



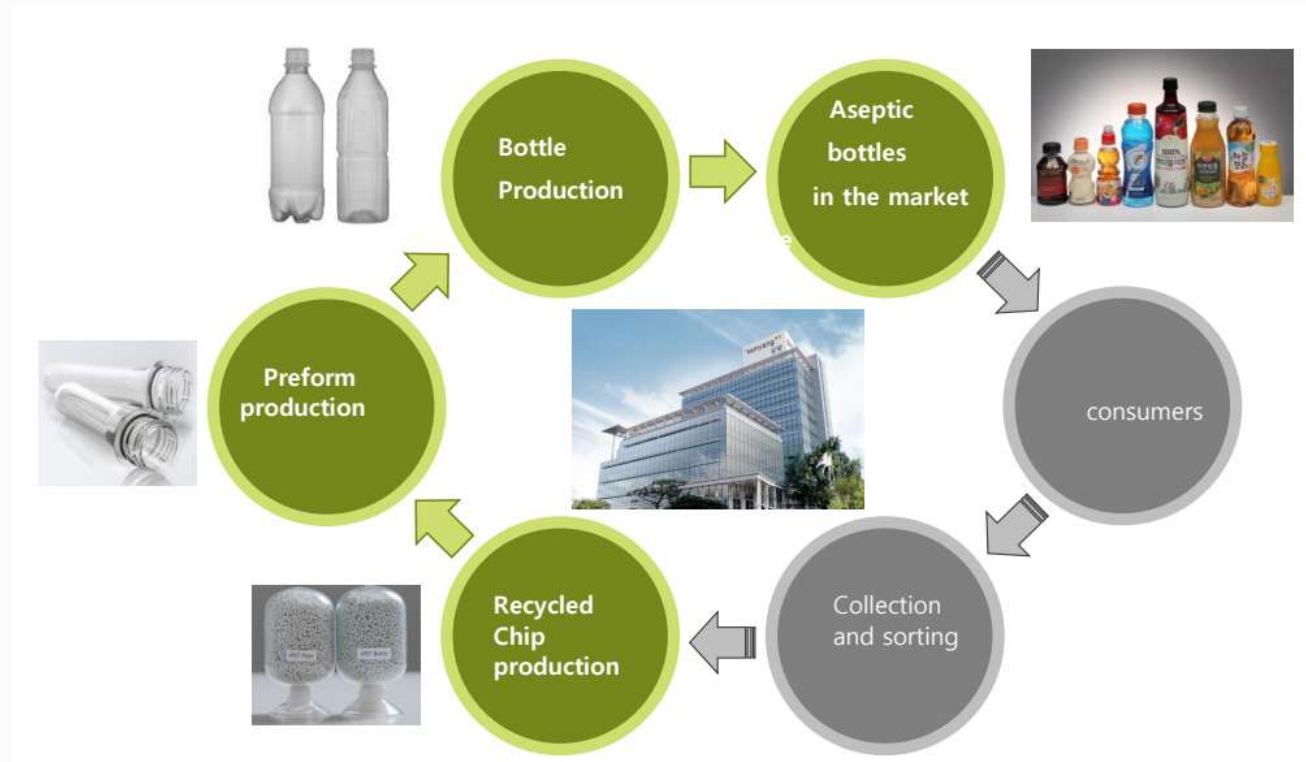
Recycling, material flow, and recycled content demands of PET bottles towards a circular economy in Republic of Korea

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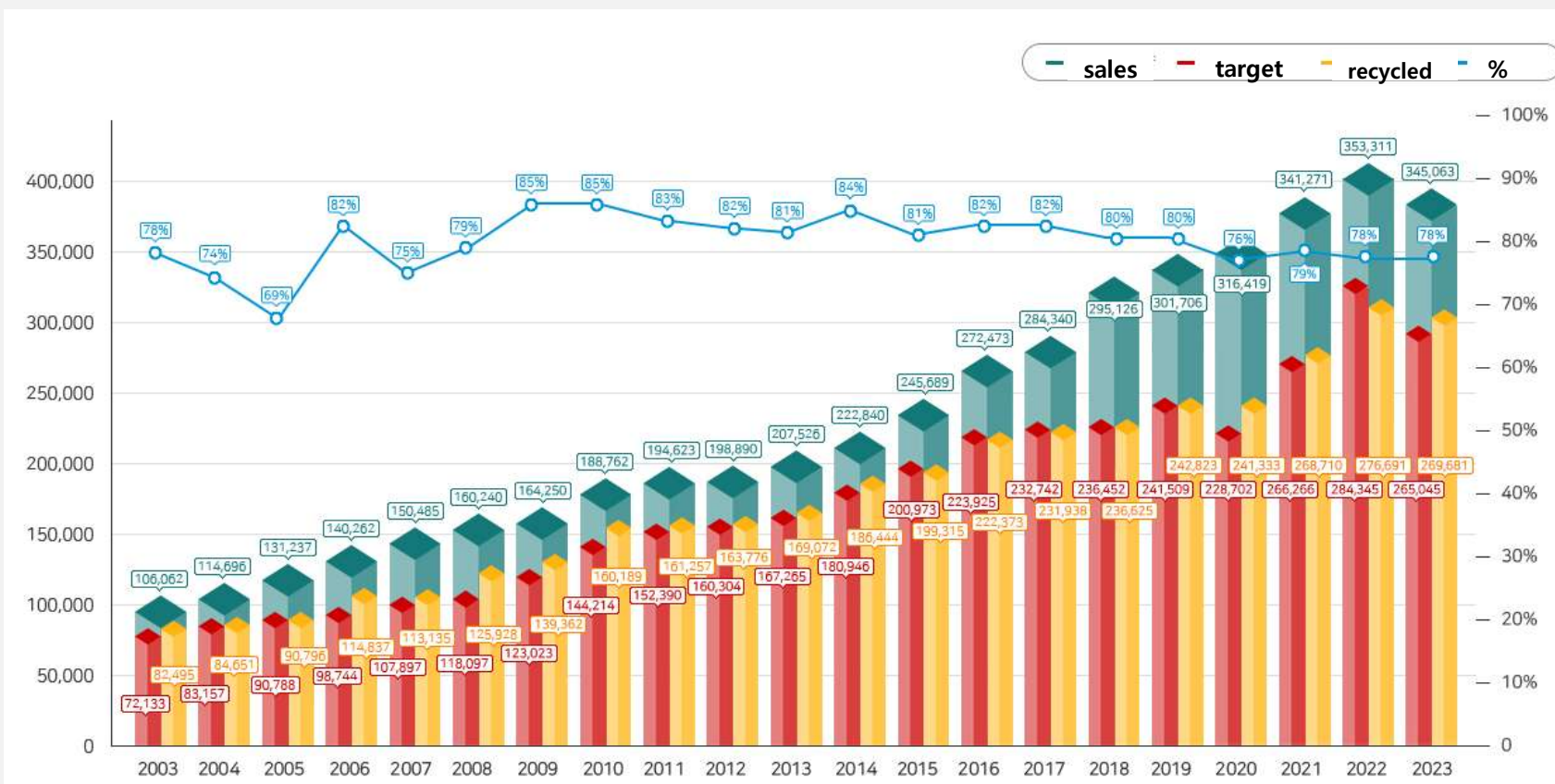
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1. PET bottle recycling and material flow in Korea: Past & Current



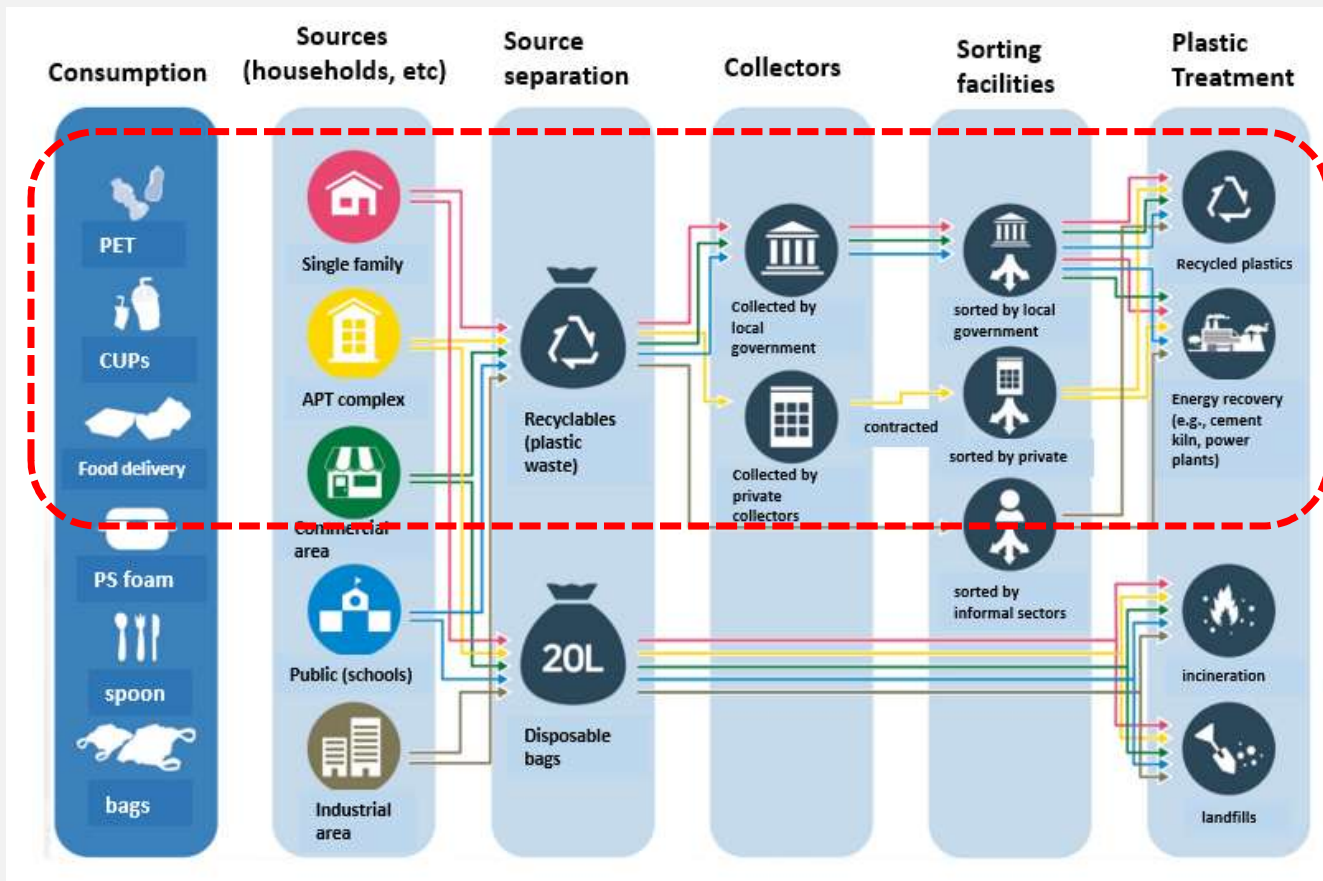
1. Sales and recycling rate PET Bottles in Korea



[Fig] Sales, mandatory recycling targets, and recycling rate of PET bottles (2003-2023)

- ✓ PET bottles have been recycled by extended producer responsibility (E P R) since 2003.
- ✓ In 2021, 340,000 tons of PET bottles were sold on the market and about 80% of PET bottles were collected and recycled.

2. Recycling system of PET Bottles in Korea



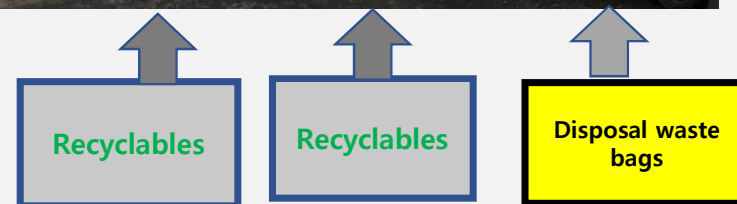
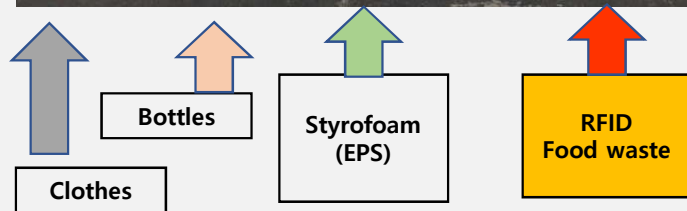
Recycling System supported by EPR

disposal waste streams

[Fig] Source separation and recycling of waste materials in Korea

2. Recycling system of PET Bottles in Korea

Source separation for recyclables, combustibles, and non-combustibles is actively practiced by households and monitored by local government.



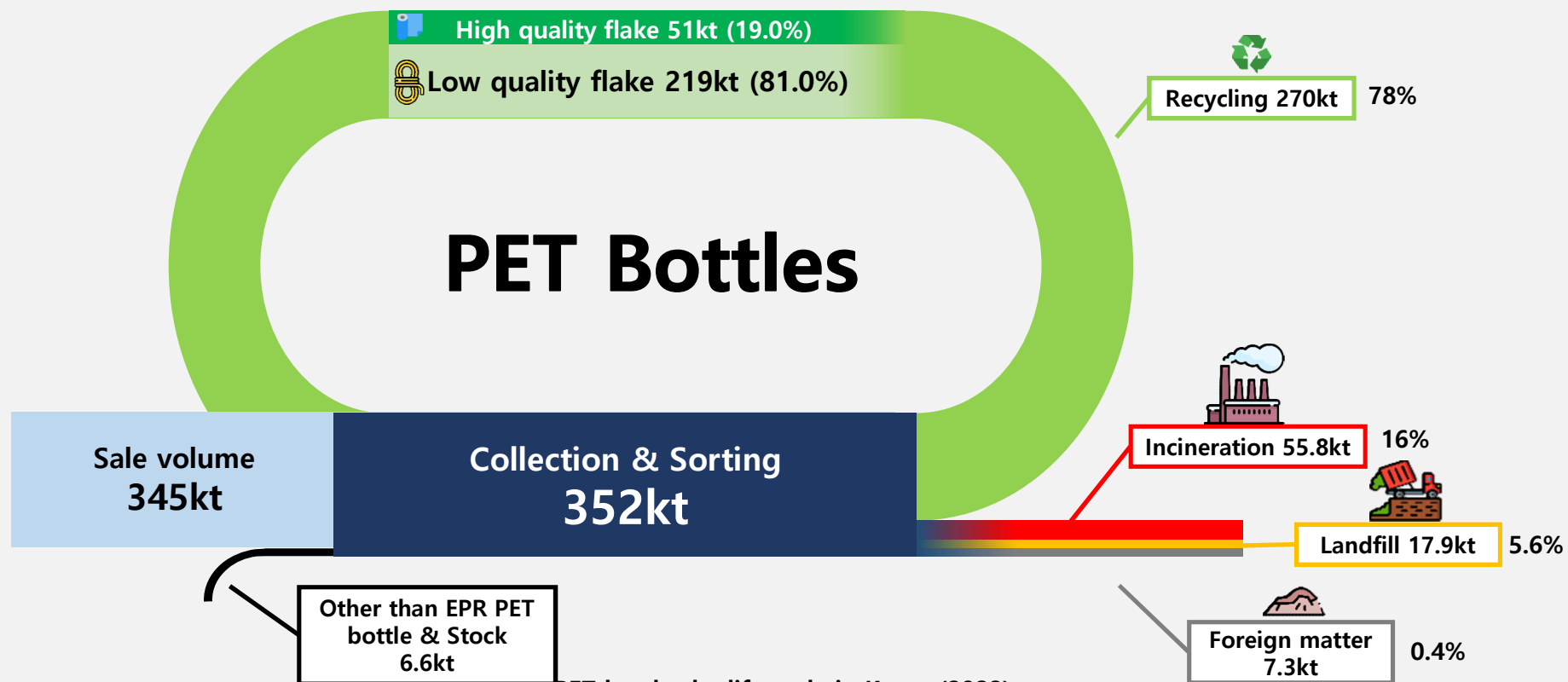
[Figure] Source separation of recyclables from households in Korea (Jeju)

2. Recycling system of PET Bottles in Korea



[Figure] PET bottle collection, sorting, and recycling flow from households in Korea

3. Material flow of PET Bottles in Korea



[Fig] Material flow of PET bottles by life cycle in Korea (2023)

- ✓ Approximately 339,000 tons of PET bottles were collected in 2021. Collected PET bottles are sorted and processed.
- ✓ In the same year, 268,000 tons of PET bottles are recycled into fibers, sheet, string and others.

4. Recycling comparisons of PET Bottles: Korea, Japan, and EU

[Table] Sales, mandatory recycling targets, and recycling rate of PET bottles (2003-2021)

	Korea (2021)	Japan (2021)	EU (2020)
PET bottle sales (1,000ton/yr)	340	581	3,600
PET bottle consumption per capita (kg/yr/person)	6.5	4.6	8.0
PET bottle recycling (1,000ton/yr)	268	500	2,229
Recycling rate of PET bottle per person (kg/yr/person)	5.2	4.0	5.0
Collection rate	85%	110%	61%
Recycling rate	79%	86%	62%
High-quality (sheet, bottle grade)	19%	67%	67%
Recycling rate for food grade (bottles/containers)	<1%	58%	30%

- ✓ In Korea, the recycling rate of PET bottles are relatively high and comparable with those of Japan and EU.
- ✓ However, high-quality recycled materials are limited in Korea, when compared with Japan and EU.

5. Eco-design of PET Bottles: colorless PET bottles production (2021)



1. Colorless PET bottle in 2020 from green PET



2. Easy removal of labels on bottle in water



3. Colorless PET bottle with PE label



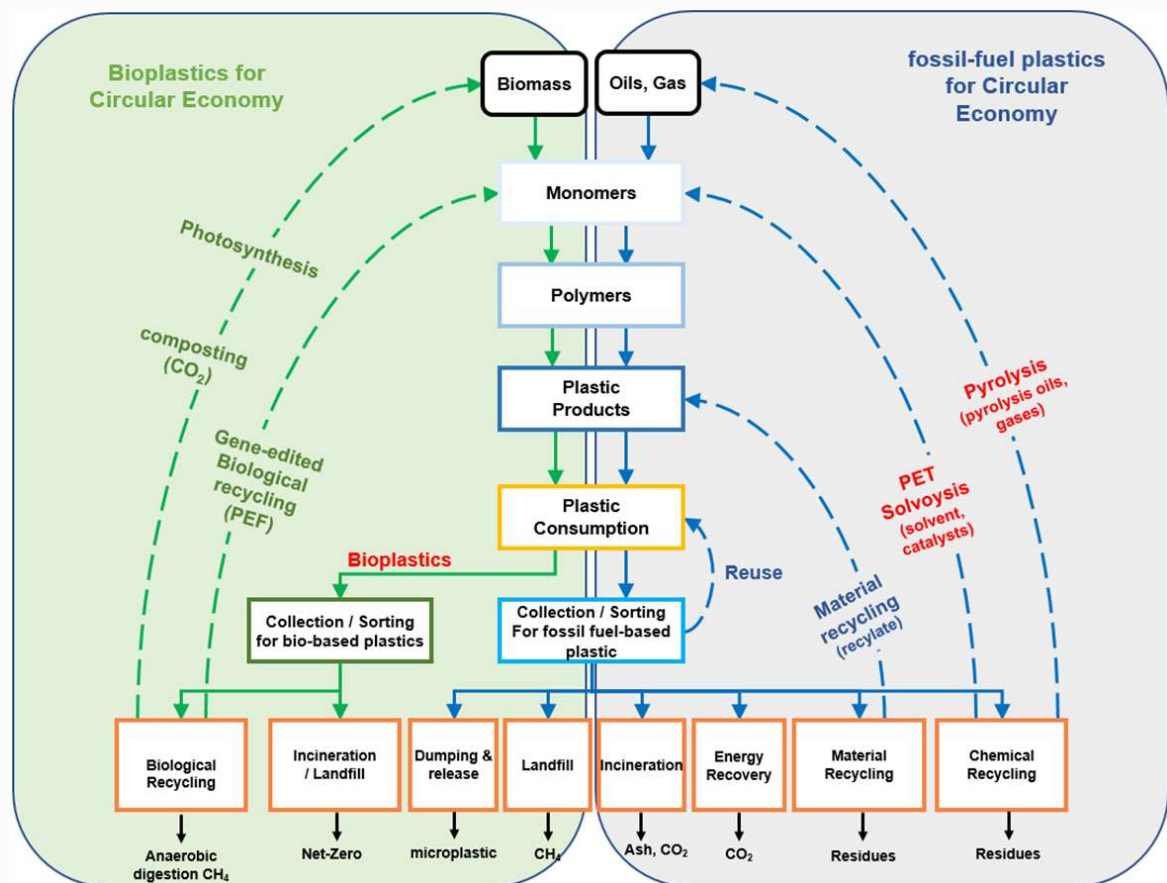
4. No labels on PET bottle in 2020



2. PET bottle recycling in Korea toward a circular economy: **Future direction**

6. Directions and challenges of plastic circular economy in Korea

Directions for Korea Plastic Circular Economy



[Figure] Future direction for plastic circular economy in Korea

1. Fossil-fuel Plastics for Circular Economy

- Fossil fuel-based plastic economy should rely on circularity by adopting **chemical recycling** as well as material recycling
- Plastic consumption, especially single-use plastics should be reduced and **reused**
- **Circular plastic production with econ-design** is very important and should be incentivized
- Plastic products with recycled content can be promoted and encouraged

2. Bioplastics for Circular Economy

- In the long-term, **bioplastics** can replace current fossil fuel-based plastic, which will contribute to reducing carbon emission
- Bioplastics for circular economy can be established by overcoming technical, social, and economical barriers (e.g., economics, efficiency, end-of-life, ethics, education)

7. Recycled content requirement in Korea : 30% by 2030 PET Bottles (10% in 2026)

[Table] Reduced PET bottle consumption and recycled content requirement for PET bottles in 2030 and 2040 in Korea by scenario

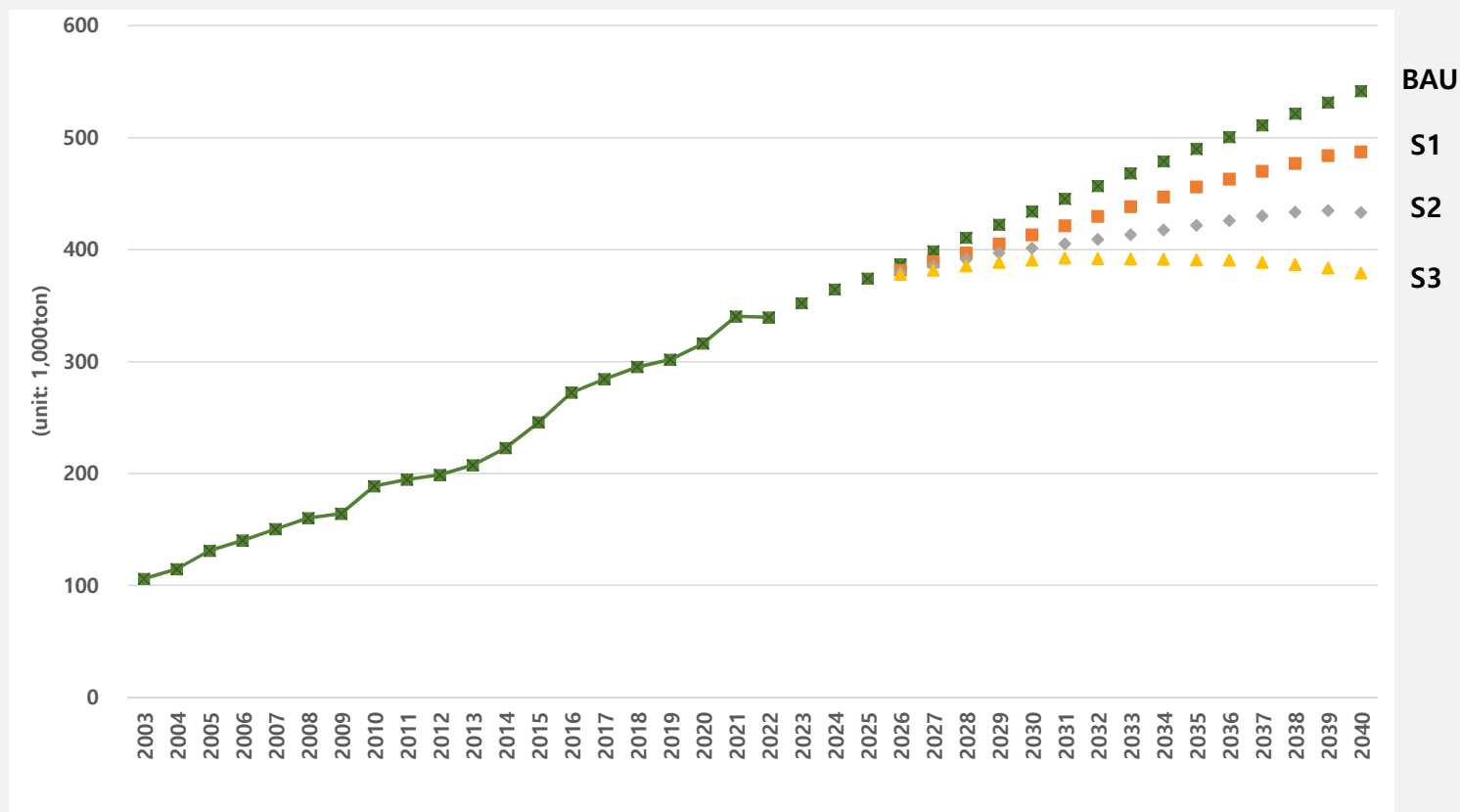
	Reduced PET bottle consumption	Target for recycled content
BAU	-	30% (2030 year) 40% (2040 year)
S1	10% reduction to BAU in 2040	
S2	20% reduction to BAU in 2040	
S3	30% reduction to BAU in 2040	

[Table] Supply capacity of rPET bottle grade in Korea by 2040 (unit: 1,000 ton)

	2024 (current)	2030년	2040년
H company*	14	24	24
L company	-	55	170
S company	10	22	22
D company	-	11	11
Total	24	112	227

- ✓ In Korea, 30% recycled content is required for PET bottles by 2030 (10% in 2026).
- ✓ By 2030 and 2040, rPET bottle grade will be supplied up to 112,000 tons and 227,000 tons, respectively, by PET recycling companies by investment.

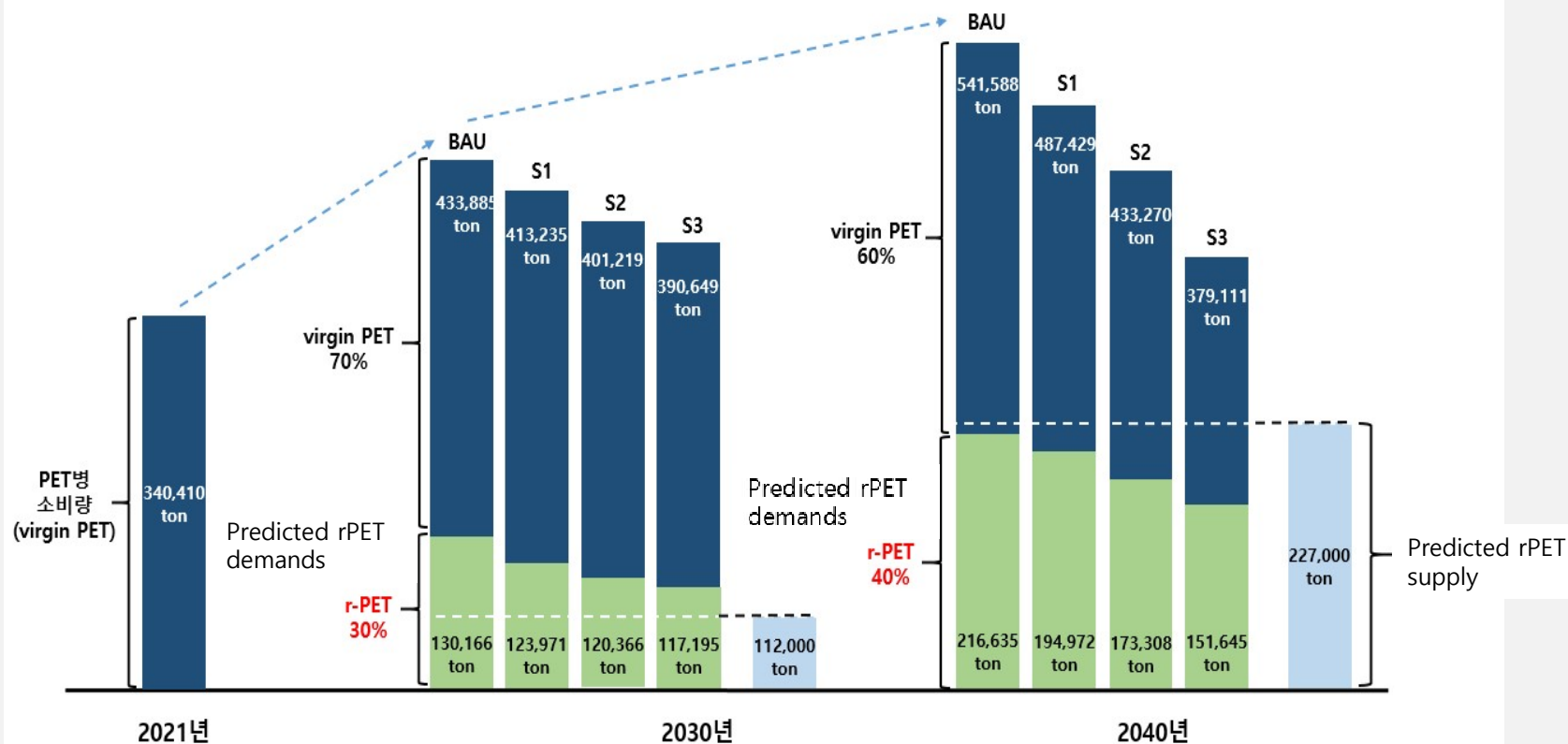
8. Sale projection of PET Bottles in Korea by 2040



[Fig] Sales projection of PET bottles in Korea by scenario analysis (2023-2040)

- ✓ By scenario analysis, in 2040, the sales of PET bottles may reach to between 380,000 and 550,000 tons, depending on scenario.

9. Demands and supply for recycled PET by 2040 in Korea



[Fig] Recycled PET(rPET) demands for PET bottles in 2030 and 2040 in Korea by scenario analysis)

- ✓ By considering the demands and recycled content requirement, r-PET bottle grade will be needed about 117,000 tons and 130,000 tons in 2030
- ✓ In 2040, between 151,000 tons and 216,635 tons of r-PET will be needed to meet 40% recycled content requirement.

10. Summary and Conclusion

- 1 Need to establish plastic circular economy around the world from linear economy.
Much of plastic waste is treated by incineration and landfilling, resulting in plastic pollution and greenhouse gas emissions
- 2 Discuss the results of recycling and material flow analysis for PET bottles in Korea
Achieve almost 80% recycling rate, but high-quality closed loop recycling with recycled content should be enhanced.
- 3 In 2030, more recycled materials will be needed to meet recycling content 30% requirement.
In 2040, by adopting chemical recycling technology from recycling industry, there is a high chance to achieve 40% recycled content.

Thank you for your attention

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