

Development Trend of Wastewater Treatment Resource Utilization and Strategic Options for Commercial Banks

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Abstract: China's per capita possession of water resources is only a quarter of the world's per capita. It is one of the world's largest sewage discharge countries, as well as in the sewage discharge increase rate. China's water quality water shortages (serious pollution of traditional water sources) and resource water shortages (low per capita water resources) are superimposed on each other, especially more serious in North China and coastal economically developed areas, and the use of sewage resources is an important way to solve water shortages, and an important initiative to protect China's water security. Since 2022, domestic sewage resource planning obviously accelerates the pace, and the whole industry top-level planning reflects a strong support. In May and June, the National Development and Reform Commission (NDRC) held a meeting to promote the use of wastewater resources and expert symposiums to promote the construction of wastewater resources and the use of "1 + N" policy framework system, followed by the end of July, the NDRC and the Ministry of Housing and Construction issued the "urban sewage facilities to fill the shortcomings and weaknesses implementation items", the policy side of the intensive promotion of sewage treatment resources. In this context, commercial banks can adopt differentiated marketing strategies for enterprises in the upstream industry chain, focus on direct financing services in the midstream industry chain, actively promote the sewage treatment PPP asset securitization model in the downstream industry chain, steadily promote the diversified business model, and enrich the sewage resourcing financial products, so that they can better promote their own business development while deeply promoting the resourcing of sewage treatment.

Keywords: Wastewater Treatment Resource Utilization; Strategic Options; Commercial Banks

1. Overview of wastewater treatment resource utilization

1.1 Basic concepts and roles

Wastewater Treatment resource utilization, also known as Sewage Resource Utilization (Waste Water Recovery), is to lead industrial, agricultural and domestic wastewater to a predetermined purification system, the use of physical, chemical or biological methods of treatment, so that it can be reused to meet the standards of the entire process, to improve the utilization of water resources, which is an important measure. Specifically, it is the sewage treatment plant after the first and second level of treatment to meet the standard of water and then carry out in-depth tertiary treatment, so that it can reach the standard of agricultural irrigation, living miscellaneous water, river recharge, clean landscape water, industrial cooling water cycle, etc.. Among them, the primary treatment is mainly the use of physical treatment method through the grating, sand sedimentation tank, primary sedimentation tank and other structures to remove solid pollutants in the sewage in suspension; the secondary treatment is mainly the use of activated sludge or biofilm method and other technologies to remove organic pollutants in the sewage in the state of colloidal and dissolved organic pollutants, organic pollutants to meet the standards for discharge; the tertiary treatment of filtration, activated carbon adsorption, membrane technology and other combinations of unit technology so as to further treatment of difficult to degrade organic matter and soluble inorganic substances, and ultimately get renewable water quality. According to the source of sewage, it can be further divided into municipal sewage resources and industrial sewage resources.

1.2 Classification of wastewater treatment resource utilization

At present, there is no uniform division for the use of wastewater recycling in the world, and the proportion of various types of wastewater recycling is also different to a certain extent according to the end-use demand and choice of wastewater recycling treatment process in different countries and regions (as shown in Table 1). Because of the limitations of Japan's land area, agriculture is not its main development

industry, and Japan attaches more importance to the restoration of the natural environment, and its re-claimed water reuse is mostly used for river recharge, landscape water and snowmelt water (accounting for 27%, 27%, and 22%, respectively); California, as a major agricultural center in the U.S. and the serious over-exploitation of groundwater, its reclaimed water is mostly used for agricultural irrigation, recreation and landscape water (accounting for 29%, 23%, 19%, and 29%, 23%, and 19%, respectively). California, as a major agricultural area in the United States with serious groundwater overdraft, uses most of its reclaimed water for agricultural irrigation, recreational water and landscape water (29%, 23% and 19% respectively). According to China's "Urban Wastewater Recycling Classification", China's wastewater recycled water is divided into five categories, namely, agriculture, forestry, animal husbandry and fishery water, environmental water, urban miscellaneous water, industrial water and supplemental water, which is currently mainly used for agricultural irrigation, industrial water, environmental water, urban miscellaneous water and groundwater recharge. According to the data of Urban and Rural Construction Statistical Yearbook, in 2018, the highest proportion of China's reclaimed water use was for farmland irrigation, followed by environmental water and industrial water, and groundwater recharge accounted for a lower proportion of utilization due to its higher technical requirements.

Table 1 Classification of sewage resource utilization by country

China		USA		EU	Japan
Water for agriculture, forestry and fisheries	Agricultural irrigation afforestation and nursery animal husbandry aquaculture	Water for agriculture	Food crops/processed food and non-food crops	Water for the environment and aquaculture	
			Restricted/ unrestricted		
Environmental water	Water for recreational landscaped environments Water for ornamental landscape environments	Environmental water			Landscape water
Miscellaneous urban water	urban greening flush road sweeping Vehicle washing building construction fire-fighting	Urban water	Restricted/ unrestricted	Personal, urban and irrigation water	Water for greening Toilet flushing water
		Drinking type utilization	Non-direct potable use/ direct potable use		
Industrial water	Cooling water Wash water Boiler water Process water Product Water	Industrial water		Industrial Cooling water consumption	
Supplementary source water	Surface water recharge Groundwater recharge	Groundwater recharge (not for direct drinking)		Indirect aquifer recharge	Water for play

Source: Organized by the author

1.3 Sewage resource utilization is an important path to solving China's water resource problems

China's total water resources rank sixth in the world, but its per capita possession of water resources is only one quarter of the world's per capita level, making it one of the countries in the world with relatively poor per capita water resources. The distribution of water resources is uneven, and there is a large gap between demand and distribution. In addition, in recent years, due to China's industrialization and urbanization process continues to advance, sustained rapid economic and social development, rising demand for water resources, overdevelopment, pollution is also becoming increasingly serious, so that our country is facing the dual dilemma of water shortage, water quality water shortage. The water shortage situation is aggravated. As global warming and extreme weather and other worldwide environmental problems further deteriorate, rising water temperatures and reduced dissolved oxygen will affect water quality, resulting in a decline in the self-purification capacity of freshwater basin water bodies, the demand for both drinking water and irrigation water will increase. In order to alleviate the problem of water scarcity, sewage resource treatment is necessary. Precisely because we really lack clean water, therefore, if in the final sewage treatment plant link, sewage can be turned into surface III class water above the standard of clean water, then the water cycle can really form a closed loop, and the water shortage problem is also solved. After solving the problem of water shortage, the proportion of total water supply to total water resources in China will be further increased, and the problem of water shortage can be solved on the premise of reducing water consumption.

2. The development history and trend of China's sewage resource utilization

2.1 Development history of sewage resource utilization in China

China's sewage resource utilization can be divided into four stages: start-up period, exploration period, rapid development period, and green development period:

(1) Start-up period (1949-1978): The degree of sewage pollution was relatively low. The treatment scale of sewage treatment plants is generally very small, and the treatment process is dominated by simple sedimentation and activated sludge method. The main feature of China's sewage resource utilization at this stage is that sewage is basically untreated or used for agricultural irrigation and fish farming after simple treatment.

(2) Exploration period (1979-2000): China's industrialization and urbanization level is increasing, the degree of sewage pollution is getting heavier and heavier, and China formally put forward the concept of "sewage resource utilization". The main feature of China's sewage resource utilization at this stage is that, in addition to still being used for agricultural irrigation and fish farming, treated sewage began to be widely used in high water-consuming industries such as iron and steel, coal and other water, as industrial production of water in order to improve the recycling rate of water.

(3) Rapid development period (2001-2011): China began to focus on the construction of sewage re-cycling demonstration projects and re-cycled water centralized use of engineering, and in the "Tenth Five-Year Plan" period for the first time put in the use of sewage resources into the national economy and social development plan. The main feature of China's sewage resource utilization at this stage is the rapid expansion of the national sewage resource utilization surface, the use of technology and effect of the research continues to deepen, and the use of the scope of further expansion.

(4) Green development period (2012 to the present): in the context of the construction of ecological civilization, China's sewage resource utilization has made greater progress. The main feature of China's sewage resource utilization at this stage is that, under the guidance of the ecological civilization thought of "green mountains are golden mountains", it strengthens the integration of unconventional water resources into the unified allocation of water resources, seeks for a low-carbon green development mode, and explores a more comprehensive resource utilization of sludge.

2.2 Status of development: the overall proportion of sewage resource utilization remains low

Although the concept of China's sewage resource utilization and practice for a long time, but the overall level of sewage resource utilization is still low, the overall advancement rate and the pace of technological iteration is not enough. Only in the water-scarce Beijing-Tianjin-Hebei region sewage reuse rate steadily increased, but most provinces and municipalities of sewage re-source has been in the primary stage. According to the data, in 2022, China's urban recycled water consumption of 9.4 billion cubic meters, recycling ratio of only 15.98% (sewage recycling rate = sewage recycling volume / total sewage treatment), far lower than the "National Comprehensive Plan for Water Resources" (2010-2030) mentioned in the target of more than 50% of the sewage reuse, and lower than the average of developed countries. From the provincial perspective, in 2022, China's sewage recycling utilization rate ranked the top five provinces and cities are Beijing, Shandong, Inner Mongolia, Tianjin, Hebei, sewage recycling utilization rate of 55.7%, 36.0%, 31.1%, 28.0%, 27.6%. At present, China's sewage resources to 0.1-0.5 million tons of project scale / day, with large-scale treatment capacity of fewer enterprises, and only Beijing has reached 550,000 tons / day sewage treatment capacity in enterprises.

2.3 Technological Trends, Policy Advancement and Market Space for Wastewater Treatment and Resource Utilization

Sewage resources mainly go through the secondary effluent of sewage plants and then further do in-depth treatment, with the upstream of the industrial chain process research and development applications to the middle reaches of the relevant sewage treatment equipment, the mainstream sewage resources treatment technology including coagulation - precipitation - filtration process, biological processes, membrane

processes. Coagulation-sedimentation-filtration process is one of the traditional deep treatment technologies, with low investment, easy management, low operating costs and other advantages, but the treatment effect is unstable, poor water quality; aeration biofilter (BAF) and other strengthened filters to remove nitrogen and phosphorus, good water quality, low investment, but the daily operation of the difficulty of the water quality is not stable; membrane process technology has a separation effect of the separation effect, the biological process, membrane process and so on. Membrane technology has good separation effect, stable effluent water quality, small amount of chemicals, low energy consumption and other characteristics, increasingly widely used in deep water treatment, is currently the main process of deep water treatment. In recent years, the membrane process has accounted for nearly half of the sewage resources in Beijing, and other cities with high sewage recycling rate also use the membrane method mostly, and the membrane process is expected to be applied on a large scale in the recycling of sewage in other provinces and cities.

3. Strategies of commercial banks under the development of wastewater treatment resource utilization

3.1 Upstream industry chain: differentiated marketing strategies

The upstream industry chain of sewage treatment resourceization contains sewage treatment instruments (including filtration and screening instruments and wastewater treatment membranes) and related chemical manufacturers. From the perspective of the market competition pattern and development trend, the current sewage treatment chemicals market supply and development is relatively stable, and commercial banks can be used as a traditional credit and settlement business expansion target. It is worth noting that the wastewater treatment instruments segment of the wastewater treatment membrane-related enterprises, whose membrane process is to enhance the scale of wastewater treatment resources of the core technology. Its market space in the upstream industry chain of wastewater resources will be rapidly enhanced, and in the current wastewater treatment membrane field there are two types of enterprises, commercial banks can adopt a strategy of differentiation: (1) international wastewater treatment enterprises in the wastewater treatment membrane production process is good, with stable quality and strong visibility, and commercial banks can focus on the promotion of transaction banking business, cross-border business, supply chain finance and other aspects of active involvement, give full play to the advantages of regional channels; (2) under the encouragement of the policy, the domestic sewage treatment membrane field of small and medium-sized enterprises in the field of technology has gradually made progress and achieved large-scale production, which in turn led to the reduction of the cost of domestic membrane technology material costs and operating costs. This type of small and medium-sized enterprises in domestic are active and numerous in the domestic wastewater treatment market, with strong ability to capture market opportunities and adapt to the environment. Commercial banks can actively sort out the relevant wastewater treatment membrane-related enterprises in their operating regions and promote comprehensive financial services by linking up the total and branch offices, and can design intellectual property rights credit (pledge) loans for membrane-related enterprises, and financing and leasing services for projects in eligible segments (ultrafiltration, microfiltration, submerged and MBR modules).

3.2 Midstream industry chain: focus on direct financing services

The main body of the sewage treatment resources industry chain for the sewage resources project operation enterprises (EPC mode, entrusted operation, investment and operation), these operating companies have a high degree of marketization, and its standardization, complete sets of sewage treatment equipment can be customized to match the application of the environmental and pollution conditions of the water body, with a short construction time, adaptability, quick results characteristics. In the future with the business is more complete, more standardized management of the integrated Sewage resource utilization service provider or environmental protection business transformation, commercial banks can focus on providing direct financing services. Since this year, sewage resources related policies intensively promote, especially on July 31, sewage treatment to fill the short board program promulgated, the market for the midstream industry chain in the operation of the enterprise concern more, with the recent capital may be more obvious.

Combined with the process of transformation from deleveraging to superior leverage, the proportion of direct financing will gradually increase, the development of multi-level capital market speed up the process of commercial banks on the sewage operation of financial services, which can focus on direct financing services, specifically: (1) relying on the construction of the “big investment bank” system, improve the direct financing services for sewage operating enterprises, strengthen the over-the-counter main body, and directly and deeply participate in every link of the direct financing system; (2) relying on the investment and loan linkage and the debt and loan linkage to provide credit enhancement for the sewage operating enterprises, and dispersing the distribution of indirect financing in the sewage resources industry; (3) by participating in the merger and acquisition fund of the central enterprise or leading listed company, serving the potential sewage operating enterprises; and recommending customers to the cooperating brokerages and holding subsidiaries through the provision of the comprehensive listed consultant, cooperative brokerage firms and holding subsidiaries.

3.3 Downstream industry chain: actively promoting the PPP asset securitization model for sewage treatment

The downstream of the industrial chain mainly contains water treatment companies, and this field of business is mainly dominated by the local government-operated enterprises, generally by the local original state-owned sewage treatment plants or water treatment plants, such as the reform and restructuring of the local government-led restructuring, with capital and policy support from the local government. As the main carrier of the classified output of reclaimed water, in the local sewage treatment and resource utilization projects will be in an advantageous position in the competition. Commercial banks for this field of water companies can take the following strategies: (1) actively promote municipal sewage treatment PPP asset securitization model. Sewage industry project PPP from the operation mechanism can effectively match the government and enterprise demand, help to maximize the overall benefits of the project, but the current low rate of project landing is mainly due to the financing is not in place, commercial banks can seize the advantage of sewage treatment PPP project with stable cash flow through asset securitization, to provide a new financing channel for the project. At the same time, can try to develop a variety of intermediate business based on the franchise. (2) It is possible to participate in the equity market and share the growth benefits of the sewage resorption industry by setting up sewage resorption industry funds and development funds. At the same time, under the influence of the epidemic, the financial subsidy gap related to sewage resources may continue to become larger, and the recent academic and practical circles have proposed to raise funds through the issuance of “government-supported bonds” and other market-oriented ways, so commercial banks can pay close attention to the relevant information, fully prepared for the various plans, and actively involved. (3) With the promotion and implementation of total environmental and resource management, water assets will form a brand new asset category. Commercial banks should pay attention to its market scale, and can actively participate in the construction and improvement of the water property rights market, such as the right to income from sewage treatment, the right to use water, the right to transfer and so on, and water assets can be part of the allocation of green assets under the permission of the policy.

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