Promoting Public-Private Partnership or Waste-to-Energy: Lessons from China

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Nowadays, to manage the sustainably and effectively the rapidly increasing volume of municipal solid waste (MSW), many countries have sought the implementation of Waste-to-Energy (WTE) projects under Public-Private Partnership (PPP) frameworks. This approach aims to reduce pressure on public budgets and attract private sector participation in WTE initiatives. Thus PPP activities in MSW treatment have grown rapidly in China, contributing significantly to improved MSW management efficiency, active private sector engagement in energy recovery from waste, and the advancement of the national circular economy. In such a regards, this article analyzes the implementation of PPP-based WTE projects in China, focusing on incentive policies that encourage the development of such projects particularly those using the PPP model and provides policy recommendations for Vietnam.

PPP MODELS FOR WTE PROJECTS IN CHINA

In China, PPP arrangements have been widely applied in the WTE incineration sector to leverage private sector advantages in innovation, expertise, flexibility, and financial capacity. In 2004, China had only 54 incinerators with an annual design capacity of 6.17 million tons, treating 2.9% of the collected MSW (4.49 million tons). By 2018, this number increased to 331 incinerators with an annual capacity of 133.08 million tons, handling 44.67% of collected MSW (101.84 million tons), with at least 80 additional WTE plants planned. By 2019, over 80 projects were under development with a total investment of 35 billion yuan (CNY), with at least 80% of China's WTE incineration projects procured and operated through PPPs. Among these, the Shenzhen PPP project stands out as the largest WTE plant in China, with a capacity of 5,000 tons/day. In this project, private investors are responsible for both construction and operation, holding project management rights for 20 years. Additionally, WTE projects in Central and Western China, as well as in third- and fourth-tier cities, hold significant development potential due to saturated markets in developed areas and growing demand in less-developed regions. PPPs provide essential financial support for developing WTE incineration projects in these emerging areas. WTE projects are key to enabling a circular economy by maintaining the value of products, materials, and resources in the market for as long as possible and minimizing waste and resource use.

Several prominent and successful PPP-based WTE projects currently in operation in China include: Lujiashan Plant, with a capacity of 3,000 tons/day, operating since 2013 in Beijing, invested by private partner Shougang Bio Technology; Jiangqiao Plant, with a capacity of 1,500 tons/day, operating since 2005 in Shanghai, invested by private partner Shanghai Environment; Jiangnan Plant, with a capacity of 5,000 tons/day, operating since 2014 in Nanjing, invested by private partner China Everbright; Heimifeng Plant, with a capacity of 2,000 tons/day, operating since 2017 in Nanjing, invested by private partner Junxin Environment; Shenzhen WTE Project, with a capacity of 5,000 tons/day, operating since 2023, invested by private partner Shenzhen Energy Group.

China has implemented a comprehensive set of mechanisms and policies to promote the development of waste-to-energy projects using both municipal solid waste (MSW) and industrial solid waste (ISW). These policies include financial, tax, electricity pricing, technological, and socialization incentives aimed at optimizing resource use and minimizing environmental impacts.

Land Incentives: (1) Land Allocation: Priority is given to land located within renewable energy zones or green industrial parks to expedite project implementation; (2) Land Leasing and Tenure: WTE investors are granted exemptions or reductions on land lease payments during the initial 5–10 years. Continued incentives may apply based on project performance and scale; (3) Infrastructure Planning Support: The government assists in basic infrastructure planning, including grid connectivity, transportation access, and utility services.

Capital Incentives: (1) Direct Financial Subsidies: Provided for WTE projects employing advanced technologies that meet environmental standards, with subsidies covering 20–30% of total investment costs; (2) Preferential Loans: WTE projects are eligible for low-interest, long-term loans (10–20 years) from the China Development Bank and national financial institutions. Some projects may also receive government loan guarantees; (3) Fixed Power Purchase Tariffs (FiT): A fixed electricity purchase price mechanism ensures stable returns, with WTE-generated electricity priced higher than conventional sources-approximately USD 10/kWh; (4) Approval and Disbursement Timeline: Projects are typically approved within 3–6 months, depending on their scale and technology, with priority given to high-potential projects.

Electricity Price Incentives: (1) Preferential Tariff Policy: Introduced in 2012, WTE plants receive higher electricity prices than traditional power plants. Pricing is based on the calorific value of the waste, encouraging better pre-incineration sorting; (2) Electricity Price Subsidies: Direct subsidies are also provided to offset operating costs and sustain fixed tariffs, especially for plants using advanced flue gas treatment technologies meeting international environmental standards; (3) Higher Tipping Fees: To reduce landfill reliance, higher tipping fees are applied to WTE plants compared to landfills-ranging from USD 10 to 39 per ton, depending on region and waste type.

Tax Incentives: (1) VAT Exemptions or Reductions: For investments in essential WTE equipment and technology; (2) Corporate Income Tax Reductions: Available for WTE projects using MSW or ISW, with 5–10 years of preferential tax rates depending on project scale and performance; (3) Import Duty Exemptions: High-tech equipment used in WTE facilities such as advanced incineration systems, emission control technologies, and recycling technologies is exempt from import taxes.

Technology Incentives: (1) R&D Funding: The government funds 20 - 50% of research costs for projects developing advanced WTE technologies to ease the financial burden on enterprises and accelerate technological innovation; (2) International Technology Transfer: Financial and technical support is provided to help facilities adopt international best practices, optimize energy recovery, and meet global environmental standards. Enterprises can access training and technical support through research institutes or foreign partners;

Grid Connection and Waste Treatment Fee Incentives: (1) Grid Connection, the government offers full or partial exemptions on initial grid connection fees and prioritizes WTE plants for grid access to streamline deployment; (2) Waste Treatment Fees: Landfill disposal is priced higher than incineration, boosting the competitiveness of WTE facilities. Tipping fees at WTE plants range from USD 10 to 39 per ton and are higher than landfill charges. Plants may also receive subsidies for treating difficult waste types or operating in high-volume areas.

In addition to general policies promoting waste-to-energy projects, PPP projects in China have some specific policies to encourage socialization in solid waste treatment and ensure the effectiveness of projects under this model:

- The Chinese government encourages community and private sector participation through the implementation of Public-Private Partnership programs. Private investors are granted long term operational rights typically ranging from 20 to 30 years depending on the specific project to reduce the burden on public investment and attract private sector involvement in the construction and operation of WTE plants.

- Four common PPP models are prioritized in the WTE sector in China, namely: Build-Operate-Transfer (BOT), Build-Own-Operate (BOO), Transfer-Operate-Transfer (TOT), and Operation and Maintenance (O&M). For each PPP project, one of these models is selected based on the management and execution capacity of local authorities, as well as the investor's needs, in order to ensure sustainable and effective operation throughout the project lifecycle.

- Environmental access conditions are specified for WTE projects, focusing on the selection of advanced, highly reliable technologies that are adaptable to the specific characteristics of local municipal solid waste. Pilot programs for building "Zero-Waste Cities" are also being implemented to promote sustainable development.

- WTE projects, particularly those developed under the PPP model, are required to coordinate with local communities to raise awareness about waste management and environmental protection. This includes public education initiatives and campaigns to promote waste segregation at source, thereby improving the quality of feedstock for WTE facilities.

- Private sector providers participating in PPPs in the WTE sector are categorized into two main types based on the combustion technologies used: (1) Professional investment enterprises using imported combustion technologies, such as China Everbright International and China Environment Protection, which typically finance, construct, and operate WTE plants utilizing imported grate furnace technologies like Mitsubishi-Martin; (2) Professional investment enterprises using domestically developed combustion technologies, such as Jinjiang Environment and Dynagreen Environment, which generally finance, construct, and operate WTE plants using independently developed circulating fluidized bed incineration technologies.

- Administrative procedures are streamlined to reduce approval times, enabling projects to move quickly into the operational phase. The average duration from project approval to commissioning for PPP-based WTE projects in China is approximately 18 months.

RECOMMENDATIONS FOR VIETNAM

Vietnam is currently promoting WTE projects, with seven projects operational as of December 2024, including: Soc Son WTE Plant in Hanoi; Can Tho WTE Plant; Three projects in Bac Ninh Province: Ngoi Sao Xanh (2023), Thuan Thanh, and Luong Tai (2024); Phu Son WTE Plant in Thua Thien - Hue (2024); Bình Duong WTE Plant (2024); Additionally, two projects are in trial operation: Thăng Long WTE Plant in Que Vo, Bac Ninh, and Seraphin WTE Plant in Xuân Son, Hanoi. According to Decision No. 500/QĐ-TTg dated May 15, 2023, approving the National Power Development Plan for the period 2021–2030, with a vision to 2050, and Decision No. 262/QĐ-TTg dated April 1, 2024, approving the implementation plan of the same, 28 WTE projects are planned for implementation and operation between 2024 and 2030.

In Vietnam, WTE projects benefit from incentives under current legislation, including: Law on Environmental Protection (2020); Investment Law (2020); Land Law (2024); Electricity Law (2024); Corporate Income Tax Law (2013, revised 2023); Value-Added Tax Law (2024); Public Investment Law (2024); Science and Technology Law (2013); and related guiding documents. Key areas of support and incentives are illustrated in Figure 1 and include:

WTE projects under the PPP model in Vietnam, beyond general incentives, are also eligible for special incentives under the Public Investment Law (2024), including provisions to attract domestic and foreign private investors for priority project types specified in Article 9 - Criteria for Class-A projects - such as waste treatment projects with a total investment capital of VND 3,000 billion or more. After the Land Law (2024) takes effect, only PPP-based WTE projects will be eligible for land lease reductions, as stipulated in Decree No. 103/2024/NĐ-CP on land use and lease fees. Ho Chi Minh City is currently planning to attract investment for a new PPP-based WTE project with a capacity of 2,000 tons/day in Cu Chi District.

Ficture 1. Incentives, support and incentives related to promoting the development of power generation projects using solid waste

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Land Incentives: - Allocation of land resources or prioritization of land use for WTE projects. - Financial support for land lease payments. -Exemptions or reductions in land lease fees and land use charges.	Tax Incentives: - Corporate income tax reductions for projects utilizing renewable energy derived from waste. - Exemptions or reductions in import taxes for equipment and technologies serving WTE projects. - Value-added tax (VAT) reductions. -Export tax policies for products generated from WTE projects.	Preferential Loans and Financial Support: - Provision of concessional loans and interest rate support for a defined period.	Technology Incentives: - Promotion of research, development, and transfer of new technologies in waste treatment and recycling. - Organization of training programs and capacity building for human resources in the sector. - Encouragement of international cooperation projects in environmental technologies and municipal solid waste (MSW) recycling	Electricity Price Incentives: - Establishment of preferential feed-in tariffs (FiT) for electricity generated from waste. - Long - term power purchase commitments to ensure investment security and capital recovery for investors.	Grid Connection and Waste Treatment Cost Incentives: - Technical and infrastructure support for grid connection. - Waste treatment fees determined through agreements between project developers and local authorities.

Based on the review of China's incentive policies for PPP-based WTE projects, several recommendations are proposed to help Vietnam effectively implement similar projects:

1. In addition to Circular No. 36/2024/TT-BTNMT on technical-economic norms for MSW collection, transportation, and treatment (including energy recovery incineration technologies), it is necessary to issue regulations on incinerable waste types, technical manuals, and guidance for technology selection tailored to local MSW characteristics and investment capabilities, whether at the provincial or interprovincial level.

2. Inter-regional and inter-provincial WTE projects should be incorporated into planning to ensure stable MSW supply. Designing large-scale projects instead of fragmented ones can save land, allow for modern, well-planned technology investments, and improve capital recovery efficiency for both investors and local budgets under the PPP model. This approach will increase the number of WTE projects implemented via PPP.

3. It is essential to specify how each incentive (land, capital, tax, technology, electricity price, grid and infrastructure connection, socialization) is to be applied. This will support diverse technologies (e.g., direct incineration, landfill gas recovery, gasification, biogas, co-incineration), and allow periodic adjustments so that investors have reliable information to assess market opportunities in the waste-to-energy sector.

4. For PPP-based WTE projects, the appropriate PPP model should be selected to ensure effective management, environmental protection, and financial feasibility for both local governments and investors. Transparent PPP frameworks should support private companies with maximum legal, financial, and procedural incentives while sharing operational risks.

5. Private partners should be selected based on criteria that ensure proven experience, credibility, financial sustainability, and technological readiness. This will help maintain and enhance the effectiveness of PPP-based WTE projects over the long term ▪

REFERENCES

1. Yong Liua, Chenjunyan Suna, Bo Xiab, Caiyun Cuic., 2018, Vaughan Coffey Impact of community engagement on public acceptance towards waste-to-energy incineration projects: Empirical evidence from China.

2. Yongn, C., 2017. Waste to energy in China. State Key Laboratory of Clean Energy Utilization, College of Energy Engineering.

3. Https://www.sciencedirect.com/science/article/pii/S2211467X20301371.

4. Zhao, X., Jiang, G., Li, A. and Wang, L., 2015. Economic analysis of waste-to-energy industry in China; CMS Law, 2020. Overview on the newly amended law of the People's Republic of China on prevention and control of environmental pollution caused by solid waste https://cms.law/en/chn/publication/overview-on-the-newly-amended-law-of-the-people-s-republic-of-china-onprevention-and-control-of-environmental-pollution-caused-by-solid-waste.

5. Y. Li , X. Zhao , Y. Li , X. Li, 2015, Waste incineration industry and development policy in China.

6. Zhao, X., Jiang, G., Li, A. and Wang, L., 2015. Economic analysis of waste-to-energy industry in China.