

Sustainable Practice of Waste Management towards a Circular Economy – The Korean Experience –

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I. Introduction

- Republic of Korea imported 93.7% of primary energy (\$ 145.9 billion) due to minimal natural energy and resources in 2018¹⁾.
- Total cost of imports in Korea is \$ 535.2 billion, of which imported raw material is \$ 279.0 billion (52.0%) in 2018²⁾.
- The **generation amount of waste** in Korea increased from **346,669 ton/d in 2007** to **446,102 ton/d in 2018^{3,4)}**. (CAGR : **2.32%**)
- **The Framework act on resources circulation was enforced** to promote recycling in 2018. It is desirable to realize resource circulation after safe treatment of hazardous wastes.
- **In Circular Economy society**, manufacturers design products to be reusable and sustainable practices of 3R are key issues.

* CAGR : Compounded Annual Growth Rate (%)

- 1) Korea Energy Economics Institute, Frequently looking energy statistics, 2020.
- 2) Korea Statistical Information Service, Trend of raw material imports, 2020.
- 3) Ministry of Environment, National Status of Waste Generation and Treatment. 2020.
- 4) Ministry of Environment, Generation and Treatment of Hazardous Waste in Korea, 2020.

II. Concept of Circular Economy










- ▶ **(Concept)**
 - The circular economy is a model of production and consumption, which involves reducing, reusing and recycling (3R).

- ▶ **(Necessity)**
 - Increasing demand for raw materials.
 - The supply of crucial raw materials is limited.

- ▶ **(Benefit)**
 - Save raw materials
 - Reducing total annual greenhouse gas emissions.

The 7 key elements of the Circular Economy

Type	Content
 Design for the future	<ul style="list-style-type: none"> ○ To use the right materials, to design for appropriate lifetime and to design for extended future use.
 Incorporate digital technology	<ul style="list-style-type: none"> ○ Track and optimize resource use and strengthen connections between supply chain actors through digital, online platforms.
 Preserve & Extend What's Already made	<ul style="list-style-type: none"> ○ While resources are in-use, maintain, repair and upgrade them to maximize their lifetime and give them a second life through take back strategies when applicable.
 Prioritize regenerative resources	<ul style="list-style-type: none"> ○ Ensure renewable, reusable, non-toxic resources are utilized as materials and energy in an efficient way.
 Use waste as a resource	<ul style="list-style-type: none"> ○ Utilize waste streams as a source of secondary resources and recover waste for reuse and recycling.
 Rethink the business model	<ul style="list-style-type: none"> ○ Consider opportunities to create greater value and align incentives through business models that build on the interaction between products and services.
 Collaborate to create joint value	<ul style="list-style-type: none"> ○ Work together throughout the supply chain, internally within organizations and with the public sector to increase transparency and create joint value.

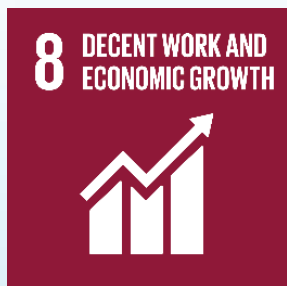
Circular Economy with SDGs in Waste Management



- ▶ The production of biogas from waste, purification and use as an energy source of LFG contributes to this goal.



- ▶ Urban planning that can reduce consumption
- ▶ Extending the life of buildings and others by material selection in construction



- ▶ Introduce a new circular business models
- ▶ Increasing resource effectiveness and efficiency,
- ▶ Creating green jobs.



- ▶ Reducing consumption by better design or material selection
- ▶ Reduction of virgin material use by reuse and recycling



- ▶ Activities including the use of clean energy and waste management contribute to industrial transformation.

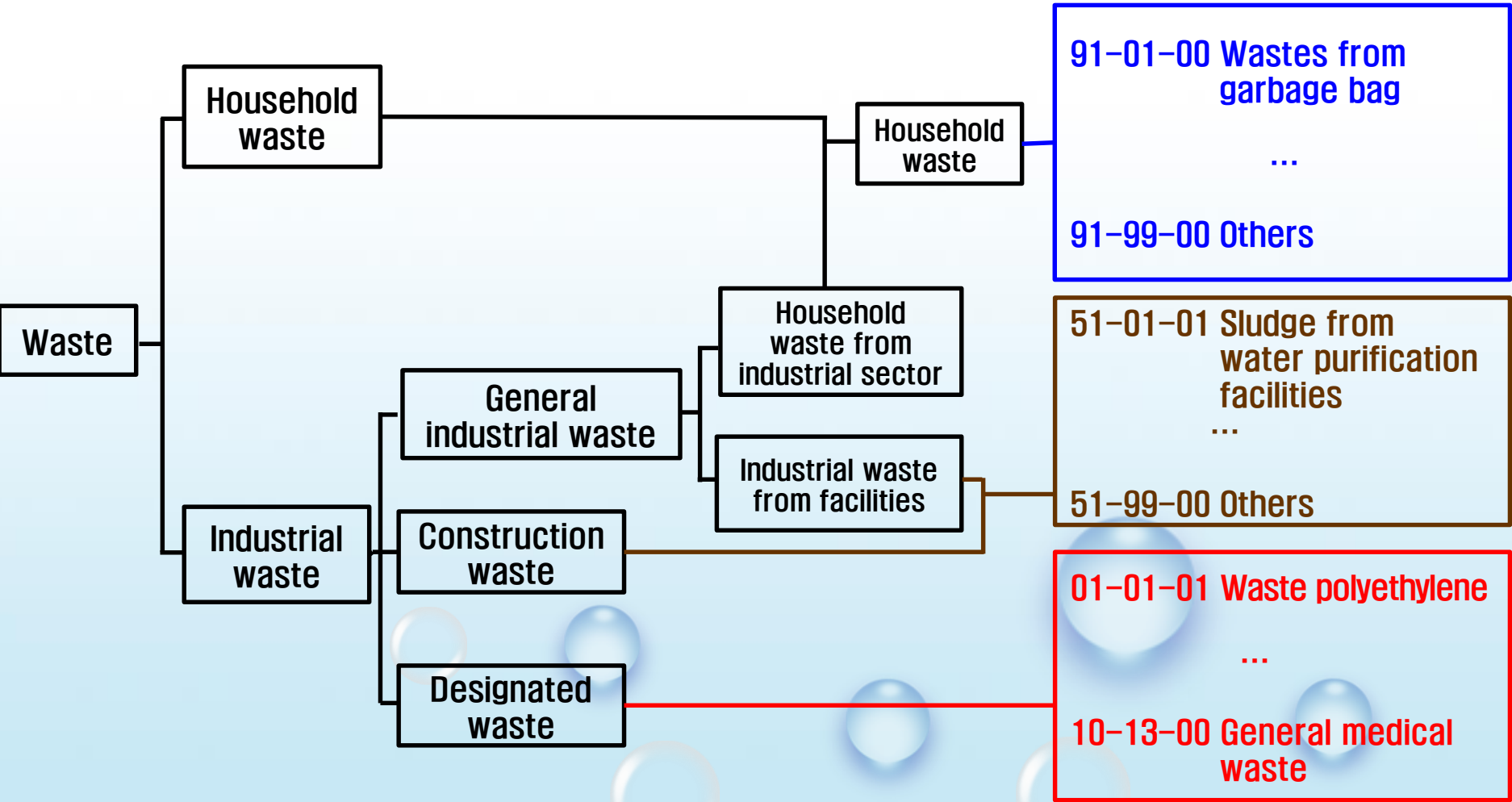


- ▶ Reducing GHG emission by resources circulation and prevention on waste generation

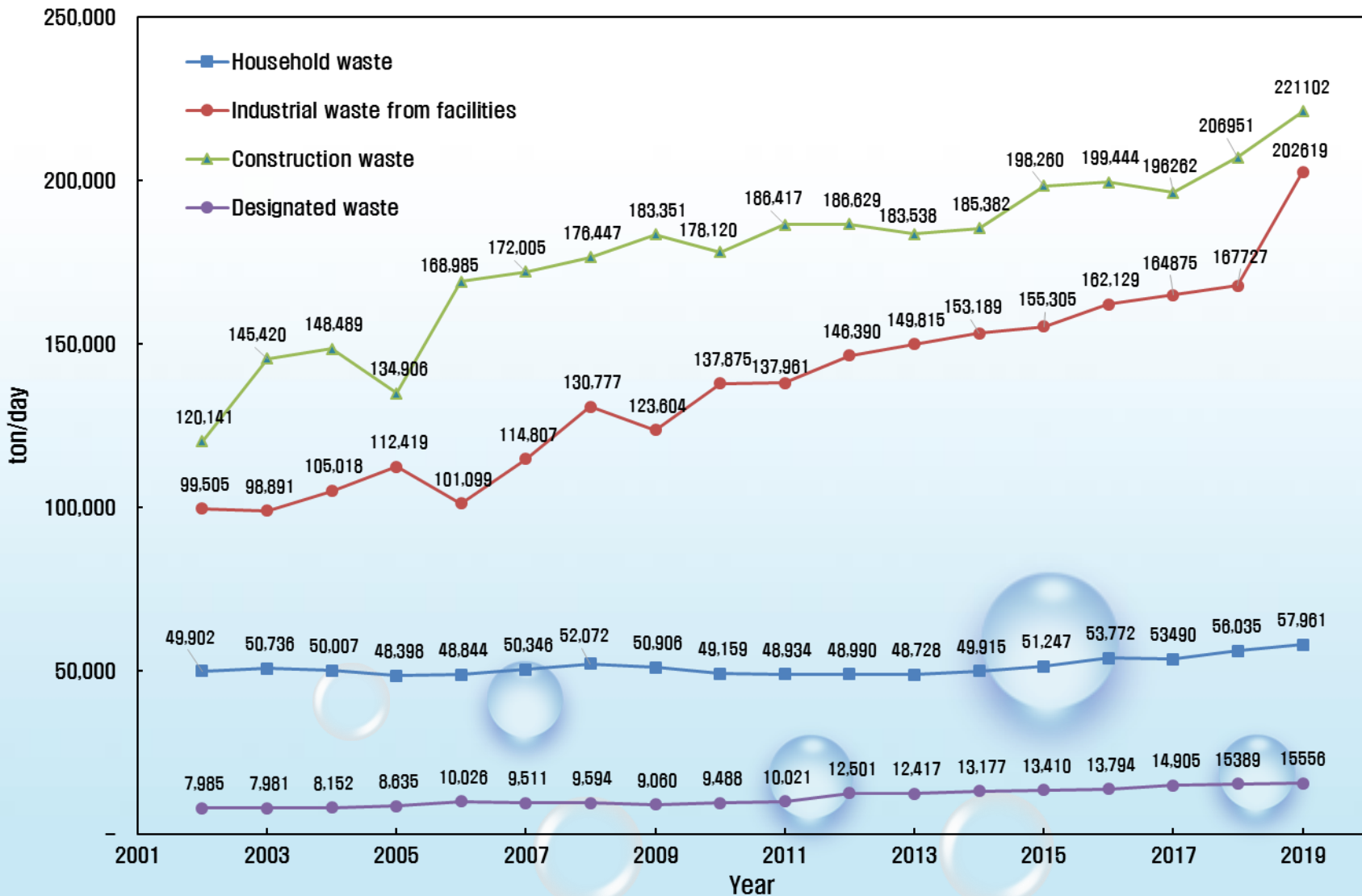
III. Waste management in Korea



Classification of Wastes in Korea

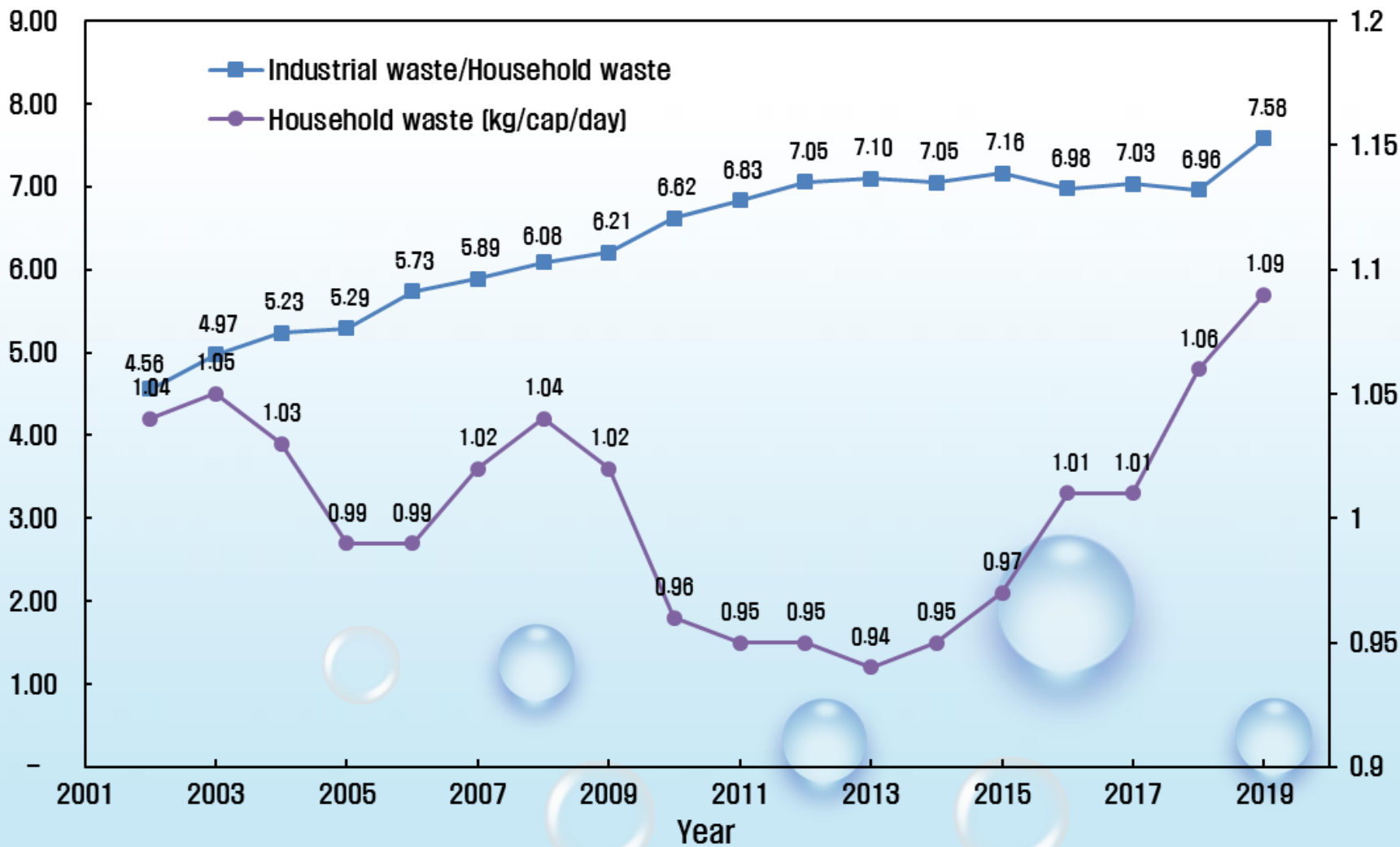


Generation of Wastes in Korea

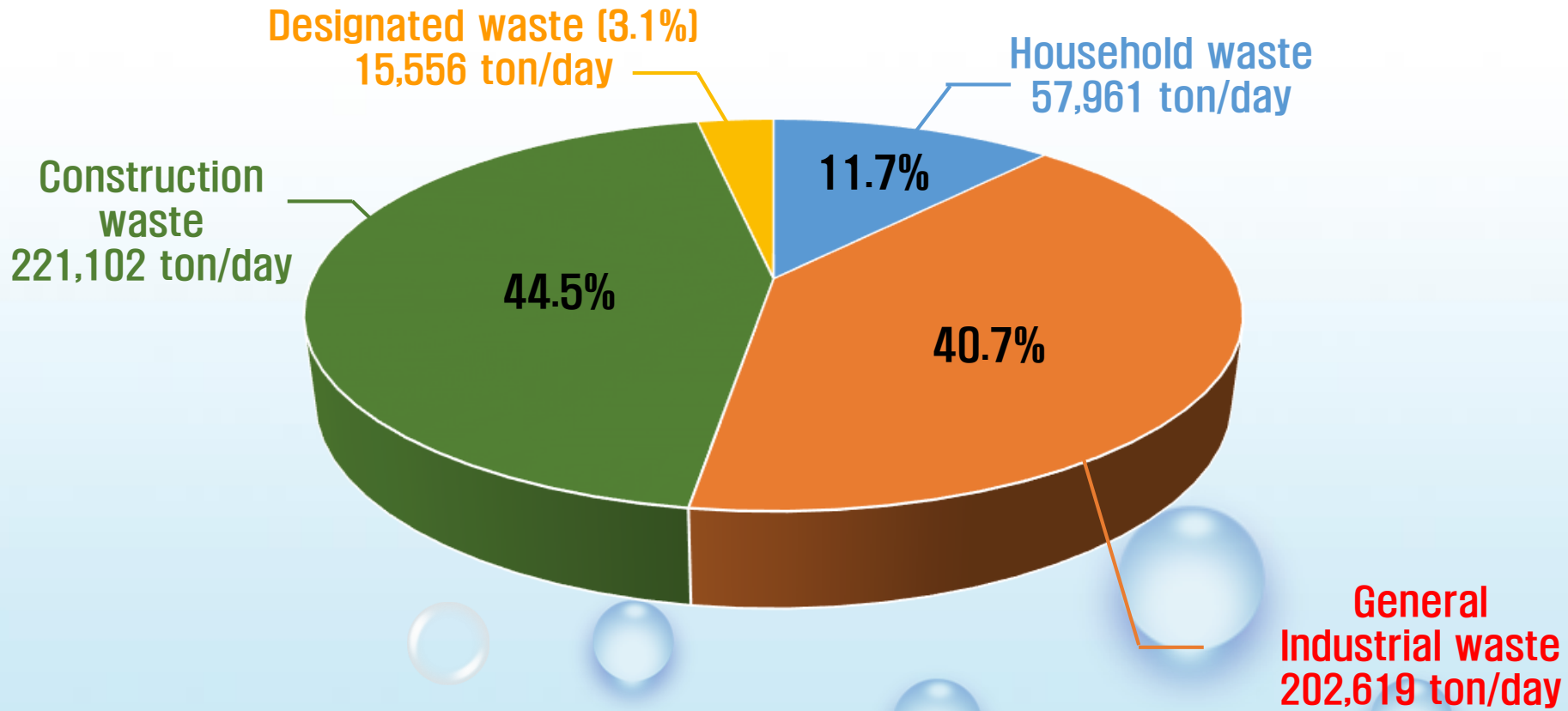


Source : Ministry of Environment, Status of waste generation & treatment (2021)

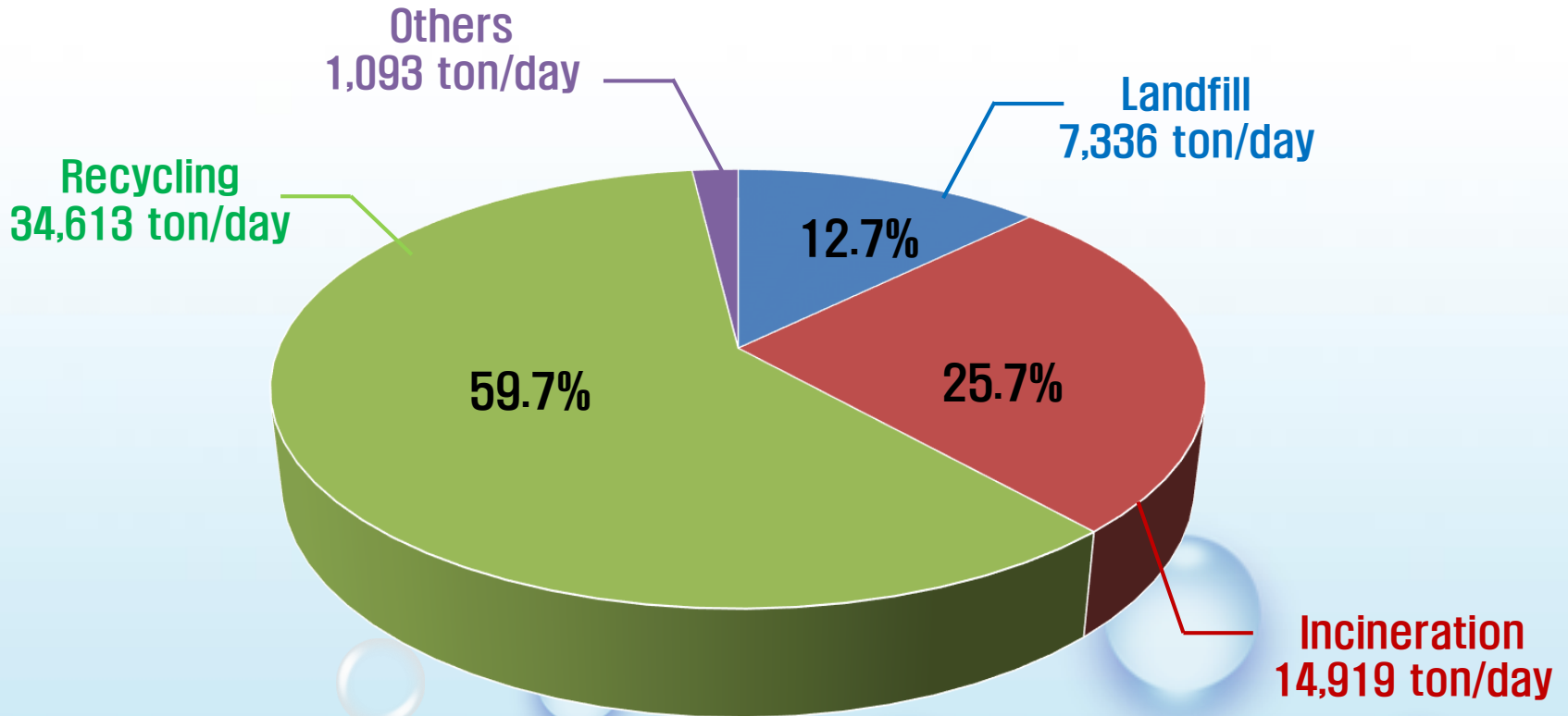
Unit Generation Rate in Household Waste



Generation of Wastes in 2019



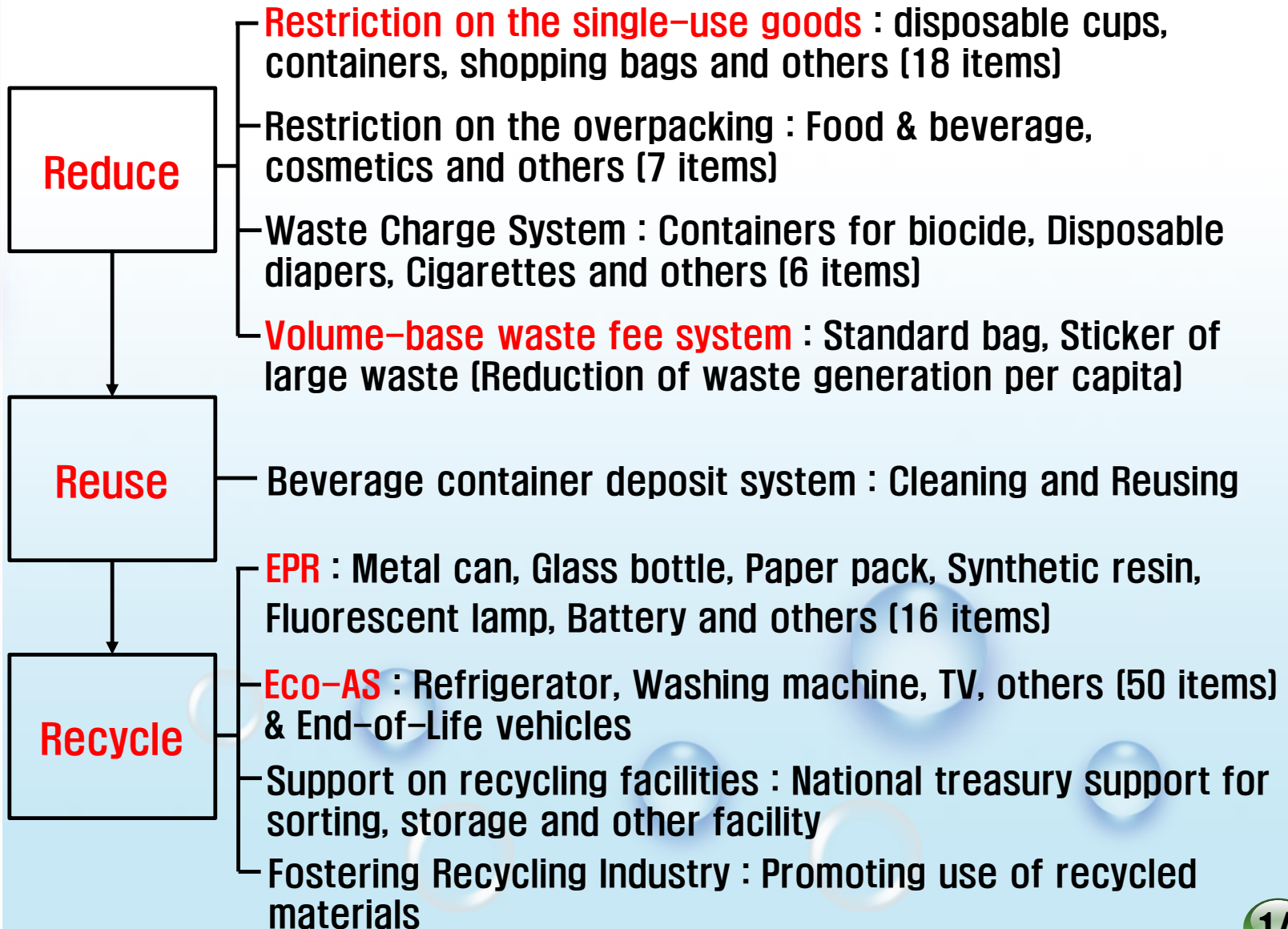
Treatment of Household Waste in 2019



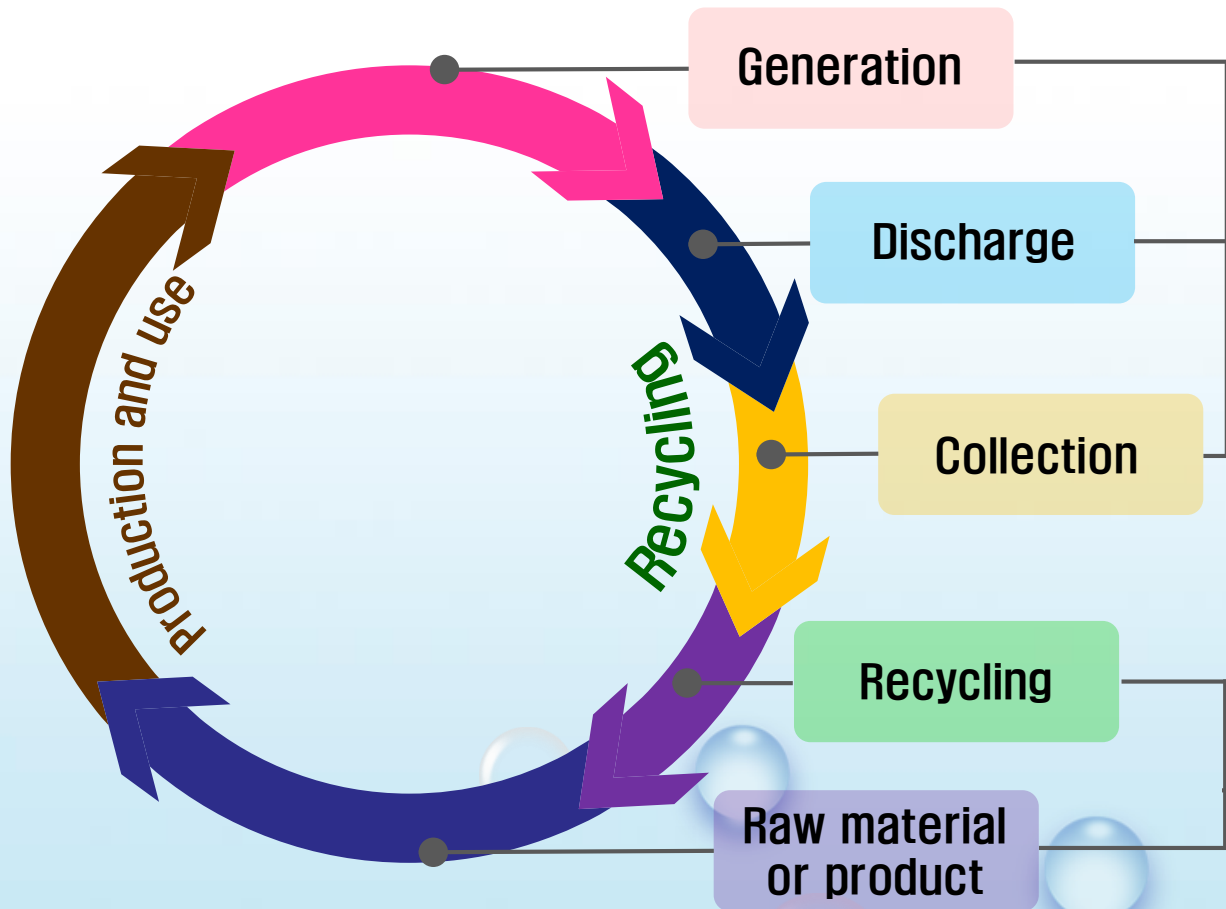
IV. Sustainable Practices of waste towards a Circular Economy



Resource Circulation in 3R



Practice of resource circulation in waste stream



- ▶ **Volume Base Waste Fee (VBWF) system**
 - MSW (mixed)
 - Food waste (using standard bag or RFID)
- ▶ **Separate discharge of 6 type of MSW**
 - Glass, Ferrous, Plastics, Paper, Textile, EPS
- ▶ **Specific waste**
 - Battery, Fluorescent lamp, other waste (using collection box)
 - E-waste (Takeback, Door to Door)

- ▶ **Operation of public waste treatment facility (Local government)**
 - Food waste recycling facility
- ▶ **Nation-wide WEEEs recycling facility (Producer Responsibility Organization)**

Separated Collection of Household Wastes

Recycling Items : Glass, Ferrous, Plastics, Paper, Textile, EPS (1992)

RFID System—Food waste (2010)



RFID : Radio Frequency Identification

Methods for RFID Food Waste Management System

Food waste discharge management card



1 Issue the RFID food waste discharge management card by household



2 The discharge port will open when you touch the card to the collection container.



3 The amount of food waste will be automatically weighted when you dump food waste in to the discharge port. (Voice command will run in parallel)

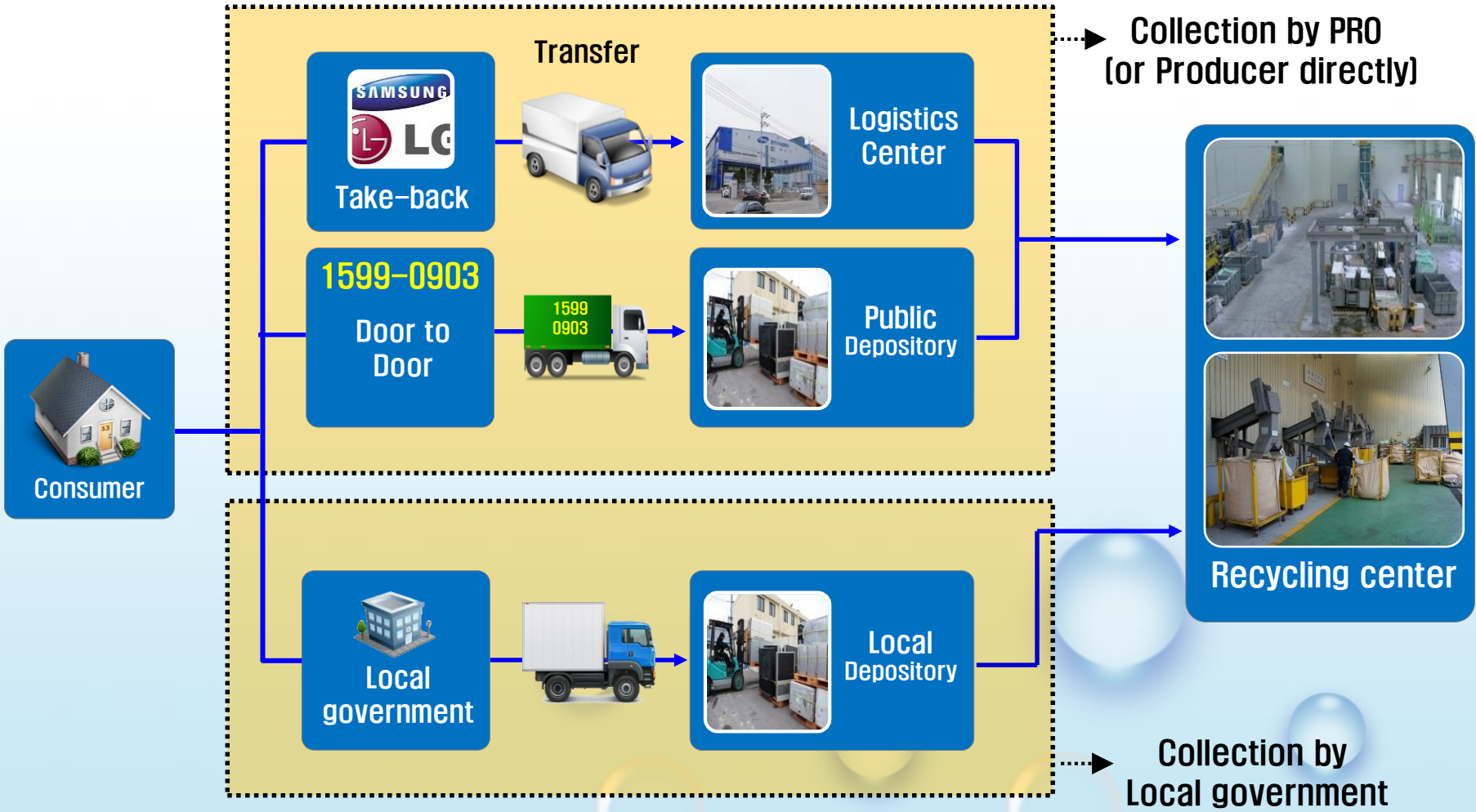


4 Information on the discharge will be sent to the central server. (Environment Corporation)



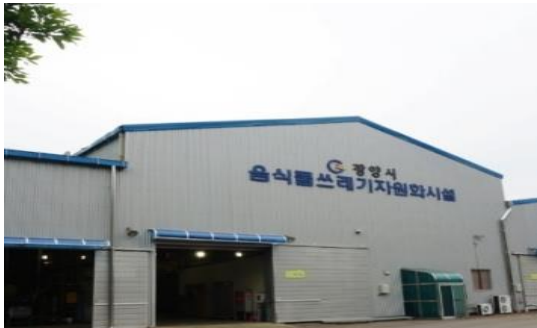
5 Levy the disposal fee by household (maintenance fee, etc.)

E-waste Collection



Food waste recycling Facility

Recycled to animal feed



Recycled to compost



Anaerobic digestion



Nation-wide E-waste recycling center

Recycling center in Metropolitan area (eastern side)



Recycling center in Jeju

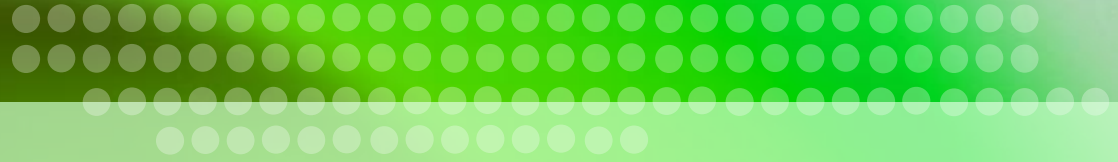


▶ Mainly recycle the large home appliances (Refrigerator, Washing machine, etc.)

V. Summary

- In Korea, regulation and laws that induce resources circulation are being implemented to realize a circular economy.
 - ▶ **Framework Act on Resource Circulation (2017)**
 - ▶ Based on resource circulation in 3R, **volume based waste fee system (1995)** and restriction on single-use goods and over-packaging are working fine.
 - ▶ EPR system (Packaging and product) and ECO-AS (E-waste)
- For sustainable practice of resource circulation, **waste flow programs** such as separate discharge, collection and recycling are conducted by local government and producer (manufacture).
 - ▶ Segregation of Household Waste and E-waste is one of the most important measure.
 - ▶ Recycling of Household Waste and E-waste is carried out by Local government and Producer, respectively.
- **A long-term master plan** and **the technical roadmap** have been established and promoted to convert towards a circular economy society through resource circulation.





Thank you for Your Attention

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