

**Waste, No Time: Circular Economy & Waste Management in Urban Centers,  
A Case Study of Singapore's Zero Waste Vision**

Lola Jacquin

Temple of Understanding  
Summer Internship Program 2019

It would take 1.7 Earths to sustain the current level of resource consumption by humans. This statistic was presented at a side event on circular economy at the 2019 UN High Level Political Forum (HLPF). Throughout the HLPF, at official meetings and side events, it was noted that climate action is urgently necessary to address the excesses of past and current human resource consumption; however, it is widely agreed that any progress toward a more sustainable future is minimal and inadequate<sup>1</sup>. A large portion of the issue is the economic system in which humanity currently operates. It is the profit motive, rather than efficient resource consumption, that drives the “take-make-waste” extractive industrial economic model that represents the world’s economy, resulting in unsustainable consumption of resources<sup>2</sup>. A circular economic model, on the other hand, is a sustainable one concerned with resource efficient and long-lasting products, as well as the reclamation of products into the economic cycle<sup>3</sup>. The minimization and management of waste is, therefore, essential to a circular economy. This presentation discusses Singapore’s Zero Waste Vision, which is entirely concerned with waste minimization and management.

Singapore recently announced that it intends to become a zero waste nation, designating 2019 as its Year Toward Zero Waste<sup>4</sup>. Singapore’s Zero Waste Vision was initiated as a result of land-scarcity<sup>5</sup>. Singapore, which ranks among the smallest nations in the world, has a singular landfill—the Semakau Landfill, located off Singapore’s southern shore—whose predicted lifespan is quickly diminishing. Singapore’s waste production, now seven times what it was 50 years ago<sup>6</sup>, has increased sharply to a rate at which the island city-state is expected to need a new landfill every 30 to 35 years<sup>7</sup>, something it cannot afford. The Zero Waste Vision can be understood to be composed of two facets: waste minimization and waste management. Waste minimization describes campaigns and policies that reduce the amount of waste produced, while waste management refers to the processes by which any waste that is produced after waste minimization is processed.

Singapore has developed a Zero Waste Masterplan, delineating its commitment to waste minimization. This “Masterplan” encompasses efforts to hold producers of waste products responsible for the reduction and management of such waste, including

---

<sup>1</sup> United Nations, "Progress of Goal 13 in 2019," Sustainable Development Goals Knowledge Platform, accessed July 26, 2019, <https://sustainabledevelopment.un.org/sdg13>.

<sup>2</sup> "Concept: What is a circular economy? A framework for an economy that is restorative and regenerative by design," Ellen MacArthur Foundation, accessed July 26, 2019, <https://www.ellenmacarthurfoundation.org/circular-economy/concept>.

<sup>3</sup> "Concept: What," Ellen MacArthur Foundation.

<sup>4</sup> Ministry of Environment and Water Resources, "Zero Waste Nation," Towards Zero Waste, accessed July 26, 2019, <https://www.towardszerowaste.sg/zero-waste-nation/>.

<sup>5</sup> Ministry of Environment and Water Resources, "Zero Waste Nation," Towards Zero Waste.

<sup>6</sup> "Waste Management Infrastructure: Solid Waste Management Infrastructure," National Environment Agency, accessed July 26, 2019, <https://www.nea.gov.sg/our-services/waste-management/waste-management-infrastructure/solid-waste-management-infrastructure>.

<sup>7</sup> Ministry of Environment and Water Resources, "Zero Waste Nation," Towards Zero Waste.

electrical and electronic waste, food waste, and packaging waste<sup>8</sup>. The plan is to be formalized into official policy within the coming years<sup>9</sup>.

In Singapore, the National Environmental Agency (NEA) is responsible for planning, developing, and administering waste management systems, within which the two primary facilities are the Integrated Waste Management Facility (IWMF), which is to be developed by 2024<sup>10</sup>, and the Tuas Water Reclamation Plant (TWRP)<sup>11</sup>. A central aspect of Singapore's Zero Waste Vision is the co-location of these two facilities, so that synergies might be used to make the process of waste management more efficient<sup>12</sup>. The NEA has identified five streams of waste: incinerable waste, recyclable waste, food waste, sludge, and used water<sup>13</sup>. Each of these pass through either or both of the waste management facilities; this presentation discusses the intricacies of the management processes for each waste stream. For example, incinerable waste is incinerated in the IWMF, reducing its volume by 90%, and sent to the Semakau Landfill to be interred<sup>14</sup>. The incineration process not only generates 3% of Singapore's energy, but minimizes its environmental impact through Wet Flue Gas Treatment, which purifies gases released during incineration<sup>15</sup>. Food waste, which is collected in the IWMF, and sludge, which is collected in the TWRP, are dewatered in the TWRP and then sent to the IWMF to join incinerable waste<sup>16</sup>. Recyclable waste is simply collected in the IWMF, recycled, and sold to industry<sup>17</sup>. Finally, used water is reclaimed as NEWater, which is ultra-clean water, and reintroduced into homes and industry<sup>18</sup>.

---

<sup>8</sup> Ministry of the Environment and Water Resources, "Zero Waste Masterplan," Towards Zero Waste, accessed July 26, 2019, <https://www.towardszerowaste.sg/zero-waste-masterplan/>.

<sup>9</sup> Ministry of the Environment and Water Resources, "Zero Waste Masterplan," Towards Zero Waste.

<sup>10</sup> "Waste Management Infrastructure: Integrated Waste Management Facility," National Environment Agency, accessed July 26, 2019, <https://www.nea.gov.sg/our-services/waste-management/waste-management-infrastructure/integrated-waste-management-facility>.

<sup>11</sup> "Waste Management: Overview," National Environment Agency, accessed July 26, 2019, <https://www.nea.gov.sg/our-services/waste-management/overview>.

<sup>12</sup> "Waste Management Infrastructure: Integrated Waste Management Facility," National Environment Agency.

<sup>13</sup> *Integrated Waste Management Facility (IWMF)* (National Environment Agency, n.d.), accessed July 26, 2019, <https://www.nea.gov.sg/docs/default-source/resource/iwmf.pdf>.

<sup>14</sup> "Waste Management Infrastructure: Waste-to-Energy Incineration Plants," National Environment Agency, accessed July 26, 2019, <https://www.nea.gov.sg/our-services/waste-management/waste-management-infrastructure/waste-to-energy-and-incineration-plants>.

<sup>15</sup> "Waste Management Infrastructure: Waste-to-Energy Incineration Plants," National Environment Agency.

<sup>16</sup> *Integrated Waste Management Facility (IWMF)*

<sup>17</sup> "3R Programmes and Resources: Types of Recyclables and Recycling Process," National Environment Agency, accessed July 26, 2019, <https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/types-of-recyclables-and-recycling-processes>.

<sup>18</sup> "NEWater," Singapore's National Water Agency, accessed July 26, 2019, <https://www.pub.gov.sg/watersupply/fournationaltaps/newater>.

Returning to the larger context of implementing a sustainable economy globally, the question become whether Singapore's Zero Waste Vision might be used as a model after which urban centers across the world can design localized efforts at sustainability. In order to determine this, the context in which the Zero Waste Vision arose must be examined. Singapore is, as aforementioned, a small city-state; therefore, its approach to sustainability is only applicable to urban centers, rather than larger national policies. Additionally, with a GDP of \$64,581 per capita<sup>19</sup>, Singapore has developed advanced and expensive waste management infrastructure, which not all urban centers can afford to implement. These are two major considerations that must be taken into consideration when approaching Singapore's Zero Waste Vision an applicable model of sustainable waste management. The Zero Waste Vision does, however, offer a valuable lesson. Its primary objective, as aforementioned, is to address Singapore's land-scarcity. Land-scarcity is admittedly not an environmental motivation, yet an ambitious and environmentally-oriented waste minimization and management plan was born from it. Therefore, regardless of its applicability, the Singaporean case offers an especially important and universal conclusion: the motivation to incorporate elements of circular economy into local economic systems—to develop environmentally conscious policies and infrastructure—may be drawn from anywhere and, with the widespread catastrophic impacts of climate change, most certainly exist for every locality.

---

<sup>19</sup> "GDP per capita (current US\$)," World Bank, accessed July 26, 2019, <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?end=2018&locations=SG-Z4&start=2017>

## Works Consulted

- "3R Programmes and Resources: Types of Recyclables and Recycling Process." National Environment Agency. Accessed July 26, 2019.  
<https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/types-of-recyclables-and-recycling-processes>.
- "3R Programmes and Resources: Waste Minimization and Recycling." National Environment Agency. Accessed July 26, 2019.  
<https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/waste-minimisation-and-recycling>.
- City of New York. "OneNYC 2050: New York City's Strategic Plan." OneNYC 2050. Accessed July 26, 2019. <http://onenyc.cityofnewyork.us>.
- "Concept: What is a circular economy? A framework for an economy that is restorative and regenerative by design." Ellen MacArthur Foundation. Accessed July 26, 2019.  
<https://www.ellenmacarthurfoundation.org/circular-economy/concept>.
- "GDP per capita (current US\$)." World Bank. Accessed July 26, 2019.  
<https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?end=2018&locations=SG-Z4&start=2017>.
- Hosansky, David. "Flue Gas Treatment." In *Encyclopedia Britannica*. Last modified June 27, 2014. Accessed July 26, 2019.  
<https://www.britannica.com/technology/flue-gas-treatment>.
- Integrated Waste Management Facility (IWMF)*. National Environment Agency, n.d. Accessed July 26, 2019.  
<https://www.nea.gov.sg/docs/default-source/resource/iwmf.pdf>.
- Ministry of Environment and Water Resources. "Zero Waste Nation." Towards Zero Waste. Accessed July 26, 2019.  
<https://www.towardszerowaste.sg/zero-waste-nation/>.
- Ministry of the Environment and Water Resources. "Zero Waste Masterplan." Towards Zero Waste. Accessed July 26, 2019.  
<https://www.towardszerowaste.sg/zero-waste-masterplan/>.
- "NEWater." Singapore's National Water Agency. Accessed July 26, 2019.  
<https://www.pub.gov.sg/watersupply/fournationaltaps/newater>.
- United Nations. "Progress of Goal 13 in 2019." Sustainable Development Goals Knowledge Platform. Accessed July 26, 2019.  
<https://sustainabledevelopment.un.org/sdg13>.

- "Waste Management Infrastructure: Integrated Waste Management Facility." National Environment Agency. Accessed July 26, 2019.  
<https://www.nea.gov.sg/our-services/waste-management/waste-management-infrastructure/integrated-waste-management-facility>.
- "Waste Management Infrastructure: Semakau Landfill." National Environment Agency. Accessed July 26, 2019.  
<https://www.nea.gov.sg/our-services/waste-management/waste-management-infrastructure/semakau-landfill>.
- "Waste Management Infrastructure: Solid Waste Management Infrastructure." National Environment Agency. Accessed July 26, 2019.  
<https://www.nea.gov.sg/our-services/waste-management/waste-management-infrastructure/solid-waste-management-infrastructure>.
- "Waste Management Infrastructure: Waste-to-Energy Incineration Plants." National Environment Agency. Accessed July 26, 2019.  
<https://www.nea.gov.sg/our-services/waste-management/waste-management-infrastructure/waste-to-energy-and-incineration-plants>.
- "Waste Management: Overview." National Environment Agency. Accessed July 26, 2019.  
<https://www.nea.gov.sg/our-services/waste-management/overview>.
- "Waste Management: Waste Statistics and Overall Recycling." National Environment Agency. Accessed July 26, 2019.  
<https://www.nea.gov.sg/our-services/waste-management/waste-statistics-and-overall-recycling>.