

# **Sustainable Practice of Waste Management towards a Circular Economy – The Case Study in Korea –**

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# Contents

I . Introduction

II . Concept of Circular Economy

III . Waste Management in Korea

IV . Sustainable Practices of Waste towards a Circular Economy

V . Summary

# I. Introduction

- Total cost of imports in Korea is \$ 535.2 billion, of which imported raw material is \$ 279.0 billion (52.0%) in 2018<sup>1)</sup>.
- The **generation amount of waste** in Korea increased from **346,669 ton/d in 2007** to **446,102 ton/d in 2018<sup>2,3)</sup>**. [CAGR : **2.32%**]
- Globally the most important issues in resources circulation are **SDGs and Circular Economy**.
- In Korea, **the Framework Act on Resources Circulation** was enforced to promote recycling in 2017. MSWs including packaging waste and plastic waste have been managed through resource circulation towards circular economy.
- **For Circular Economy Society**, sustainable practices based on 3Rs are key issues in the field of waste management.

\* CAGR : Compounded Annual Growth Rate (%)

- 1) Korea Statistical Information Service, Trend of raw material imports, 2020.
- 2) Ministry of Environment, National Status of Waste Generation and Treatment. 2020.
- 3) Ministry of Environment, Generation and Treatment of Hazardous Waste in Korea, 2020.










## II. Concept of Circular Economy



- ▶ **(Necessity)**
  - Increasing demand for raw materials.
  - The supply of crucial raw materials is limited.
- ▶ **(Methodology)**
  - The circular economy is a model of production and consumption, which involves reducing, reusing and recycling (3R).
- ▶ **(Benefit)**
  - Save raw materials
  - Reducing total annual greenhouse gas emissions.



# The 7 key elements of the Circular Economy

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

# Circular Economy with SDGs in Waste Management

## 7 AFFORDABLE AND CLEAN ENERGY



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

## 11 SUSTAINABLE CITIES AND COMMUNITIES



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

## 8 DECENT WORK AND ECONOMIC GROWTH



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

## 12 RESPONSIBLE CONSUMPTION AND PRODUCTION



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

## 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



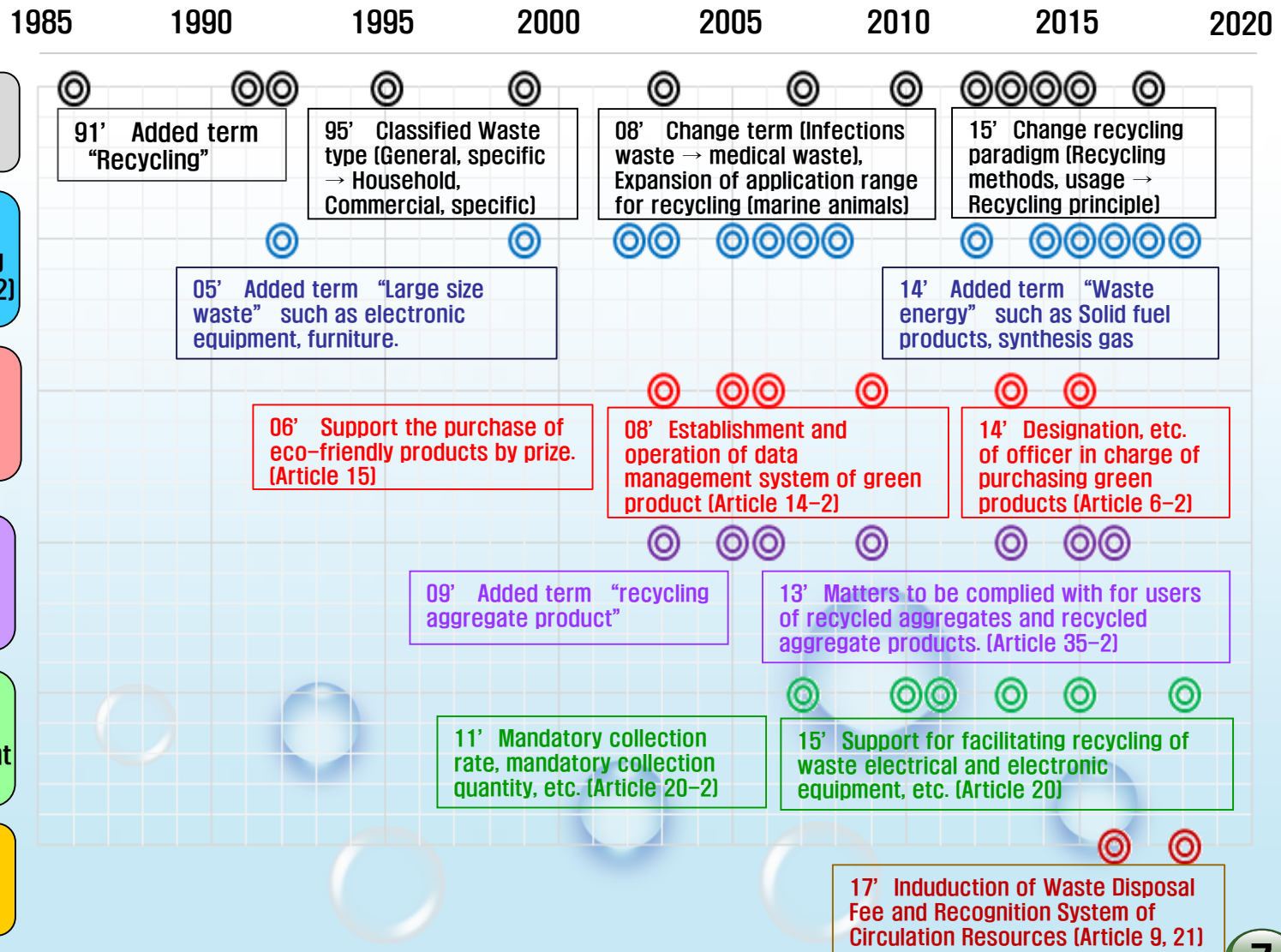
- ▶ Activities including the use of clean energy and waste management contribute to industrial transformation.

## 13 CLIMATE ACTION



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

### III. Waste Management in Korea since 1986



## Resource Circulation in 3R

### Reduce

- Restriction on the single-use goods : disposable cups, containers, shopping bags and others (18 items)
- Restriction on the overpacking : Food & beverage, cosmetics and others (7 items)
- Waste Charge System : Containers for biocide, Disposable diapers, Cigarettes and others (6 items)
- Volume-base waste fee system : Standard bag, Sticker of large waste (Reduction of waste generation per capita)

### Reuse

- Beverage container deposit system : Cleaning and Reusing
- EPR : Metal can, Glass bottle, Paper pack, Synthetic resin, Fluorescent lamp, Battery and others (16 items)

### Recycle

- Eco-AS : Refrigerator, Washing machine, TV, others (50 items) & End-of-Life vehicles
- Support on recycling facilities : National treasury support for sorting, storage and other facility
- Fostering Recycling Industry : Promoting use of recycled materials

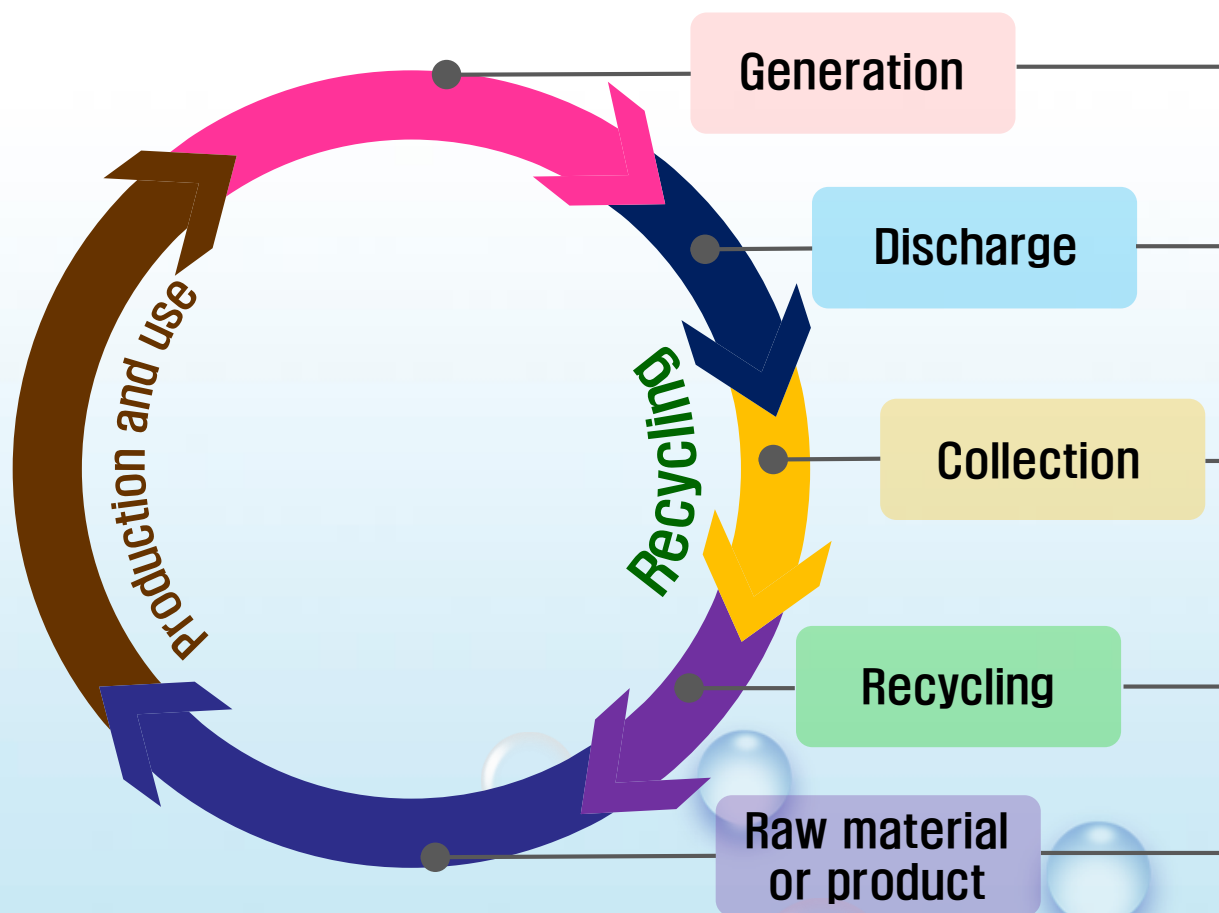




# Strategy on Plastic Free Society in Household waste

Strategy		Content
Policy	Regulation on reduction of single use plastic products	<ul style="list-style-type: none"> <li>– Conversion to other materials (metal can, paper, others) → <b>47% (Current) ▶ 38% (2025)</b></li> <li>– No production and use single-use plastic products in Government and Public Institute from 2021</li> <li>– Prohibition of double packaging from 2021</li> </ul>
	Expansion of recycling of plastic waste	<ul style="list-style-type: none"> <li>– Mandatory use of recycled plastic → <b>30% (2030)</b></li> <li>– Ban on import of plastic waste and promote consumption of domestic recycled products → PET, PE, PP, PS (Current) ▶ All type of plastic waste (2022)</li> </ul>
	Strengthen management of marine debris and micro plastic	<ul style="list-style-type: none"> <li>– Strengthening the collection system of marine debris by local governments from 2021</li> <li>– Deposit system for fishing gear and buoys from 2022</li> <li>– Prohibit intentional use of micro plastics from 2021</li> <li>– Development of risk assessment on micro plastics from 2020</li> </ul>
Technology	Transition to an alternative plastic society	<ul style="list-style-type: none"> <li>– <b>Replaced with 100% of bioplastic by 2050</b> (bioplastics produced from 100% bio-materials extracted from land and ocean, no petroleum-based)</li> <li>– Develop recycling technology for bioplastic by 2050</li> </ul>
Implementation support		<ul style="list-style-type: none"> <li>– Establishment of DB on material flow of plastics by major industry from 2021</li> <li>– Planning and promotion of R&amp;D for plastic free society from 2021</li> </ul>

## IV. Sustainable Practice of waste for Circular Economy



- ▶ 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, PPE waste, Others (using collection box)
  - E-waste (Takeback, Door to Door)

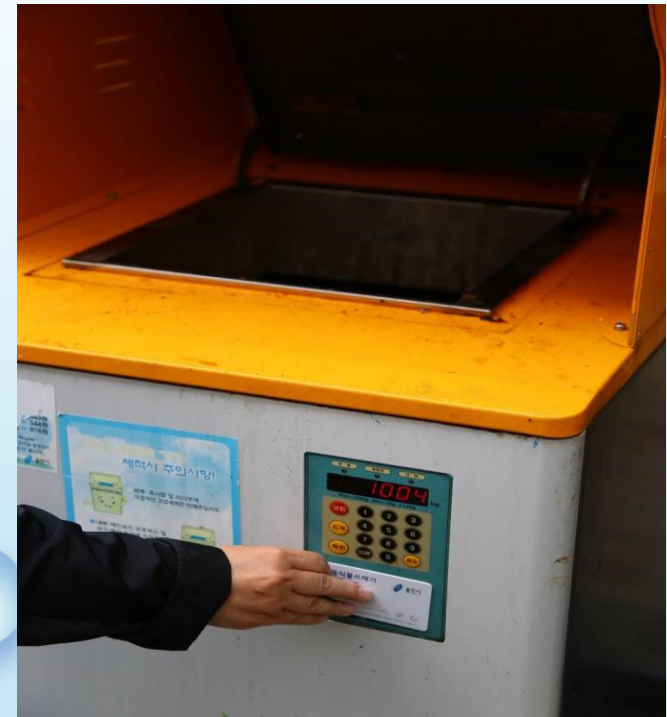
- ▶ Operation of public waste treatment facility (Local government)
  - Food waste recycling facility
- ▶ Nation-wide E-wastes recycling facility (Producer Responsibility Organization)

# Collection of Recycling Wastes

6 Items : Glass, Ferrous (Cans), Plastics, Paper, Textile, EPS

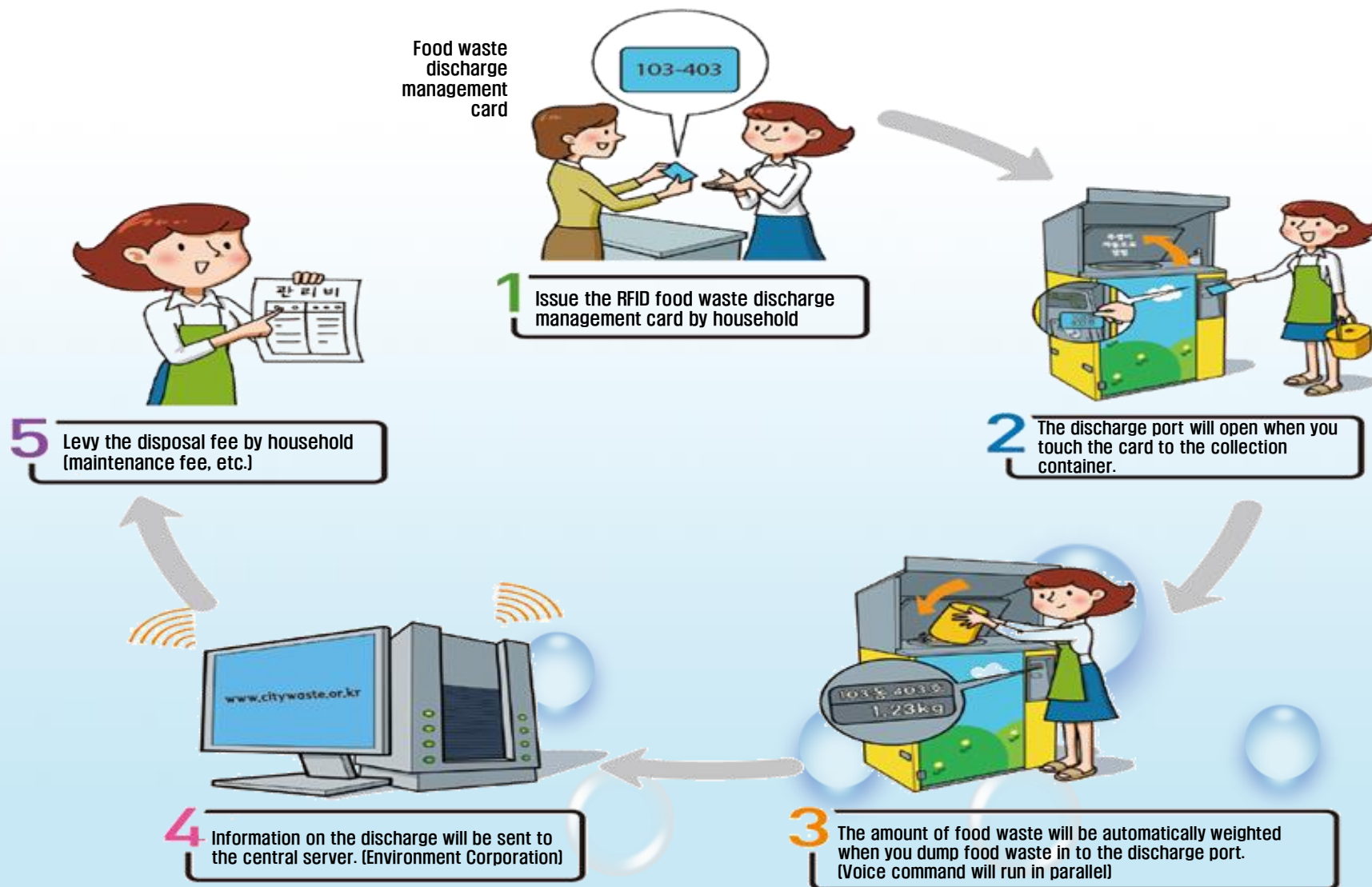
## Collection of Food Waste

Volume based waste fee system by RFID System (2010)



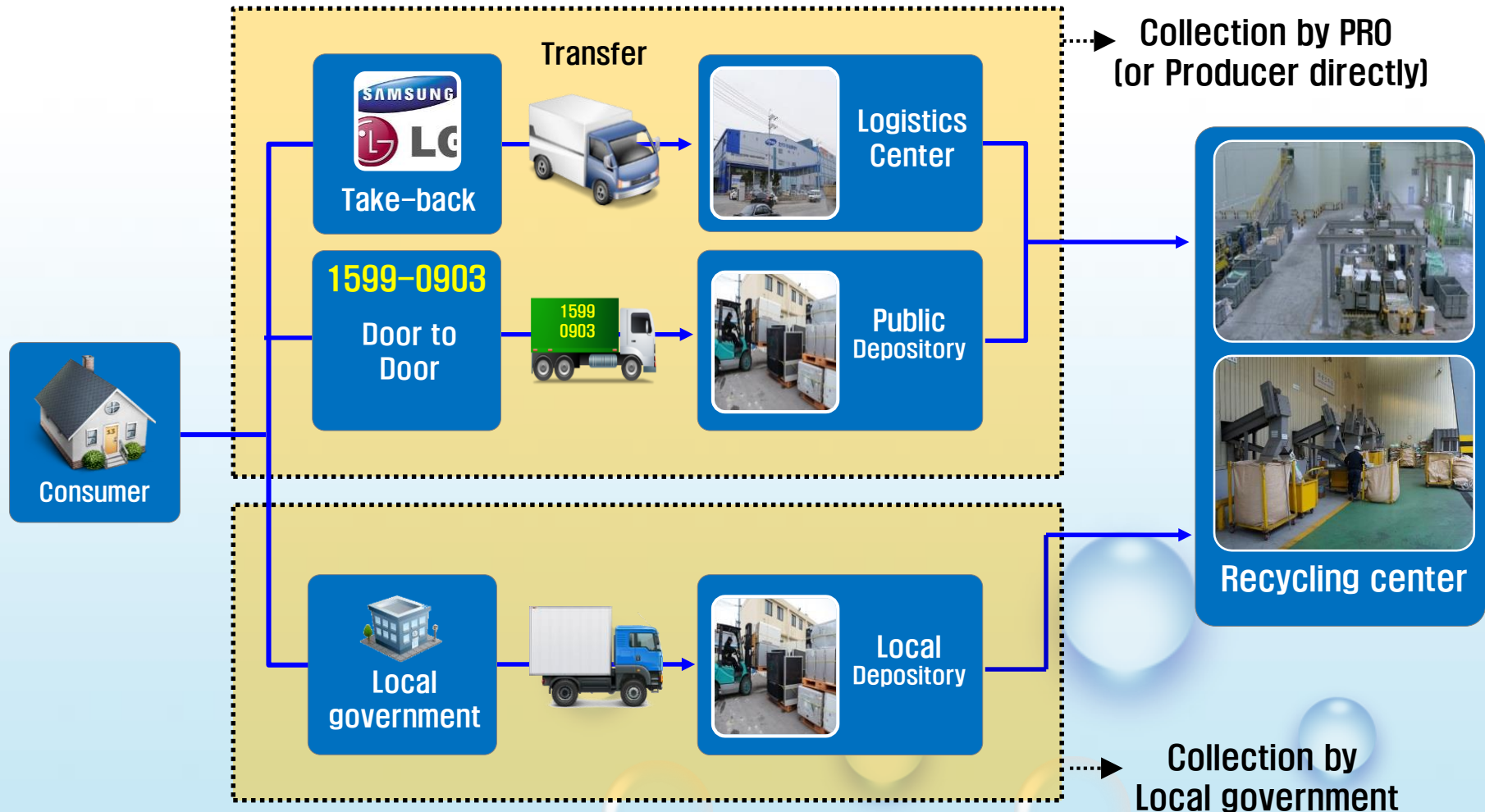
RFID : Radio Frequency Identification

# Food Waste Management using RFID System



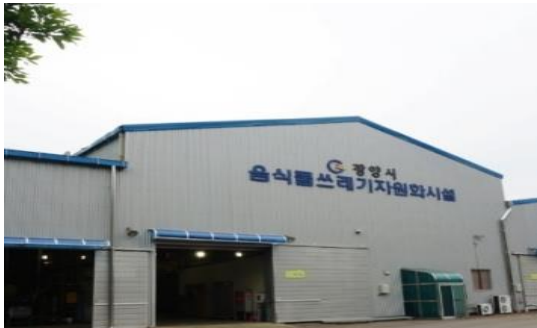


# E-waste Collection



# 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.)

# Recycling Practice of Plastic Waste

## Discharge-Collection-Separation-Recycling of plastic waste



## Collection and storage-Intermediate processing-Rolling-Recycled sheet





# Sustainable Practice of waste PPE related to COVID-19

WM&R


Short Communication

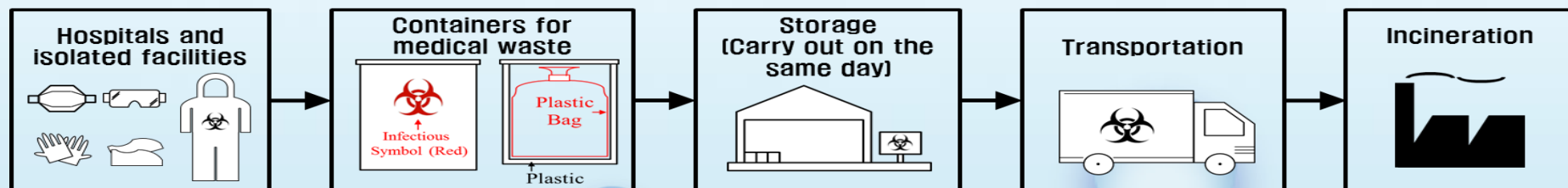
## Management of used personal protective equipment and wastes related to COVID-19 in South Korea

Seung-Whee Rhee 

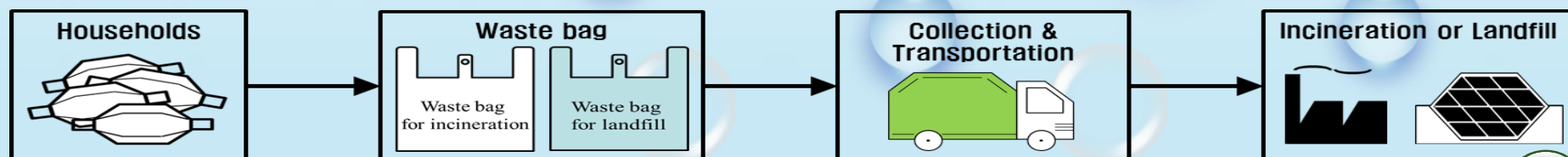
### Abstract

With the rapid spread of coronavirus disease 2019 (COVID-19), the amount of used personal protective equipment (PPE) including face masks and protective clothes has significantly increased. This used PPE in a hospital can lead to the indirect infection by COVID-19. Accordingly, it has been recognized that the management of used PPE is very important to prevent the spread of COVID-19. Through the experience of spreading some infectious diseases such as severe acute respiratory syndrome, Middle East respiratory syndrome and Ebola virus in South Korea (Republic of Korea), a safe management method of waste related to infectious diseases has been

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〈Sustainable Practice of Waste PPE from hospitals and isolated facilities〉



〈 Sustainable Practice of PPEs (used mask) from households〉

## 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 MSW is one of the most important measure.
  - ▶ Responsibility of MSW management belongs to local authorities.
  - ▶ Recycling of E-waste is carried out by producer and PRO.
- **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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