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Municipal solid waste can supply fuel to bioenergy plants of urban Malaysia

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Summary

Municipal Solid Waste (MSW) is ubiquitous wherever human beings reside. If it is not managed well, it could prove hazardous to human health as well as to the environment. A comprehensive MSW management scheme would address these issues and could concurrently contribute to bioenergy production.

Key messages

- **Enforce key collection points.**
- **Enforce rigorous waste segregation.**
- **Incentivise supply of organic municipal solid waste to bioenergy plants.**
- **Establish prediction capabilities for accurate planning.**

Introduction

According to the World Bank (2022), Malaysia's urban population has been steadily increasing since 1960. Today, the population in the country's urbanised areas has increased to 78 per cent of the total. Integral to an increase in urbanisation has been an increase in MSW generation and an increase in electricity demand. Converting MSW into electrical energy would be a two-pronged, symbiotic approach that tackles both matters simultaneously while addressing SDG 11 Sustainable Cities and Communities and SDG 7 Affordable and Clean Energy.

About the study

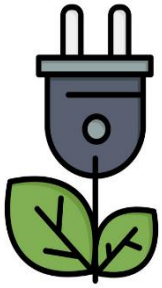
MSW management has been a challenge in Malaysia as in many developing nations. The current preferred method of disposal is via landfills which throughout the country are mostly open dumping grounds. (Samsudin & Don, 2013) This practice is not sustainable and could pose health and environmental hazards. In Malaysia, solid waste management is governed by the National Solid Waste Management Policy (DPSPN, 2016) issued by the Prime Minister's Office. Six objectives have been laid out, and the second objective briefly touches on converting waste into energy (Strategy 8, Action Plan 28). In addition, the fifth objective calls for centralised data collection (Strategy 15, Action Plans 44, 45 and 46). These policies directly address the need; however, the expected outcomes are yet to be realised. Clearly, the gap lies in the implementation of government policies. Capitalising on strategies employed in other nations as well as studies conducted locally, some methods are proposed herein to realise the policy objectives. In addition, an improvement is also proposed in the spirit of continual improvement.

To ensure success downstream, the effort must be kicked-off correctly. In this case, the first step is collection which when coupled with segregation makes the practice generally more efficient. Kubota, Horita, and Tasaki (2020) reported on the use of waste banks in Indonesia. In the study, this practice mainly benefitted recyclers.

However, if more sub-steps of the process are monetised, it would be an added motivation for all stakeholders. Local communities should be empowered in running the schemes to encourage a stronger buy-in. The segregated organic wastes could be used for local bioenergy plants, if these are available in-situ.

In 2019, Zulkifli *et al* implemented a successful pilot project of converting MSW into methane gas using anaerobic digestion (AD), citing this to be the most promising technology to meet this objective. This prototype could be suitably developed and scaled up to cater to local needs.

For localities without in-situ bioenergy power plants, biomass could be pelletised and transported to the nearest plants. This exercise could be spurred on by attractive benefits such as tax exemptions, toll-free delivery, and higher rates for long-term sustained commitments. Data collection at every level should not be neglected. In 'What a Waste 2.0' (2018), Korea was singled out as having used information management to reduce waste. A similar centralised platform could be set up which acts as a database for logging relevant information, a centre for regulatory information, geo-locations of waste banks, and bioenergy power plants. The statistics gathered, read in conjunction with population growth, change in lifestyle, and other socio-economic factors, could be used for projecting future availability of biomass for effective planning.



Results and conclusions

The rising trend of urbanisation would require rethinking of essential practices like MSW management. Deliberate micromanagement at grassroots level may be required at the onset until a sense of ownership is developed amongst stakeholders. Eventually, a self-regulating ecosystem could emerge.

Recommendations

Identify strategic MSW collection points

Select key sites for MSW collection based on relative location from main contributors like townships. Simultaneously satisfying human health requirements and minimising environmental impact. The MSW should be modelled after waste banks are established, as described above.

Incentivise waste collection and segregation

Monetise every level of waste collection and segregation. Extract organic waste for bioenergy production in-situ or off-site.

Facilitate organic waste supply to bioenergy plants

Boost supply of MSW organic wastes to bioenergy plants employing attractive benefits like tax exemptions, toll-free delivery, and higher rates for long term sustained commitments.

Forecast future supplies to enable continuity

Formulate appropriate algorithms to predict rate of availability of fuel for bioenergy plants for effective planning and management. This forecasting should include consideration for population growth, change in lifestyle and other relevant socio-economic factors.

About the author

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