

# A Look Inside the Zero Waste Masterplan

The plan to defuse Semakau Landfill's ticking timebomb.

Goh Ping Yao, Waste & Resource Management Department, National Environment Agency



01

Singapore, commonly referred to as the little red dot, is home to almost 6 million residents. With its ever-growing population and rise in disposable income levels, the amount of waste generated and disposal have been on the rise. How do we manage our daily waste efficiently such that Singapore continues to be a vibrant, liveable and prosperous home for us? Currently, about 37% of waste generated in Singapore is incinerated at the waste-to-energy incineration plants. Another 60% is recycled, while the remaining 3% of non-incinerable waste is landfilled directly. Incineration has allowed us to reduce the volume of waste by 90% and generate electricity to partially meet some of Singapore's total electricity demand.

## The Zero Waste Masterplan

The race for economic development is not without repercussions – resources are being depleted at a quicker rate than they can be replenished. Such growth is not sustainable and the following drivers have prompted Singapore to re-think its development and pursue a vision of a Zero Waste Nation.

### 1. Climate Change

Singapore, a low-lying state, is vulnerable to

sea level rise and extreme weather brought about by climate change. There is a critical need for Singapore to address the existential threat of climate change, which also affects our water and food supply, as well as spread diseases such as dengue.

### 2. Unsustainable Consumption

As an affluent and convenience-oriented country, how Singaporeans consume is greatly influenced by social norms, such as the ubiquity of food delivery options that encourage the use of disposables, keeping up with the social media trends, or getting their hands on the latest gadgets. The pervasive throwaway culture in Singapore has contributed to the seven-fold increase in the amount of waste disposal over the past 40 years to 21,083 tonnes per day.

### 3. Land Constraints

At this rate of waste disposal, Semakau Landfill, Singapore's only existing landfill, will be fully filled up by 2035. With only 721.5km<sup>2</sup> of land space in this little red dot, there is insufficient land space to build new incineration plants or landfills in Singapore.

### 4. Global Push Towards Zero Waste

There has been a shift towards sustainable



02

growth on the global stage as well. In 2015, World leaders have adopted the 2030 Agenda for Sustainable Development, which also acts as an urgent call to action for sustainable development for all countries. Singapore is also committed to play our part in the global effort to protect Mother Earth.

### 5. Rising Community Commitment to Zero Waste

Various community organisations have stepped forward to address the waste issue, be it campaigns to reduce the usage of plastics bags or to encourage recycling. This is in line with the growing international trend of community involvement and commitment.

### 6. Technological Progress

The advent of technology has allowed us to explore innovative solutions. Singapore is looking to recycle incineration bottom ash, which constitutes approximately 70% of what goes into our landfill. Field trials will be conducted using treated incineration bottom ash as a road base or sub-base material in road construction to validate the treatment methods.

With these six driving forces in mind, it is evident that we had to magnify our trash

problem and look at the situation on a much broader scale. Hence, the Zero Waste Masterplan was born. Singapore's inaugural Zero Waste Masterplan was launched on 30 August 2019, which marked a significant milestone in Singapore's sustainable development journey and a key step towards the vision of a Zero Waste Nation. The Masterplan maps out Singapore's key strategies to build resource, climate and economic resilience. This involves moving away from a linear take-make-dispose economic model to a circular one through sustainable production and consumption, and transforming trash into treasure. In addition to the 70% overall recycling rate, 30% domestic recycling rate and 81% non-domestic recycling rate targets under the Sustainable Singapore Blueprint 2015, the masterplan targets to reduce the waste sent to Semakau Landfill each day by 30% by 2030 which will help to prolong Semakau's Landfill lifespan beyond 2035.

### Circular Economy Approach

To achieve this target, a circular economy approach will be adopted across the entire value chain via the following three strategies:

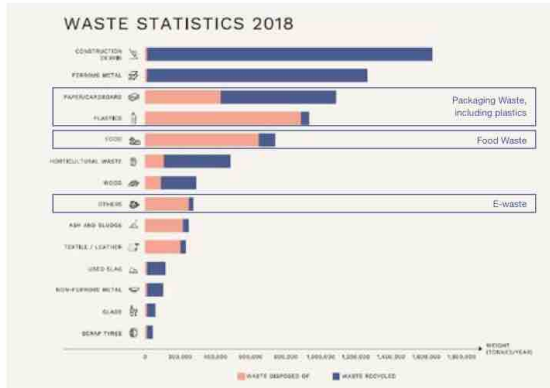
### a. Sustainable Production

Climate change, resource constraints and the growing consumer demands for sustainable products emphasise the need for businesses to re-think their processes, adopt new methods with improved resource management and reduce the amount of waste produced. Government-led Initiatives such as the voluntary Singapore Packaging Agreement formed in 2007 encourages companies to reduce packaging waste. With over 240 signatories till date, it signifies the willingness of companies to step up to the challenge.

On the broader scale, the promotion of industrial symbiosis, where "one man's trash is another man's treasure", or in this case, one company's waste could be utilised by another's as raw material in a mutually beneficial collaboration could lead to more sustainable processes and ultimately, cost savings for businesses. This resource optimisation concept is currently being explored at upcoming districts such as Jurong Lake District and Punggol Digital District, with the aim of closing waste loops at the district level.

### b. Sustainable Consumption

With growing affluence amongst



Singaporeans, consumption level is at an all-time high, and will only be on an upward trend. There is hence, a need to nudge Singaporeans towards a greener mindset and shift in lifestyle habits to practise the 3Rs. There are initiatives to encourage reduction of food waste and disposables, such as the Say YES to Waste Less campaign, to increase public awareness on overconsumption, its environmental impacts and highlight the need for change towards a more sustainable lifestyle. Do you also know that you can now bring your clothes and shoes to repair at certain hawker centres? Spaces have been allocated in hawker centres to promote the idea of “repair and reuse” to encourage individuals to reduce their consumption.

**c. Sustainable Waste and Resource Management**

Moving forward, there are also plans to take a step further and make existing waste and resource management strategies more sustainable. One example is exploring the recovery of treasure from trash where incineration bottom ash, which is currently disposed of at Semakau Landfill, will be treated to become “NEWSand” for non-structural construction purposes (e.g. road base/sub-base materials or as concrete aggregate). To cover resources from waste more efficiently, Tuas Nexus (recently named the “Most Innovative Water-Energy Nexus Project”) is being developed and will be the world’s first energy self-sustaining greenfield development to integrate used water treatment and waste management.

The facility incorporates many synergies such as the co-digestion of food waste with used water sludge to produce a higher yield of biogas which will in turn be used to produce electricity and power the facility, which will optimise resources and achieve long-term environmental sustainability.

**Closing the Waste Loops**

In the push for the adoption of a circular economy, Singapore also prioritised the closing of three key resource loops. These waste streams were identified due to their large generation amounts but an alarmingly low recycling rate (Figure 3). The three (3) key waste streams are: food, e-waste and packaging (including plastics).

**a. Food**

Despite Singaporeans’ penchant for eating and seemingly insatiable craving for food, households are surprisingly among the greatest generators of food waste, making up around half of Singapore’s total food waste generated. The amount of food waste has risen by nearly 30% over the last 10 years and is set to grow further with our expanding population. Despite food waste making up almost 20% of the total disposed waste in Singapore in 2018, only 17% of our food waste was recycled.

To encourage sustainable consumption of food, NEA has introduced a holistic set of measures including a consumer food waste reduction guide for consumers and piloting on-site food waste treatment systems that convert food waste into non-potable water, liquid nutrient or compost which can be used for other purposes.

On the legislative front, large commercial and industrial food waste generators will be required to segregate food waste for treatment from 2024 under the Resource Sustainability Act. From 2021, it will also be mandatory for developers of new commercial and industrial premises, where large amounts of food waste are expected to be generated, to allocate and set aside space for on-site food waste treatment systems in their design plans. Targeting the bigger contributors will be the first big step towards achieving resource sustainability for food waste.

**b. E-waste**

Every year, over 60,000 tonnes of electrical and electronic equipment are thrown away (known as e-waste), which equates to an astonishing 11kg of e-waste (weight of 73 mobile phones) discarded by each individual. While e-waste only contributes to less than 1% of the total waste in

Singapore, hazardous substances present in these laptops, batteries and refrigerators could be detrimental to both human health and the environment without proper means of disposal. On the flip side, e-waste also contains valuable resources such as precious metals which can be reused if extracted properly. To ensure the proper management of e-waste at their end-of-life and prevent the valuable metals they contain from being wasted, Singapore will implement an Extended Producer Responsibility (EPR) framework to ensure the proper end-of-life treatment and recycling of the electrical and electronic products under the Resource Sustainability Act by 2021.

**c. Packaging**

With the ease and convenience of food delivery options like GrabFood, FoodPanda and Deliveroo taking Singapore’s food scene by storm, the increased use of disposable packaging is almost inevitable. While packaging has such a prevalent presence in our daily lives – what immediately crosses our minds are our grocery shopping plastic bags, takeaway coffee cups, wine bottles and potato chips packaging among others – they are hardly reused and often just chucked down the rubbish chute. This is significant as packaging waste contributed to over 33% of Singapore’s domestic waste in 2018. For a more sustainable usage of packaging, mandatory packaging reporting will be introduced for producers and supermarkets with an annual turnover of \$10 million for a start in 2020. The eventual aim is to implement an extended producer responsibility framework (similar to e-waste) for packaging waste not later than 2025. On the technological front, the government is exploring new solutions such as chemical recycling which converts plastic into fuel or feedstock to close the plastics waste loop in Singapore.

**A Zero Waste Nation?**

So what does zero waste really mean for Singapore? The transition towards a zero waste nation not only protects our environment and mitigates our climate impact, but also benefits communities, creates more highly-skilled jobs and supports a strong local economy. According to the US Environmental Protection Agency, over 42% of greenhouse gas emissions are caused by the production and use of goods, including food, products and packaging. The transition towards a zero waste nation will help to lower our carbon footprint and greenhouse gas emissions, and bring us closer to our climate pledge under the Paris Agreement. The circular economy approach will also help to maximise resource efficiency for resource-scarce Singapore. The transformation of the environmental services industry will lead to high-skilled, safer and more productive jobs.

**The Future Ahead**

The importance of environmental sustainability seems to be catching on as more people start to embrace greener practices as a social norm. We see the growing numbers of environmental non-governmental organisations demanding for more sustainable behaviour in BYO campaigns and a string of green products such as metal straws and reusable sturdy coffee cups pop up in the market. Times have changed. There is now widespread recognition that “end of pipe” solutions such as incineration and landfilling is no longer a sustainable waste management solution. Sufficient attention must be given to upstream measures such as those laid out in the masterplan to truly tackle the waste issue. Everyone has a part to play in the success of the masterplan. Only when everyone starts to embrace the zero waste mindset can we successfully make the transition towards a Zero Waste Nation. ●