

## COMPLETION REPORT

### **A comparative study of municipal solid waste (MSW) recycling practices in Kitakyushu Japan and Putrajaya Malaysia**

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This study compares the recycling practices of municipal solid waste (MSW) in City of Kitakyushu Japan and Putrajaya Malaysia. Also assessed were (1) the Putrajaya residents' preference for MSW recycling system, (2) Kitakyushu high school students' reasons for MSW recycling, and (3) the recycling behaviour of Putrajaya school students. As the federal administrative centre of Malaysia, Putrajaya pioneers the promotion of 3R (reduce, reuse, and recycle) programme since 2001. On the other hand, City of Kitakyushu's recycling programme was driven by the resident's awareness on waste management during the "Sanitation War" in 1966. Concerns from the residential community prompted the Kitakyushu municipality to shift the focus of waste management from treatment to the promotion of waste recycling and to moving towards a "sound material-cycle society."

With respect to waste management regulation in Malaysia, Japan's recycling laws are more comprehensive and straightforward hence are more accepted by the public. The regulations are always updated with advance issues on material recycling. On the other hand, the Malaysian legal framework that specifically addresses SWM and waste recycling was only established in 2007 through The Solid Waste Management and Public Cleansing Act 2007, about 37 years behind the promulgation of similar legislation in Japan (Waste Management and Public Cleansing Law 1970). Accordingly there is still much improvement that Putrajaya could learn from Kitakyushu in relation to MSW recycling regulation.

The MSW generation rate in Putrajaya was 0.944 kg/capita/day from a population of 80,500 citizens in 2014. The MSW recycling rate in 2014 was about 8%, far from the national target (22%). In the same year, the quantity of MSW generated in the City of Kitakyushu was 390,953 tonnes with the generation and recycling rates of 0.495 kg/day/capita and 26% respectively. The City of Kitakyushu practices separated waste collection system. Waste is separated into twenty-two recyclable items and the residents are required to purchase designated bags for waste separation and storage. The separated waste is then collected at waste collection stations and collection boxes. Household waste is collected twice a week to be sent to the incineration facilities. Recyclable materials are collected once a week to be sent to four separation centers before being processed at recycling plants. Putrajaya, on the other hand, practices kerbside collection and buys back centre systems. Non-recyclable items are collected twice a week while recyclable items (paper and plastics) are collected once a week. Six community recycling centers were established near to the residential areas to enhance the recycling activities. Recyclable materials are sent to a separation center while non-recyclable materials are disposed in landfills.

No significant difference was noted between Putrajaya residents' preferences for either the existing MSW recycling system practiced in Putrajaya or the proposed MSW recycling system implemented in City of Kitakyushu. The Putrajaya residents and Kitakyushu high school students agreed that their

purpose for recycling was to reduce the amount of greenhouse gas emission and waste disposed to landfill. Another 40.5% of the respondents from Putrajaya and 75.8% from the City of Kitakyushu performed recycling due to monetary rewards. A survey conducted on the behaviour among Putrajaya school students revealed that students had exhibited positive MSW recycling behaviour. Attitude, subjective norms, perceived behavioural control, awareness, recycling practices, and situational factors appear to be the significant predictors of students' MSW recycling behaviour.

Publication of the Results of Research Project:

Verbal Presentation (Date, Venue, Name of Conference, Title of Presentation, Presenter, etc.)

19<sup>th</sup> November 2016, Universiti Pendidikan Sultan Idris International Conference on Education, Mathematics and Science 2016 in conjunction with 4<sup>th</sup> International Postgraduate Conference on Science and Mathematics 2016 (abstract acceptance) Municipal Solid Waste (MSW) Recycling Behaviour among Form Three Students in Putrajaya, Nurul Ashikin Izhar.

Thesis (Name of Journal and its Date, Title and Author of Thesis, etc.)

1. Applied Research in Quality of Life, submitted on 11<sup>th</sup> June 2016. Students' Municipal Solid Waste (MSW) Recycling Behaviour: A Case Study in Putrajaya, Malaysia. Nurul Ashikin Izhar, Norjan Yusof, Akira Haraguchi, Hanisom Abdullah, Azlan Kamari and Som Cit Si Nang.
2. Master of Education (Biology) (course work) project paper. 2016. Municipal Solid Waste (MSW) Recycling Behaviour among Form Three Students in Putrajaya, Nurul Ashikin Izhar.
3. A comparative study of municipal solid waste (MSW) recycling practices in Kitakyushu Japan and Putrajaya Malaysia (manuscript preparation).

Book (Publisher and Date of the Book, Title and Author of the Book, etc.)

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