targets in previous FYPs. While this can be an effective way to achieve emission reduction targets in traditional sectors, it is not in line with the polluter-pays principle, and removes incentives for enterprises to

develop efficient means of reducing pollution, including by plant modernization, and the use of integrated abatement technologies and of clean technologies (Linster and Yang 2018).

To leverage private markets in boosting green innovation, at the end of 2018, several ministries, led by the National Development and Reform Commission (NDRC), released an action plan to promote market-based environmental conservation and compensation mechanisms. The plan represents a major step forward in recognizing and promoting the private sector's role in supporting environmental protection. The overall policy principle of the 2018 action plan is to build an environment in which those who benefit from ecosystem services contribute financially; and those who protect, maintain, and restore ecosystems are properly compensated. This would create the desired incentives that would encourage private sector involvement (World Bank 2017).

The government has been steadily reforming public sector involvement in water, electricity, and roads, among others, by introducing policies and guidelines for private market functioning in such industries or sectors. This “marketization reform” emphasizes a reduced role for the state through private investment and financial liberalization and decentralization. Additionally, the reform agenda covers environmental tariff reform with full-cost recovery, competitive bidding procedures, changing ownership structures (e.g., public and private, local and foreign), and easing of restrictive fiscal policies (Zhong et al. 2008).

Synergy between public and private participants. The government is continuously pushing support for EPIs, both at local and central levels, in the form of public–private partnerships (PPPs)—especially for projects focused on the treatment of water and solid waste. As in other countries, local government bodies will enter long-term contracts with project owners or operators—generally spanning 15–20 years—providing a subsidy per unit of waste processed, analogous to a gate fee. Build–operate–transfer (BOT, usually financed and operated by a government institution) and build–own–operate–transfer (BOOT, usually financed by the private sector) models are the most common forms of PPP. For some industries such as incineration, sewage sludge, and organic waste treatment that produce biogas, local government bodies are—at least on paper—required to give a subsidy per unit on electricity or gas sold to the grid (Zhong et al. 2008). In 2018, the total number of pollution control and green low-carbon projects in the PPP management database of the Ministry of Finance had reached 4,766, accounting for investment of about CNY4.7 trillion.

As EPIs are increasingly localized, the selection of the form of PPP should be closely associated to the level of local conservation pricing. For example, “greenfield” categorization of PPP projects may be applied when tariffs are not sufficiently defined, especially in the wastewater sector; while “joint venture” PPP contractual approaches may be used in cities with sufficiently high conservation tariff, particularly in the water supply sector (Zhong et al. 2008).

To further develop public–private synergy, the supporting organizational or institutional structure for PPP projects should be fully integrated. This should entail the seamless interaction across pertinent government agencies and the streamlining of processes involved in preparing, approving, and procuring PPP contracts across EPIs and provinces. The Ministry of Finance and the NDRC are the main bodies responsible for PPP regulation and oversight, with both issuing PPP guidelines and lists of PPP projects.

Promote emerging environmental protection industry subsectors. The government should proactively develop strategic emerging industries in the market for environmental protection. In 2017, the NDRC, together with relevant departments, organized the formulation of the “Guiding Catalogue of Key Products and Services for Strategic Emerging Industries.” In March 2019, the PRC released its new “Green Industries Guidance Catalogue” clarifying the definition of “green industry” and harmonizing standards or benchmarks for sustainability. This new catalogue is an important step in energizing EPIs in the PRC. Six broad categories of EPIs are being promoted—ranging from renewables, cleaner production methods, waste management, sustainable infrastructure, and third-party verification and consulting services—to provide more opportunities for local and foreign companies. The establishment of formal standards for EPIs could also push the PRC to become a major exporter of those standards.

Improvements in green finance policy. The regulations on compensation for ecological protection should be improved to clarify how the financial system should manage environmental externalities. At the same time, legislative amendments covering the financial sector need to be promoted, such as the inclusion of green and relevant sustainable growth elements into the Commercial Banking Law, Securities Law, Insurance Law, and Pension Fund regulation. The government needs to require environmental information disclosure from listed companies. This includes improving information statistics and data disclosure across all asset classes and financial services (including bonds, equities, insurance, funds, and loans), as well as providing data support for green financial policy evaluation, business evaluation of relevant institutions, and future policy revision.

Ultimately, the success of the PRC's market-based mechanisms for environmental protection is hinged upon clear and forceful policy frameworks, rule-abiding market players, and public–private transparency. The promotion of green development in the PRC requires a concerted effort across related government institutions.

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