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Is it a good idea to use waste to generate energy?

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Malaysia's landfills are nearing capacity, raising the risk of exhausting available space for solid waste disposal by 2050 in tandem with economic and population growth.

Malaysians discard about 39,078 tonnes of solid waste, equivalent to about 1.17kg per person daily, according to the Solid Waste Management and Public Cleansing Corporation.

Waste-to-energy (WtE) plants, which burn municipal solid waste to produce steam that is subsequently used to power an electric generator turbine or generate other forms of energy, have been touted as an alternative to the rapidly filling landfills. The Housing and Local Government Ministry (KPKT) has said the ministry has designated 18 WtE sites nationwide. Its minister was quoted saying this on May 6.

But the reception has not been all positive. Locals residing near the planned WtE sites have been protesting due to health, environmental, safety and traffic concerns.

For instance, the Rawang Tolak Incinerator Network (JRTI) wants the Selangor government to cancel the Sultan Idris Shah WtE plant project in Rawang, saying the project does not consider the fragile geological state of the location, which is vulnerable to fire and close to the Gombak-Hulu Langat Geopark. A protest was held in January and an objection was sent to the municipal council last month on the rezoning of the land for the plant.

"WtE is being aggressively promoted now in Malaysia and other countries, with promises that it can produce energy during the incineration process. But the process of incineration transforms the waste into other forms of waste such as toxic ash and air emissions that are hazardous and also contribute to water pollution," says Mageswari Sangaralingam, honorary secretary and researcher at Sahabat Alam Malaysia (SAM).

In response to the protests by residents in Rawang, Selangor Menteri Besar Datuk Seri Amirudin Shari said in a statement that the state government is currently and will continue to engage with the residents through KDEB Waste Management Sdn Bhd to provide accurate information regarding the WtE plant development plan. The JRTI, however, issued a response claiming that the menteri besar has not granted a town hall meeting with the group.

"The land rezoning exercise is being conducted by Majlis Perbandaran Selayang (MPS) to change the land use from agriculture to heavy industry. MPS is said to plan to conduct the hearing session on May 29 to be attended by all interested stakeholders," says Abdul Hanan of JRTI. However, he says neither JRTI nor the other stakeholders have received an invitation to attend the said session.

"We [KDEB] have met these people [protestors] a couple of times. Our meeting has been jointly organised by the state assemblyman, a member of parliament and our chairman. We have met these people who are not happy with the project," Datuk Ramli Mohd Tahir, managing director of KDEB, tells ESG in response.

However, "during the meeting between KDEB and JRTI on Oct 6 last year, KDEB attempted to explain the proposed WtE but a lot of questions and concerns from JRTI were either unanswered or answered unsatisfactorily," says Abdul Hanan.



RAMLI, KDEB

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Chia, EMIR Research



Protestors and Rawang residents demonstrate against the proposed incinerator in Batu Arang.

JRTI attended the meeting to understand the company's measures for safeguarding residents against health hazards and the purported economic benefits of the proposed WtE project. They also questioned whether the state government thoroughly explored alternative sustainable waste management approaches before opting for incineration. They also queried the project's labelling as green energy.

Ramli says there are proper technologies and processes that are put in place to incinerate and turn waste into energy, which results in minimal damage to the environment compared with dumping rubbish in landfills, which are expected to fill out in the next 10 to 15 years.

"We are building a facility for the public, for the people. We are not building the facility for us," says Ramli.

The state government continues to support WtE as a key solution for waste management and energy generation. It is a major waste treatment method in some developed countries, reducing waste volume and mass by 75% to 90%, according to a WtE report by the United Nations Environment Programme (UNEP).

"For many years, the only applicable and accepted disposal method in this country was by throwing it into the landfill (but) because land is so expensive nowadays, [KPKT] has studied many technologies on how to manage waste more sensibly and WtE is one of them," says Ramli.

The municipal solid waste company is partnering with YTL Power International Bhd to set up the WtE plant in Rawang, which will be capable of handling 2,400 tonnes of municipal waste and have a gross generating capacity of 58MW of electricity per day. The plant is slated to be built on the 245-acre Lot 3847 in Rawang and will collect municipal waste from Petaling Jaya, Hulu Selangor, Shah Alam, Subang Jaya, Ampang Jaya and Selayang.

Ramli says Rawang was chosen because there are already three WtE sites that have been approved by the state government in west Selangor, including the Jeram and Tanjung Dua Belas plants.

As for the environment impact assessment (EIA), he says KDEB is now at the final stage of preparing the report and expects to submit it in June or earlier.

Abdul Hanan, however, says the geological study on the site as part of the EIA was only included after it was highlighted by JRTI that Batu Arang has an extensive network of former coal mine tunnels underneath it.

REDUCE, RECYCLE, COMPOST

The alternative suggestion for WtE is to ensure that more waste is recycled, composted, repurposed or remanufactured, or to prevent unnecessary waste from being produced in the first place. By prioritising these efforts, fewer raw materials have to be mined from the environment to create new products, as what was considered "waste" is made into new products.

The UNEP report also highlights this point by stating that reduction, reuse and recycling should be prioritised and incorporated into waste management plans that include thermal WtE recovery options.

"Composting is key to achieving 50% or higher [waste] diversion levels and can be done cost-effectively. The Malaysian government needs to emphasise backyard or at-home composting followed by community composting. Keeping organics and biodegradables out of waste collected by municipalities will reduce the volume of waste to be disposed of and managed," says SAM's Mageswari.

She argues that WtE is neither part of the circular economy nor considered a form of green energy. In contrast, going for zero waste is a better solution because it emphasises reusing, repairing and composting waste.

"From the broader perspective of sustainability, incinerators are a losing proposition. They are essentially destroyers of discarded products and materials, and concentrators of toxicity. Incinerators do not encourage waste reduction and recycling," says Mageswari.

Chia Chu Hang, researcher and author of the "Waste-to-energy: Is there a better alternative to incineration?" study at EMIR Research, however, sees WtE and recycling as complementary solutions. Both aim to maximise resource value, minimise environmental impact and address vulnerabilities like food security and energy dependence.

"WtE by itself can reduce waste that is going to the landfill, but recycling is also essential in reducing the waste that we produce. When managed effectively, recycling efforts can significantly aid in waste separation at the source," says Chia.

A BETTER TECHNOLOGY

In some developing countries, organic waste with high moisture content and presence of inert materials requires a lot of energy to incinerate. According to UNEP, the high water content and low combustibility of certain waste make it unsuitable for direct incineration.

In Malaysia, this has been highlighted as a problem as the sorting of waste is not commonly practised.

Despite the challenge, KDEB's Ramli says the incinerator equipment can be designed to accommodate varying levels of moisture in the waste.

"We are exploring technologies akin to Singapore's, which is mass burn incineration technology with energy recovery system, efficiently converting mixed municipal solid waste into energy. This approach suits Malaysia's similar waste stream and infrastructure, offering a proven solution to manage waste while generating renewable energy," he says.

Ramli says incineration technology today is not akin to open burning and safeguards are put in place to limit harmful emissions. "Incineration today is no longer like when I was in my kampung (village) in Rembau, where we bakar sampah openly (open burning). Now, we run the combustion and the room [where the burning happens] is at negative pressure. It will happen in a glass room with a proper filter system to reduce carbon and other poisonous gas emissions."

He also says the emissions from the WtE plant are monitored closely by the Department of Environment and if they exceed the threshold set for air pollution, the plant can be closed down.

"WtE discharge will be filtered out even at the molecule level. Because whatever it is, it becomes a residual bottom ash, compared to what we see at a landfill," says Ramli.

Additionally, the plan is for waste materials from the plant, such as fly ash and bottom ash, to be used for the production of cement.

Meanwhile, Chia supports WtE as a waste management solution, even as other alternatives are explored.

"There is no perfect solution to a problem as huge as waste management and as of now we only have two choices: WtE plants that can give us electricity and valuable by-products in the form of compost or construction materials; or trash that has nowhere to go because landfills have filled up to the maximum," says Chia.



CHIA, EMIR RESEARCH

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