

# Characteristics, Status and Strategies of Environmental Protection Investment and Financing in China

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**ABSTRACT**

Environmental pollution continues to aggravate with the acceleration of industrialization. As a result, the treatment of environmental pollution and protection of ecological environment have become issues of great concern during the social and economic development of China. Fund guarantee is an important link of environmental protection, and reasonable investment and financing strategies are the prerequisites of fund guarantee. To analyse the characteristics and status of environmental protection investment and financing in China and put forward targeted investment and financing strategies, the environmental protection investment and financing methods abroad were summarized. Then, the characteristics and types of current environmental protection investment and financing activities in China were examined. Results show that current environmental protection investment and financing activities in China are characterized by multiple fund sources, dominance of governance investment, and separation between investment and earnings. Specialized foundations for environmental protection, environmental policy funds, environmental pollution treatment project charges, and financial institutional loans are four major types of environmental protection investment and financing in China. There are four major problems, including inadequate total investment amount for environmental protection, unreasonable investment and financing structure, lack of investment and financing mechanism innovation, and lack of diversity of the investment and financing channels. This study's findings can provide references for decision making in terms of industrial structural transformation and upgrade, development enhancement of the environmental protection industry, and research into environmental protection investment and financing in China.

**INTRODUCTION**

In recent years, the contradiction between human society and the natural environment has escalated, owing largely to industrialization and urbanization. Different types of environmental protection approaches are conducted more frequently, which poses a serious threat to the survival and development of individuals. China is facing environmental pollution and ecological destruction because of the rapid development of its economy. Despite the practical environmental pollution treatment and protection policies adopted by China, the severity of its environmental pollution has shown no signs of alleviation. Table 1 shows that the discharge of major pollutants, including wastewater, waste gas, and solid waste, in China is fluctuating, and the overall environmental pollution index is high. To achieve sustainable economic development, environmental capacity should not be ignored; otherwise, environmental pollution can easily occur. For a long time, environmental protection investment and financing have played an important roles.

Fund input is indispensable for environmental protection. In fact, environmental protection investment can, to a large extent, show the efforts of a country in environmental protection. Although environmental protection investment and financing of China have made great strides in recent years, long-term environmental pollution calls for a larger fund input than what is currently provided. Therefore, environmental protection investment and financing, especially steady and adequate fund support, become a linchpin to realizing the environmental protection objective of China. This study mainly examines the characteristics and types of environmental protection investment and financing in China, based on which strategies for environmental protection financing and investment are proposed. These strategies can improve the environmental protection investment and financing mechanism, gain a deeper understanding of the gap between environmental protection investment and financing demand and supply, and promote coordinated development among economy, society and environmental protection.

Table 1: Discharge of major pollutants, 2011-2015.

	2015	2014	2013	2012	2011
Total waste water discharger (10,000 t)	7353226.83	7161750.53	6954432.7	6847612.14	6591922.44
Total CO <sub>2</sub> discharge (t)	18591000	19744000	20439000	21180000	22179081.69
Total NO <sub>x</sub> discharge (t)	18510241.91	20780015.34	22273587.45	23377617.22	24042744.89
Total smoke (dust) discharge (t)	15380132.7	17407507.58	12781410.76	12357747.79	12788255.37

## EARLIER STUDIES

In the research field of environmental protection status and causes, most scholars observe a close link between environmental pollution and economic development and urbanization. However, in the research field of environmental protection investment and financing, the focus has been on the environmental regulatory policies, environmental protection investment scale and investment efficiency evaluation, and correlation between coordinated development of economy and society and environmental protection investment. Research into environmental pollution, namely, pollution status and causes, has achieved significant findings. Hardoy et al. (1991) analysed the urban environmental problems in the developing nations, and concluded that water and air pollution, natural and human disasters, and noise pollution are the major types of environmental pollution. Zhu et al. (2003) investigated polycyclic aromatic hydrocarbon pollution in the surface water of Hangzhou, China, and its potential risks. Jin et al. (2004) focused on the status of perfluoro octane sulfonate pollution in the tap water or rivers in China. After investigating electronic waste disposal in Mainland China, Li et al. (2006) pointed out the necessity of controlling the environmental pollution caused by electronic waste through policy regulation. Ge et al. (2006) also studied the recycling and disposal status of electronic waste in China and developed measures to cope with the existing problems. Cole et al. (2006) claimed that foreign direct investment is to blame for the worsening of environmental protection. Bose (2010) analysed the causes of global warming and suggested that energy, environmental pollution, and excessive use of electricity and electronics have led to an evident increase in temperature. In addition, many scholars have studied environmental protection investment and financing. Bernauer (1995) studied the chlorine pollution of Rhine and proposed international financing strategies for environmental protection. Martinot (2001), after analysing energy projects of the World Bank in China, believed that environmental investment could effectively boost environmental protection. Aslaksen et al. (2003) examined the incentive effect of ethic investment on strengthening the environmental protection and social responsibility of an enterprise (Aslaksen et al. 2003). Jalil et al. (2011)

used the co-integration method to investigate the influence of economic growth, energy and financial development on the environment of China. Li et al. (2013) discussed the financing status and development trend of current natural reserves and argued that the implementation of investment and financing policies in natural reserves can reinforce environmental protection in natural reserves. Ming et al. (2014) proposed relevant treatment policies after examining the status, models, and existing problems of current renewable energy investment and financing. Hu et al. (2015) investigated environmental protection investment and financing mechanism in the Yangtze River Delta and Pearl River Delta, respectively. Zhang et al. (2016) studied the legal issues of infrastructure investment and financing in rural environmental protection and explored the potential countermeasures for these legal issues. Ma et al. (2017) discussed the influence of the carbon tax of coal power plants on low-carbon investment decision-making. The literature reviews indicate that, in the study of environmental protection investment and financing, scholars mainly focused on identifying the environmental protection investment and financing problems and providing different solution plans or suggestions for improvement. These suggestions mainly include the expansion of financing channels and establishment of government-dominated environmental protection investment and financing companies. The environmental pollution status in China and its causes, from which problems in the current environmental protection investment and financing are identified, are also analysed. Feasible solution plans for environmental protection investment and financing in China are identified by studying the ideal solutions to environmental problems based on advanced environmental protection investment and financing models abroad.

## CHARACTERISTICS OF ENVIRONMENTAL PROTECTION INVESTMENT AND FINANCING IN CHINA

**Diversity of fund sources:** Sociality and openness are two striking characteristics of the current environmental protection investment and financing in China. Thus, environmental protection is an undertaking that can benefit the entire society. Meanwhile, environmental protection investment

and financing have no restriction in terms of participants. Thus, various fund sources are available for environmental protection in China. These sources mainly include multi-entity investment and financial institutional financing, such as government investments, enterprise self-raised funds, national bonds, social and individual investments, and foreign investment.

**Government dominance:** Environmental protection is a widely known issue with a close bearing on public and social welfare. Even if enterprises do not make any investment, they can still enjoy the benefits brought by investments in environmental protection. Such activity necessitates the government's leadership and supervision. In fact, not all environmental protection projects should be entrusted to enterprises. Most projects closely related to public interest are dominated by financial investments from the government. The main reason for this dominance is that the public is barely passionate over projects for public good, even if environmental protection is beneficial to public health. Under such conditions, launching compulsory policies and fiscal fund input is of paramount importance for the government.

**Separation between investment and earnings:** Separation between environmental protection investment and earnings mainly refers to separation between investment subjects and beneficiaries of environmental protection. Funds raised by environmental protection investment and financing are expected to prevent or tackle environmental pollution. However, the effects of environmental pollution prevention or treatment usually manifest after a long time. This timing also determines the long-term nature of environmental protection investment and financing. Therefore, obtaining immediate earnings is difficult for environmental protection investors. Although an entity or individual does not invest in environmental protection, one can still enjoy the benefits brought by environmental protection investment and financing. The post-stage earnings of environmental protection investment and financing are frequently shared by a large group. Hence, investment subjects of environmental protection and beneficiaries are inconsistent.

## CURRENT TYPES OF ENVIRONMENTAL PROTECTION FINANCING

**Specialized foundations for environmental protection:** To improve the efficiency of environmental pollution treatment, the Chinese government usually allocates a budget for environmental treatment at the beginning of every fiscal year based on the local environmental pollution status. These funds are used for environmental pollution treatment, survey of environmental pollution treatment, monitoring of

environmental status, natural protection, advertising, and education of the living environment. The guaranteed funds in the national fiscal system form an important component of China's environmental protection investment and financing. These funds have a positive effect on talent development, environmental pollution treatment, and environmental pollution advertising and education that promotes environmental protection.

**Environmental policy funds:** China's funds for environmental protection policy mainly cover protection, update and transformation, infrastructure, maintenance, and environmental and pollution treatment. Among them, update and transformation funds have been adopted for treatment of pollution from old-style industrial enterprises. However, due to an adjustment of the industrial structure, several old-style enterprises have been discontinued. As a result, certain funds are left idle. In terms of environmental protection policy, infrastructure and maintenance funds account for a large percentage and have been on an annual increase.

**National charges for environmental treatment projects from enterprises:** Sewage discharge, treatment, and rubbish disposal fees account for the major national charges for environmental treatment projects from enterprises. Unfortunately, a unified set of implementation standards for sewage discharge charges in China's provinces is not in place. The differences mainly result from differences in economic development and environmental pollution. Thus, the Chinese government can only set a period in which charges are required. Specific charges are then decided by the areas according to their local conditions.

**Financial institutional loans:** Financial institutional loans mainly refer to bank loans, which are an important channel for environmental protection investment and financing. In recent years, bank loans have played an important role in the treatment and improvement of environmental protection, along with an increased number of investment and financing projects.

## STATUS OF ENVIRONMENTAL PROTECTION INVESTMENT

**Inadequateness of China's total investment for environmental protection and financing:** Table 2 shows that the total investment for environmental protection and financing in China has increased by a large margin. From 2011 to 2015, the total investment for environmental pollution treatment increased by 23%. Urban environmental infrastructure has the most investment among the treatment projects for environmental pollution. This finding means that the Chinese government attaches great importance to investment in urban drainage, fuel gas construction, central heat-

Table 2: Overview of China's investment for environmental pollution treatment 2011-2015.

Indexes	2015	2014	2013	2012	2011
Total investment in environmental pollution treatment (100 million/RMB)	8806.3	9575.5	9037.2	8253.46	7114.03
Investment in urban environmental infrastructure construction (100 million/RMB)	4946.8	5463.9	5222.99	5062.65	4557.23
Investment in urban fuel gas construction (100 million/RMB)	463.1	574	607.9	551.81	444.09
Investment in city central heating construction (100 million/RMB)	687.8	763	819.48	798.07	593.34
Investment in city drainage construction (100 million/RMB)	1248.5	1196.1	1055	934.08	971.63
Investment in city greening and sanitation (100 million/RMB)	2075.4	2338.5	2234.86	2380.04	1991.94
Investment in city appearance and sanitation construction (100 million/RMB)	472	592.2	505.75	398.64	556.23
Investment in industrial pollution source treatment (10,000/RMB)	7736822.2	9976510.87	8496646.57	5004572.67	4443610.1
Investment in new construction, reconstruction and expansion environmental protection (100 million/RMB)	-	-	3425.84	2690.35	2112.4

Table 3: Overview of investment in China's industrial production environmental pollution treatment.

Indexes	2015	2014	2013	2012	2011
Investment in industrial pollution treatment(10,000/RMB)	7736822	9976511	8496647	5004573	4443610
Investment in waste water treatment (10,000/RMB)	1184138	1152473	1248822	1403448	1577471
Investment in waste gas treatment (10,000/RMB)	5218073	7893935	6409109	2577139	2116811
Investment in solid waste treatment (10,000/RMB)	161468	150504	140480	247499	313875
Investment in noise treatment (10,000/RMB)	27892	10950	17628	11627	21623
Investment in other treatment projects (10,000/RMB)	1145251	768649	680608	764860	413831

ing, greening, city greening, and sanitation.

Table 3 shows that a significant growth occurred in the investment in industrial pollution treatment, which is as high as 74%. This figure suggests that industrial enterprises have turned to technical transformation and clean production for pollution prevention and treatment. Investment growth in wastewater, gas, and solid waste treatment projects is also equally impressive.

Fig. 1 shows the percentage of China's environmental protection investment and financing in China's GDP from 2006 to 2015. The annual average is approximately 1.43%. In other words, despite the significant growth in China's environmental protection investment in recent years, environmental quality has not yet achieved substantial improvement. The total investment for projects, such as traditional industry pollution source treatment, construction (new construction, reconstruction, and expansion), and urban environmental infrastructure (sewage, renewal, and sludge disposal and rubbish treatments), is obviously inadequate. This fact has hindered the development of China's environmental pollution treatment, which cannot prevent the generation of new pollution or solve inherited environmental pollution.

**Unreasonable structure of China's environmental protection investment:** Fig. 2 illustrates that urban

environmental infrastructure accounts for China's highest investment in environmental protection. Among China's investment in urban environmental infrastructure greening, fuel gas construction, and central heating can also bring environmental benefits. As their functions partially deviate from those of environmental protection, regarding them as a part of environmental protection investment and financing is highly disputable. When taken as a whole, China's environmental pollution treatment remains focused on end-treatment. Investment in the process and source remains inadequate. Consequently, the level, effects, and facilities of pollution treatment do not meet the enterprises' demands for development. In addition, they cannot contribute to the improvement of environmental quality. If the investment and treatment model remains unchanged, then achieving good results for environmental protection will be impossible.

**Lack of environmental protection investment and financing mechanism innovation:** Current environmental protection investment and financing innovations are still focused on the investment and financing model, which is mainly reflected as the Public-Private Partnership (PPP) model innovation and green finance innovation. The difficulty of combining social capitals with environmental protection demands has been a critical issue. Although most people hold the potential of the PPP model in the field of

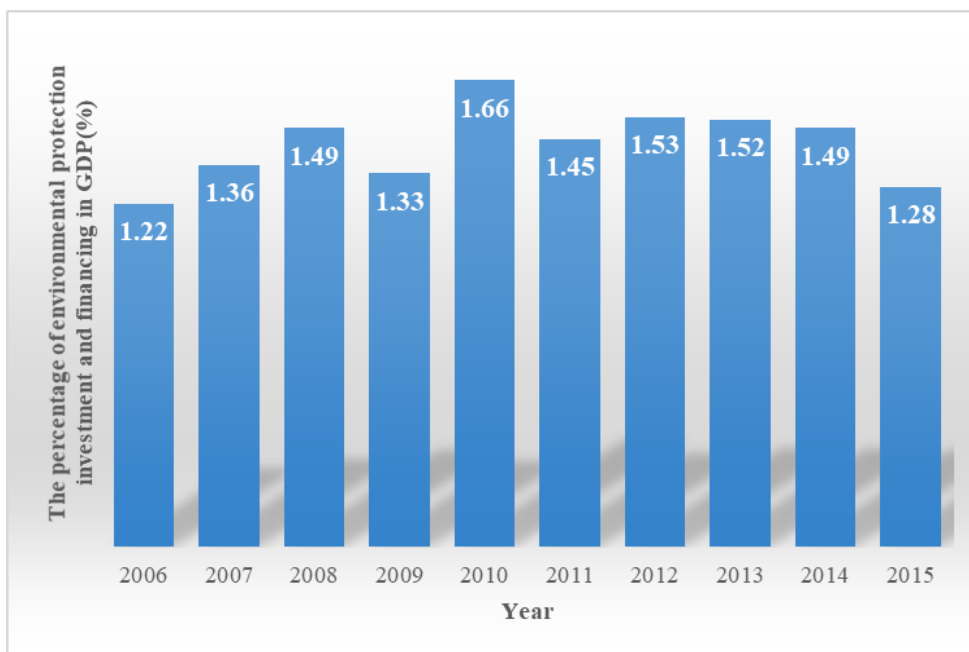


Fig. 1: Percentage (%) of China’s investment in environmental pollution treatment in GDP, 2006-2015.

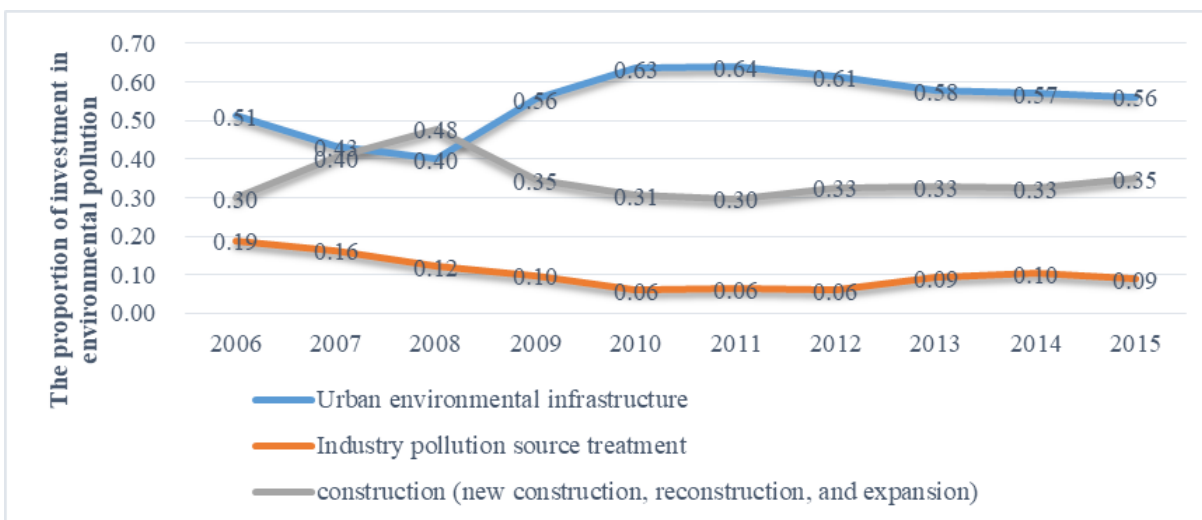


Fig. 2: Structure of environmental protection investment.

environmental protection in a positive light, investors lacking a deep understanding of environmental protection and experience in the operation of environmental protection teams and project construction do not dare to provide too much input into environmental protection. This scenario has been a hurdle in the inflow of social capitals. The PPP model itself suffers from a series of problems, including unstable investment return mechanism, lack of market justice and standards, and incompleteness of risk prevention and guidance mechanism. As a result of these problems, investors

can barely find a point for integration and make a breakthrough. In terms of green finance, financial institutions have yet to establish a guidance mechanism for environmental protection investment, and environmental protection projects often yield slim profits.

**Lack of diverse channels for environmental protection investment and financing:** Currently, China’s environmental protection financing and investment still follow the nationally regulated investment and financing channels, which

do not adequately meet the demands of environmental protection financing and investment in the new era. Measures such as the strengthening of capital guarantee for environmental protection treatment, expansion of financing channels, promotion of third-party treatment models for environmental protection, and improvement of social capital participation mechanism should be adopted to mobilize the participation of social, private, and corporate institutions in environmental protection financing and investment.

### **STRATEGIES FOR ENVIRONMENTAL PROTECTION FINANCING AND INVESTMENT**

**Increasing the total amount of and improving the structure of environmental protection investment and financing:** China's total environmental protection financing and investment are still inadequate to meet the nation's demand for environmental pollution treatment funds. Government units across all levels, enterprises, and the general public should cooperate on environmental pollution treatment. Meanwhile, vigorous treatment measures, including confirming the powers of investment and financing subjects, scientifically designing environmental pollution treatment investment, and developing innovation investment and financing channels and products, should be adopted. A proper restriction mechanism for environmental protection financing and investment and market competition mechanism should be put in place so that the sustainable development of humans, natural environment, and economy can be promoted. During the corporate production and operation process, techniques that are environmentally friendly, energy- and resource-conserving, and capable of optimizing the production structure of enterprises should be promoted. Enterprises should take the initiative to undertake the task of environmental pollution treatment and invest in production and technical services for environmental protection products. In this way, they can maximize their profits from the operation and development of environmental protection projects and continuously increase the market share of their products or services.

**Expanding the environmental protection financing and investment channels and innovating environmentally friendly financing and investment products:** In the field of environmental protection and treatment, institutions and individuals from all walks of life have the responsibility to invest in environmental pollution treatment. Projects such as the construction of facilities for urban domestic sewage and waste are mostly government-invested. However, in these projects, more than one person is accountable, and thus, the major accountable persons are difficult to identify. The government can refer to the "polluter pays principle" to mobilize the public and pollution-induced enterprises to

participate in such financing and investment projects and share the investment risks. Government institutions should likewise increase financial input, increase the efficiency of fund utilization, optimize the fiscal expenditure structure, build environmental finance, shrink general expenditure, clarify environmental protection expenditure items, concentrate on enhancing major projects, build environmental protection approval and fund arrangement management system, and set up an environmental protection foundation. The financing assets of the environmental protection industry can be securitized, and the legal system should be further improved to support the normal operation of financing during the guarantee period. The development of financial leasing can also be deepened. With BOT at the core, enterprises and other investors should be allowed to develop or build environmental protection projects. After projects are built and gain the right of independent operation for a certain period, the profits obtained can be used to compensate enterprises or pay for the costs incurred by investors during the construction process. After the agreement expires, the projects shall be transferred to government institutions free of charge. Market-oriented operations can also improve the operational benefits of cooperation projects.

**Improving the supporting policies for environmental protection investment and financing and strengthening the government's basic service ability:** The "polluter pays principle" should be pinned down. The market-price relationship should be tackled comprehensively in accordance with supply and demand theory. Through the formulation of relevant tax policies, the efficient operation of the mechanism for environmental protection financing and investment can be guaranteed, and the government's environmental pollution treatment level can be improved. Efforts should be intensified to enhance the government's service ability in environmental protection and the supervision ability of specialized environmental protection departments. During the process of environmental protection and pollution treatment, the supervision and management system and law enforcement procedures should be improved for the operation of environmental protection facilities. Relevant laws and regulations for environmental protection should be upgraded as well to standardize law enforcement activities and improve law enforcement behaviour. Moreover, the application procedures for environmental protection fund should be standardized, a professional demonstration program should be put in place, the reasonable use of input fund should be guaranteed, and easily understandable feasible, flexible investment methods should be designed. Different investment means should be formulated to guarantee investors' selection of the most suitable one for investment.

Investment behaviours should be kept in strict accordance with the laws. By guaranteeing “sewage discharge fees to be higher than pollution treatment costs,” environmental pollution treatment subjects can reap benefits from what they are doing. The interests between pollution dischargers and treatment subjects should be scientifically and reasonably distributed. During the charge collection process, the principles of fairness, justice, and openness should not be violated. The supervision of environmental protection funds should be increasingly transparent. The sources and use of funds should also be meticulously tracked, and special funds should be allocated to special uses.

## CONCLUSION

The acceleration of industrialization in recent years has increasingly worsened environmental pollution in China. The fund guarantee for environmental pollution treatment is an important link in environmental protection. Favourable financing and investment strategies can lay a solid foundation for solving environmental pollution. To analyse the characteristics and status of environmental protection investment and financing in China and put forward targeted investment and financing strategies, this study first summarizes the methods for environmental protection investment and financing applied abroad. Then, the characteristics and types of China’s current environmental protection investment and financing activities are examined in an attempt to cast light on the status of environmental protection and financing in China. Finally, strategies for China’s environmental protection financing and investment are proposed. This study’s findings show that China’s current environmental protection investment and financing are characterized by multiple fund sources, dominance of governance investment, and separation between investment and earnings. Results also show that foundations specializing in environmental protection, environmental policy funds, project charges for environmental pollution treatment, and financial institutional loans are four major types of environmental protection investment and financing in China. The study identifies four major problems, namely, inadequate total investment amount for environmental protection, unreasonable investment and financing structure, lack of innovation for the investment and financing mechanism, and lack of diversity of investment and financing channels. In sum, the findings of this study can provide references to enhance one’s understanding of the status of environmental protection financing and investment in China. In addition, the findings can improve the development abilities of the environmental protection industry and expand the research into environmental protection financing and investment. Further research and explorations can be promoted to study

environmental protection financing and investment issues and mechanism innovation, the efficiency of environmental protection financing and investment, financing and investment forms for different types of pollution treatment projects, spatial difference of cross-provincial environmental pollution investment and financing, and environmental regulations.

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