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Evaluation of the Efficiency of Singapore's Waste Management Controls

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Abstract

With the constant population growth in such a limited land, Singapore is faced with multiple challenges in waste management. Over the last decades, Singapore aimed to strive for a zero-waste environment for its nation by reducing the significant amount of waste disposed of through recycling and maximizing landfills. The scope is to present whether Singapore has had an efficient control over its waste management in the last two decades. The poster took approaches to analyze statistics that concludes the recycle rates categorized into different classifications of waste disposals from 2003 to 2020 and average of total saved energy through the process of recycling. Overall, the findings suggest Singapore had an efficient waste management at the beginning with constant growth of recycle rate, but discrepancies are found starting from 2018 since the rate declined rapidly in three years. So, we concludes that Singapore's efficiency on waste management control still has the potential to develop sustainable improvement. Visualizing and understanding these data information can help Singapore's government to implement recycling policies that motivate people to improve their living environment and enhance waste management controls.

Introduction

- Because of its limited landfills and dense population, it is essential for Singapore to have an efficient system to recycle generated wastes.
- The waste management hierarchy, which includes minimization, recovery and transformation, and land disposal, has been adopted by most industrialization.
- The process of waste management is that waste collection, to plant, to energy, and finally to electricity.

Research Questions

1. Did Singapore has efficient control management of waste disposal for the past twenty years?
1. Should Singapore implement more recycling policies to maintain a zero-waste environment for its nation?

Methods/Approaches

- Method 1:

  Collected data from different types of wastes that Singapore generated annually and how much of them are converted into reusable energy and resources from 2003~2020. The types of wastes include:

  - Metal
  - Food
  - Paper
  - Wood
  - Construction waste
  - Glass
  - Textile/Leather
  - Plastics
  - Scrap Tyres
  - Horticultural waste

  We used the recycle rate (total waste recycled / total waste generated) to compare and evaluate the efficiency of Singapore's performance on waste management overtime.

Figure 1: Construction Waste

Figure 2: Plastic Wastes

- Method 2:

  Collected data about energy conversion by recycling 1 metric tonne per waste type and illustrated through a pie graph. The energy was converted and reused as electricity (kWh) therefore people can have better understanding of how much energy was recycled with Singapore's waste management and recycle procedures.

Results

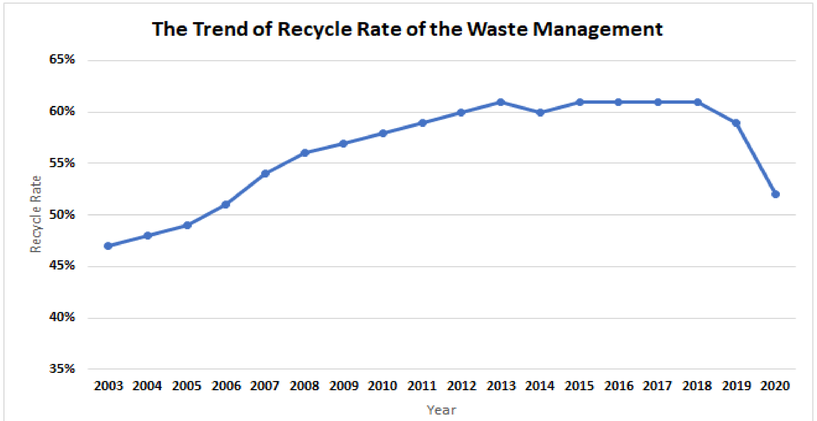

Figure 3: The Trend of Recycle Rate of the Waste Management

As figure 3 above, the recycle rate was increasing from 2003 to 2013. Later, it remains stable from 2014 to 2018. From 2019 to 2020, the recycle rate declined relatively dramatically that might due to multiple reasons.

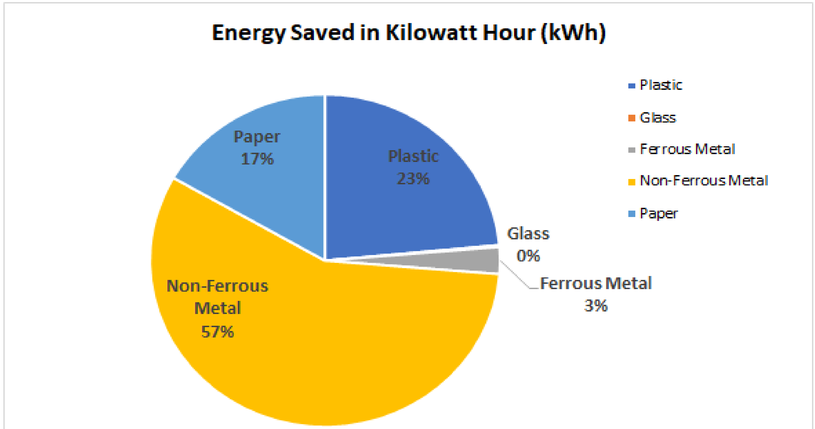

Figure 4: Energy saved in terms of electricity

Figure 4 illustrates the proportion of energy reused in terms of electricity by recycling one metric tonne per waste type. The total reused energy in terms of electricity is 24,558 kWh, which is equivalent to approximately two years of electricity consumption of one household.

Conclusion/Recommendations

- Singapore was taking proactive actions on implementing effective strategies to encourage its people to reuse and recycle generated waste prior to COVID-19.
- The average recycle rate is above 50%, which indicates that Singapore recycled more than half of its generated waste nationally.
- The reasons for rapid decline from 2019 to 2020 might be:
  - Growing population in limited land
  - COVID-19
    - Lack of labor
    - Reduced the total waste
- Consider implement advanced recycling policies within the pandemic condition.
- Consider recycle energy from other waste types.

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