Drivers and constraints of waste-to-energy incineration for sustainable municipal solid waste management in Vietnam

ベトナムにおける持続的な都市廃棄物管理に向けた廃棄物焼却発電の推進と制約

NGUYEN Thi Doan Trang

Implementation of Waste-to-Energy (WtE) incineration has recently surged in developing countries, but the drivers of this growth and the constraints on WtE project sustainability in local contexts, remain incompletely understood. In Vietnam particularly, neither the drivers of, nor the constraints on, the sustainability of WtE project installation have been identified.

In this study, face-to-face interviews and a field survey were employed to investigate stakeholders' opinions and consolidate WtE-related information to identify drivers for Hanoi Capital as a case study. Drivers—the factors promoting the installation of WtE incineration—were identified as those repeatedly confirmed in our investigation of authorities' attitudes towards WtE investment, to have substantial influences in promoting WtE decision-making. The opinions of other interviewed stakeholders involved in WtE projects were also examined. Furthermore, the characteristics of local waste governance were considered for the presence of locally specified drivers. Constraints—challenges to the sustainable installation of WtE projects—were determined through comprehensive consideration of the stakeholder face-to-face interview results and the local facts and figures gained through the field survey.

The main drivers were found as the current limited treatment capability, local opposition to current strategies, introduction of legislative incentives and landfilling restrictions, the Hanoi government's involvement, the example set by the existing WtE plant in Can Tho, increasing waste generation with increasing land scarcity, competitive tipping fees, and introduction of a public-private-partnership model. Some of these identified drivers eliminated historical Vietnamese WtE barriers. Constraints were determined by evaluating the interview results and local data from the field survey. These constraints had legal aspects (e.g. overlapping agency responsibilities), as well as financial (e.g. low tipping fees), technical/technological (e.g. unsorted waste), environmental (e.g. lack of stringent flue gas controls), and social (public opposition to plants) aspects.

Under the unprecedented global pandemic of COVID-19, proper and safe handling of COVID-19 related waste was critical for pandemic prevent and control. Poorly operated medical waste systems, as mostly seen in developing countries, appeared to face higher potential of COVID-19 spread. Incineration of medical waste, the treatment method preferably recommended for COVID-19 waste, was not popularly applied and/or unproperly operated in these nations (e.g. in lower temperature

than 850°C required to safely treated SARS-CoV-2 contaminated waste). Considering the rapid rise of implementation of Waste-to-Energy incineration dedicated to MSW in the context of urgent demand of COVID-19 waste incineration, co-processing was initially considered, as an effort to address the technical constraint in relation to input low heating value determined in this study. COVID-19 waste, composed of 76.66% of plastic as estimated in this study, was technically seen feasible to enhance the combustion efficiency of WtE incineration plant dedicated for municipal waste, through its great calorific value of 16,057 kJ kg^{-1}. Cares must be thoroughly considered regarding the loading of COVID-19 waste– a type of infectious medical waste, to avoid hazardous situation. Also, optimal ratio of COVID-19 waste in mixed input feeding to WtE facility required to be calculated in association to the local context of WtE incineration built, as well as the according COVID-19 waste composition and generation.

The drivers and constraints determined presented here could help secure waste treatment capacity through sustainable WtE incineration in other fast-growing cities in developing countries. Especially, co-processing of COVID-19 pandemic waste, as initially considered in this study, could provide a potential solution to overcome the technical constraint determined and, simultaneously, to meet the seriously urgent demand of safe treatment of COVID-19 waste for pandemic prevention and control.