

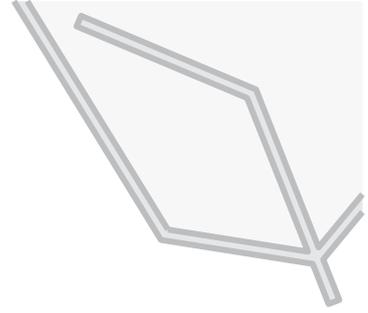
THEMATIC REPORT 07

China Sludge Treatment and Disposal Industry

Edited by China-Italy Chamber of Commerce



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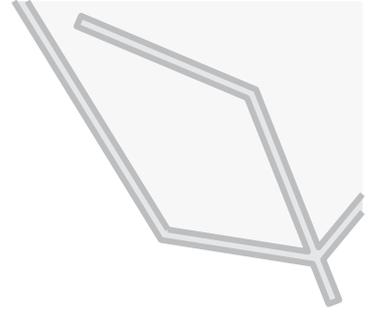


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1. Analysis of Environmental Influence on China Sludge Treatment and Disposal Industry

1.1. Analysis of the Influence of Macro Environment on the Sludge Treatment and Disposal Industry

1.1.1. Sludge Planning Investment in China

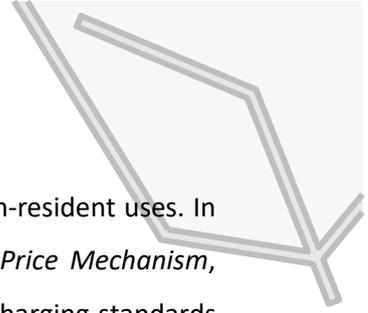
The latest three five-year plans have invested nearly RMB 100 billion in sludge. According to the National Construction Planning for Urban Sewage Treatment and Recycling Facilities, the state set clear targets for the investment in sludge treatment under the 11th Five-Year Plan, 12th Five-Year Plan, and 13th Five-Year Plan. The total investment in sludge treatment and disposal in these three five-year plans reached RMB 96.4 billion. Only the relevant investment under the 11th Five-Year Plan and 12th Five-Year Plan reached RMB 67 billion.

However, the actual completion rate of investment in the sludge treatment and disposal industry is less than 40%. During the period of the 12th Five-Year Plan, the investment in sludge-related fixed assets in China was only RMB 11 billion and only 31.7% of the planned investment were completed. This was in line with the sludge innocuous treatment and disposal rate of 31-35% recorded at the end of the period of the 12th Five-Year Plan. During the period of the 11th Five-Year Plan, as the sludge treatment and disposal issues did not attract enough attentions, the actual investment rate was even lower. Based on an investment rate of 25%, the sludge-related investment during the period of the 11th Five-Year Plan was about RMB 8 billion. Therefore, the total investment in sludge treatment and disposal during the period of the 11th Five-Year Plan and the 12th Five-Year Plan did not exceed RMB 20 billion, with an actual investment rate less than 30% of the planned investment. In addition, it is expected that the investment amount at the end of the period of the 13th Five-Year Plan will not be able to complete the target investment, but the completion rate would gradually increase.

1.1.2. Charges and Subsidies for Sludge Treatment

The sewage treatment fees currently charged in China are relatively low and, in most cases, they are not enough to ensure the normal operation of sewage plants. Adding the sludge treatment and disposal fees to the sewage treatment fees would increase the economic burden of payers. Therefore, subsidies would be one of the sources of sludge treatment and disposal funds for a long time.

China has made adjustments to sewage charging standards. In January 2015, the National Development and Reform Commission, the Ministry of Finance and the Ministry of Housing and Urban-Rural Development jointly issued *the Notice on Formulating and Adjusting Sewage Treatment Charging Standards and Relevant Issues*. It proposed that prior to the end of 2016 the charging standards for urban sewage treatment should be adjusted to be no less than RMB 0.95 per ton for residents, and no less than RMB 14 per ton for non-resident uses. In principle, the charging standards for sewage treatment in counties and key designated



towns should be adjusted to be no less than RMB 0.85 for residents and RMB 12 for non-resident uses. In October 2015, the State Council issued *Several Opinions on Promoting the Reform of Price Mechanism*, which clearly stated that "in order to reasonably raise sewage charging standards, the charging standards for urban sewage treatment shall not be lower than the cost for sewage treatment and sludge disposal." The State Council requested to further improve the urban sewage treatment charging policies and appropriately raise the charging standards for urban sewage treatment. The charging standards shall reimburse the costs for sewage treatment and sludge innocuous disposal and obtain reasonable profits. With the gradual implementation of the water price reform, sewage treatment fees will gradually cover sludge treatment cost.

In addition to the collection of the sludge treatment fee, subsidy policies for sludge disposal projects have been promulgated throughout China. They have encouraged sludge disposal projects and have provided subsidies for the operation or project investments in various manners. Moreover, the subsidies for sludge treatment and disposal vary according to the differences among sludge treatment regions and economic development levels. The subsidies for municipal sludge are generally within the range of RMB 150-300 per ton. There is a large span for subsidies, with a relatively high flexibility to negotiate with the government.

At present, some cities in China have already provided subsidies for sludge treatment and disposal. However, since the treatment schemes vary from case to case, there is no unified standard for such subsidies. Moreover, the operation of the sludge treatment industry relies greatly on government subsidies, but the coverage of subsidies is insufficient yet.

1.2. Analysis of Industrial Policies and Laws and Regulations Environment

1.2.1. National Policies

Since the period of the 11th Five-Year Plan, the sewage treatment industry has developed rapidly in China. It had a rapid increase in sewage treatment capacity and treatment rate, while bringing about a rapid increase in sludge production. After the implementation of the 12th Five-Year Plan, China commenced to pay attention to sludge treatment. However, most of the sludge has not yet been disposed effectively.

In 2015, the *Water Pollution Prevention and Control Action Plan* (hereinafter referred to as the *10-Chapter Water Pollution Action Plan*) issued by the State Council has driven the sludge treatment and disposal industry to enter into a new round of development. The document redefined the treatment and disposal of the sludge generated from sewage treatment facilities in a stabilized, harmless, and recycling manner. It also forbade to discharge into cultivated land the sludge that are treated and disposed in a nonconforming way, and banned the illegal sludge storage sites without exception. It also specified that the existing sludge treatment and disposal facilities should upgrade to the standards by the end of 2017. It finally stated that the sludge innocuous treatment and disposal rate of cities at prefecture level and above should reach 90% or more by the end of 2020.

The 13th Five-Year Plan pointed out that the treatment of atmosphere, sewage, and sludge are the three main directions for domestic environmental protection treatment in the future. It also developed and improved relevant standards for sludge stabilization and harmlessness. It also stated that the supervision and incentive mechanisms are still to be reinforced, thus making a significant layout for sludge treatment and disposal in the next five years. *The Ecological Environment Protection Plan* under the 13th Five-Year Plan, issued in 2016, further enhanced the planning goals. It proposed to promote vigorously the stabilized, harmless and recycling sludge treatment and disposal, and to reach the harmless sludge treatment and disposal rate of 90% in cities at prefecture level and above, and 95% in Beijing-Tianjin-Hebei region. During the period of the 13th Five-Year Plan, the state strengthened its guidance on policies relating to sludge treatment and disposal.

In addition to the *10-Chapter Water Pollution Action Plan* and the 13th Five-Year Plan, China has also issued a series of policies relating to sludge treatment and disposal, while benefiting from the fact that the supervision on sludge discharge would be gradually tightened, and the profitability of the sludge treatment and disposal industry would be better guaranteed. Therefore, attaching increasing importance to the relevant policies would bring strong supports to the development of the sludge treatment and disposal industry.

Serial No.	Time	Institution	Policy Name
1	March 2011	Ministry of Housing and Urban-Rural Development, and Development and Reform Commission	<i>Notice on Further Strengthening the Organization and Implementation of Demonstration Projects for Sludge Treatment and Disposal</i>
2	November 2011	Ministry of Finance, and State Taxation Administration	<i>Notice on Adjusting and Improving Value-Added Tax Policies for the Products and Labor Services in Comprehensive Resources Utilization Type</i>
3	December 2011	The State Council	<i>Notice on Printing and Distributing the National Twelfth Five-Year Plan for Environmental Protection Issued by the State Council</i>
4	May 2012	The State Council	<i>Notice on Issuing and Distributing the National 12th Five-Year Plan for the Construction of Urban Sewage Treatment and Recycling Facilities Released by the General Office of the State Council</i>
5	August 2013	The State Council	<i>Opinions of the State Council on Accelerating the Development of Energy-Saving and Environmental Protection Industry</i>
6	October 2013	The State Council	<i>Regulations on Urban Sewage and Sewage Treatment</i>
7	May 2014	The State Council	<i>Notice on 2014-2015 Action Plan for Energy Saving, Emission Reduction and Low-Carbon Development</i>

8	December 2014	Ministry of Finance, Development and Reform Commission, and Ministry of Housing and Urban-Rural Development	<i>Administrative Measures for the Collection and Use of Sewage Treatment Fees</i>
9	April 2015	The State Council	<i>Water Pollution Prevention and Control Action Plan ("10-Chapter Water Pollution Action Plan")</i>
10	October 2015	The State Council	<i>Several Opinions of the Central Committee of the Communist Party of China on Promoting the Reform of Price Mechanism</i>
11	December 2016	The State Council	<i>Notice of the State Council on Issuing and Distributing the 13th Five-Year Plan for Ecological Environmental Protection</i>
12	November 2017	Ministry of Housing and Urban-Rural Development	<i>Technical Standards for Sludge Treatment in Urban Sewage Treatment Plants</i>
13	January 2018	Standing Committee of the National People's Congress	<i>Law of the People's Republic of China on Prevention and Control of Water Pollution</i>

Table 1 National Policies for the Sludge Treatment and Disposal Industry.
Data source: GEP Research.

1.2.2. Local Policies

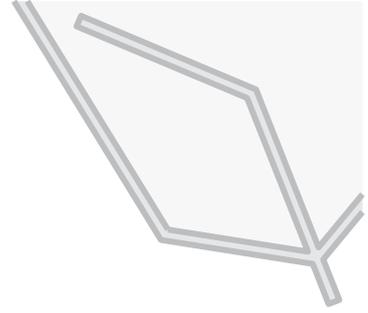
While the state has issued a series of policies relating to sludge treatment and disposal, the local governments across the country have also issued specific implementation plans and corresponding plans one after another. Judging from the relevant policies on sludge treatment and disposal released by the local governments in recent years, the government lacks initiative and willingness to follow up. The relevant issued policies are still not enough and, therefore, the local level is still in the wait-and-see stage, which lacks the driving force of policies.

1.2.3. Technical Specifications

At present, the state has issued a number of technical standards for sludge treatment and disposal. The norms and standards relating to the sludge treatment technologies, such as anaerobic digestion, high-temperature aerobic fermentation (composting), and lime stabilization, the sludge disposal methods, such as land use, landfill, and comprehensive utilization of building materials, as well as the sludge transportation and storage have already been in place.

In addition to the sludge treatment and disposal standards issued by the state and corresponding industry, in 2010, the State Environmental Protection Administration and the Ministry of Science and Technology jointly formulated *the Technical Policies for Urban Sewage Treatment and Pollution Prevention*. In 2017, the Ministry of Housing and Urban-Rural Development also formulated *the Standards for Sludge Treatment Stabilization in Urban Sewage Treatment Plants*, which was of great significance in regulating the construction of domestic sludge treatment projects, guaranteeing stabilized sludge treatment effect, and

improving the standard system for sludge treatment and disposal.



2. Demand Analysis and Prospect Forecast of China Sludge Treatment and Disposal Industry

2.1. Market Demand Analysis and Trend Forecast for the Sludge Treatment and Disposal Industry

Sludge is generally generated in sewage treatment process. 95-98% of the total volume of sludge comes from sewage treatment plants, while the remaining 2-5% comes from other sewage treatment equipment. As of the end of 2018, about 4,000 sewage treatment plants had been built and operated in towns, cities, and counties in China, with a sludge output of 54.38 million tons from sewage treatment plants, and a total annual sludge generation volume of 56.65 million tons in China. Because of the relatively low sewage treatment rate and rural sludge generation volume in rural areas, this Chapter takes no account of rural sludge generation volume in the total sludge generation volume in China, but only includes urban and county sludge generation volume. It is estimated that from 2018 to 2020 the annual compound growth rate of sludge generation volume in China would reach about 4%, and by 2020, the total sludge generation volume would reach 61.77 million tons.

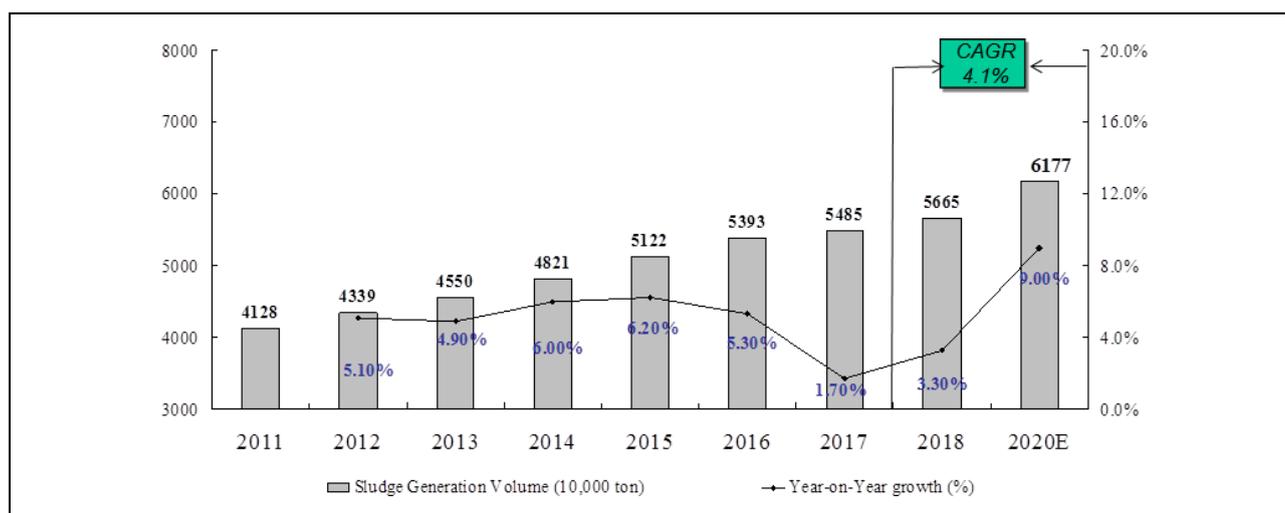


Figure 1 2011-2020 Total Sludge Generation Volume in China (Unit: 10,000 ton/year).
Date source: Ministry of Housing and Urban-Rural Development and GEP Research.

The market scale of sludge treatment and disposal industry in China was RMB 60.8 billion in 2018, and it is expected to increase at an annual compound growth rate of about 4% in the next three years. By 2020, the market scale will reach RMB 66.2 billion.

Unless otherwise specified herein, the sludge treatment and disposal market scale in this report is based on the sludge treatment and disposal volume calculated according to the total sludge generation volume in China.

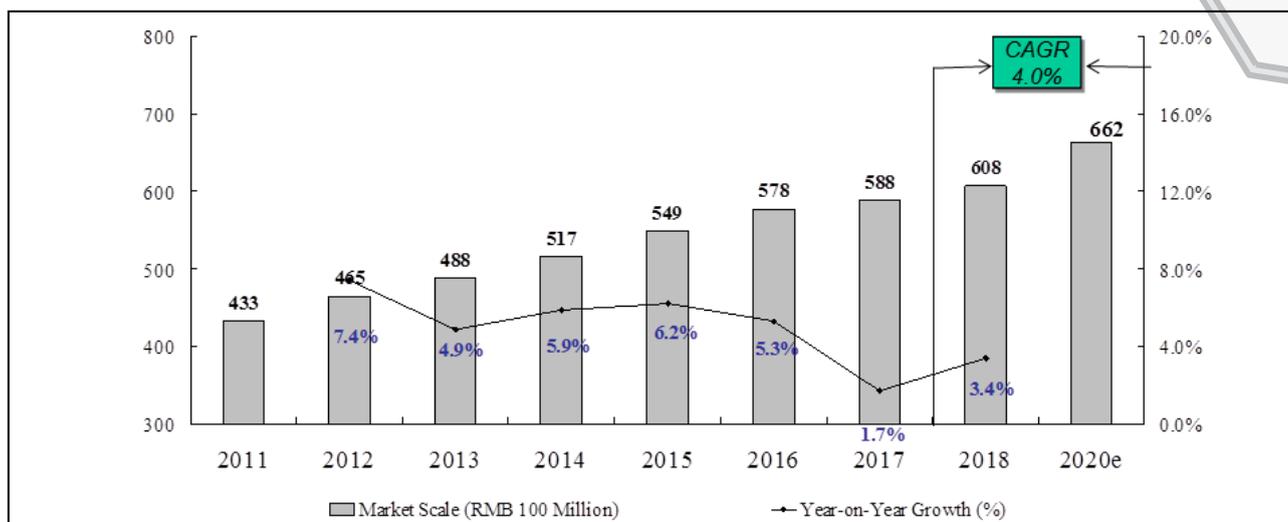


Figure 2 2011-2020 Market Scale of the Sludge Treatment and Disposal Industry (Unit: RMB 100 Million) (market scale: the sludge treatment and disposal volume calculated on the basis of the total sludge generation volume in China).
Data Source: Ministry of Housing and Urban-Rural Development and GEP Research.

2.2. Demand Development Trends and Driving Factors

With the gradual improvement of sewage treatment capacity in China, the sludge generation volume will increase correspondingly. It is estimated that by 2020, the total sludge generation volume in China will reach 61.77 million tons. The market scale of sludge treatment and disposal market will reach RMB 66.2 billion. However, the current domestic sludge treatment stabilization, detoxification, and resource utilization levels are still relatively low, with a decrease in the growth rate of total sludge generation volume. Through strengthening the driving force of policies based on the *10-Chapter Water Pollution Action Plan* and the 13th Five-Year Plan, the sludge treatment and disposal industry in China would obtain good development opportunities.

2.2.1. Declined Growth Rate of Total Sludge Generation Volume

According to statistics from the Ministry of Housing and Urban-Rural Development, the growth rate of sewage discharge volume has decreased in recent years. Consequently, the growth rate of the total sludge generation volume has also decreased. From 2012 to 2016, it maintained a high growth rate of 5-6%. It started to decline in 2015. It is expected that the sludge generation volume in China will increase at an annual compound growth rate of 4.05% from 2018 to 2020, with a declining growth rate.

2.2.2. Driving Force of Policies is to Be Strengthened

The issuance of the *10-Chapter Water Pollution Action Plan* and the 13th Five-Year Plan, the actions against black and odorous water bodies rectification as well as other actions have driven the sludge treatment and disposal industry to enter a new round of development, and made significant layout for sludge treatment and disposal in the next five years. However, more than 50% of sludge in China is not properly treated yet, with relatively low harmless and recycling levels. In respect to sludge harmless disposal and recycling, the driving force of policies seems to be weak. The sludge treatment and disposal industry would have a

large space for development, with relatively large market potential in the future.

2.3. Regional Market Demand Analysis and Prospects

2.3.1. Market Demands at Administrative Region Level

From the perspective of market demands at the regional administrative level, the sludge treatment and disposal industrial market in China is composed of urban market and county market, among which, the urban sludge generation volume accounts for about 85% of the total sludge generation volume. The county sludge generation volume accounts for about 15% of the total sludge generation volume.

2.3.2. Regional Market Demand

The regional distribution of sludge generation volume is consistent with the regional distribution of sewage generation volume, which is mainly distributed in East China, Central China and North China, accounting for about 80% of the total sludge generation volume. In 2018, the sludge industrial markets in East China and Central China were worth respectively RMB 18.5 billion and RMB 18.2 billion, each accounting for about 30% of the market scale of the national sludge market. The market scale of the sludge industrial market in Northern China was RMB 13.5 billion and accounted for 22% of China, while the market scale in the Southwest, Northeast, and Northwest was RMB 10.6 billion in total, accounting for 18% of that of the whole country.

2.3.3. Demand Prospects of Regional Markets

During the period of the 13th Five-Year Plan, the planned total investment in sludge treatment and disposal was RMB 29.4 billion. The five regions with the highest investment amounts are Guangdong, Zhejiang, Shaanxi, Jiangsu, and Henan. The total planned investment in these five provinces accounted for 36% of China. Other 12 provinces obtained an investment of more than RMB 1 billion around the country.

From the perspective of regional treatment needs (planned investments in various regions), at present, Beijing, Xinjiang, Tibet, Qinghai and other provinces are in a relatively saturated state or have relatively small treatment demands. Inner Mongolia, Heilongjiang, and other provinces have relatively small demands, but there are still some space for investment. The sludge treatment and disposal demands in Guangdong, Zhejiang, Jilin and other provinces is far greater than their actual processing capacity. The investment in these regional markets is relatively promising.

3. Analysis of Supply and Competition in China Sludge Treatment and Disposal Industry

3.1. Analysis of the Supply in Sludge Treatment and Disposal Industry

At present, there are thousands of sludge treatment and disposal enterprises in China, including regional subsidiaries. By the end of 2018, the number of sludge treatment and disposal enterprises reached about 3,500, including sludge treatment and disposal equipment companies. The number of newly added enterprises reached 2,000 only from 2017 to 2018, with strong supply capacity reserves.

The average annual production capacity of sludge treatment and disposal enterprises in China is about 500,000 tons, but the volume is still relatively small. Most of the enterprises have a daily treatment and disposal scale of 300-500 tons per day.

The current average operation rate of sludge treatment and disposal enterprises nationwide still needs to be increased, as it ranges from 30% to 50%. Compared with the sewage treatment industry, the sludge treatment and disposal industry still remains in the layout stage.

3.2. Market Share, Industry Concentration and Forecast of the Sludge Treatment and Disposal Industry

The sludge treatment and disposal enterprises in China are numerous but in small scale. They have a relatively low market concentration and a scattered industry distribution. According to GEP Research data, the market share of CR3 industry is less than 10%. The industry concentration is expected to increase.

4. Technical Analysis of China Sludge Treatment and Disposal Industry

The Technical Guide for Sludge Treatment and Disposal in Urban Sewage Treatment Plants (Trial) issued by the Ministry of Housing and Urban-Rural Development and the National Development and Reform Commission in March 2011 introduced four sludge disposal methods, including land use, sanitary landfill, construction material utilization, and incineration.

GEP Research estimates that the application status of the four technology routes for sludge treatment and disposal in 2020 will be as follows: 34% of sanitary landfill, 31% of land use, 20% of incineration, and 15% of building material utilization.

The existing sludge treatment and disposal industry in China has already formed some main technology routes, including anaerobic digestion technology, aerobic fermentation and land use, desiccation, incineration, and ash residue landfilling, and building material utilization. Anaerobic digestion technology is employed on a large-scale in Beijing, Changsha, Zhenjiang and other places; desiccation and incineration technology, ash and slag landfilling are under restrictions; deep dehydration treatment is currently used in many places as an emergency treatment technology.



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