Evaluation of Environmental Burden in Cascade Recycling of Plastic Containers and Packaging Wastes in Japan

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Veil of plastic containers and packaging wastes

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Background

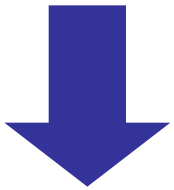
Plastic containers and packaging wastes

- Recycling of plastic containers and packaging wastes started in 2000 in Japan
  - Plastic containers and packaging: containers and packaging made of plastic other than PET bottles
- Mechanical recycling of the plastic wastes doesn't work very well
  - Mechanical recycling: produce plastic again
  - Feedstock recycling: decompose the plastic wastes and use as reducing agent, gas, or oil

Objective

Cascade recycling of the plastic wastes

- Mechanical recycling
  - Possible to use plastics as plastics many times



There are no research taking these into consideration...

- Comparison of environmental burden and costs in cascade recycling of plastic containers and packaging wastes in Japan

Life Cycle Assessment (LCA)

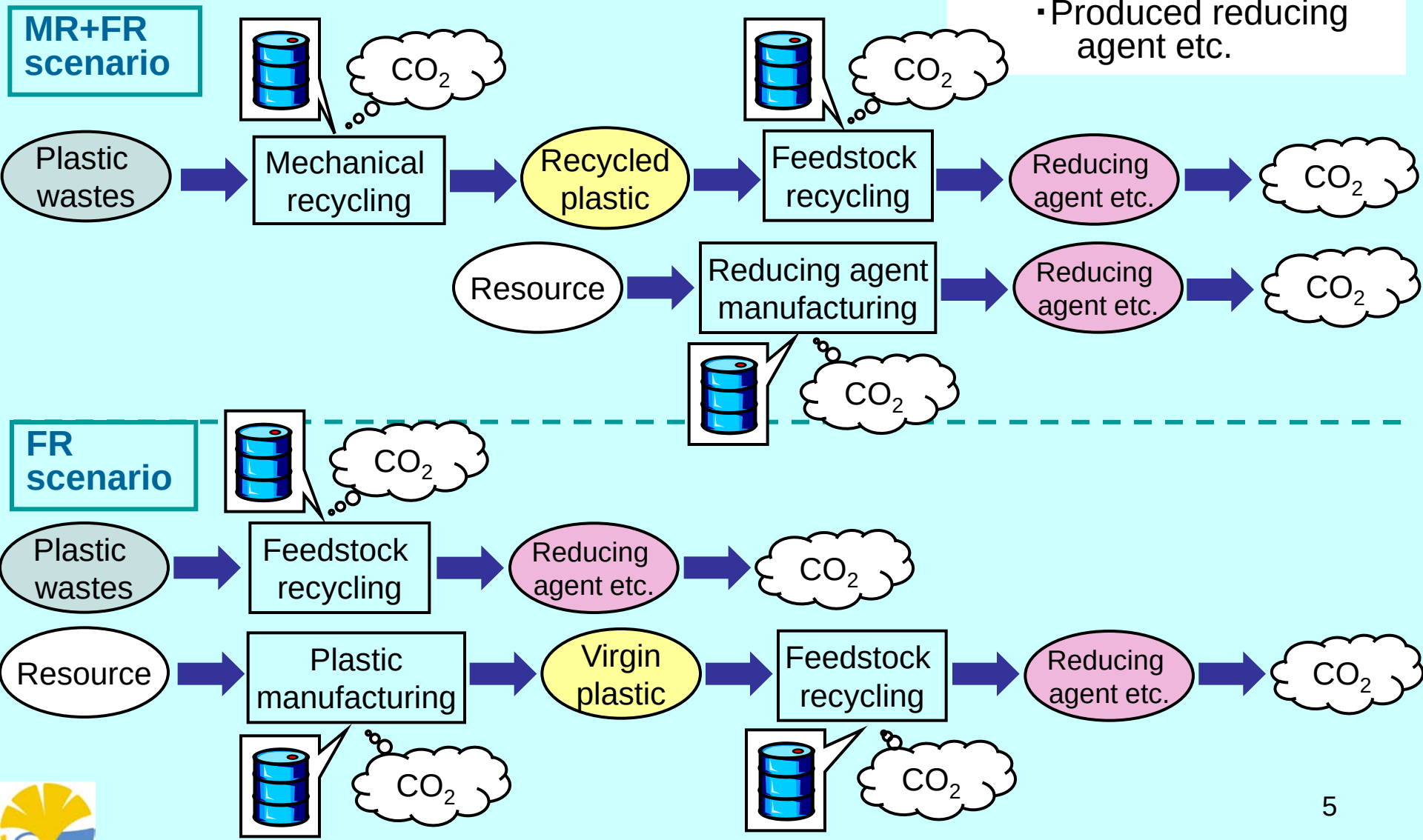
Methodology
Life Cycle Assessment (LCA)

- account for upstream and downstream inputs and emissions related to the life cycle of a product or a service
- A process
  - to evaluate the environmental burdens associated with a product, process, or activity
  - to assess the impact of those energy and material uses and releases to the environment
  - to identify and evaluate opportunities to effect environmental improvements

Methodology

Scenarios to compare with

- The following amount is same in two scenarios
  - Plastic wastes
  - Produced plastic
  - Produced reducing agent etc.



Results & Discussion

MR+FR : MR+FR scenario
FR : FR scenario

Energy consumption & CO_2 emission

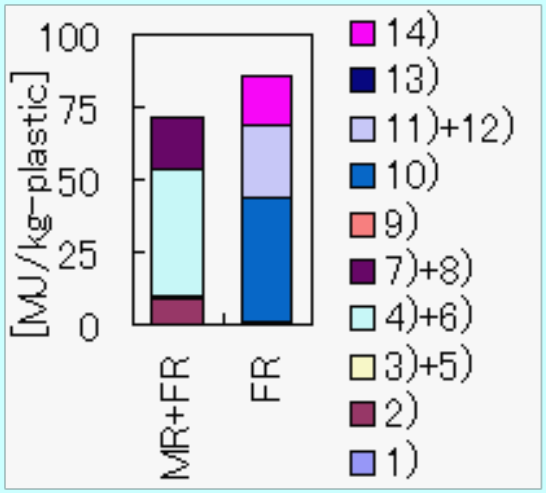


Fig. Energy consumption per kg-plastic wastes

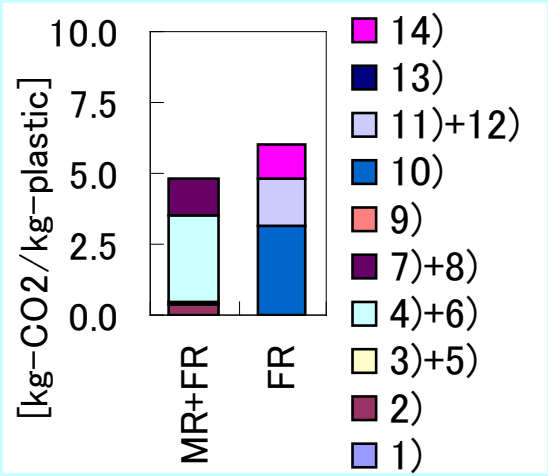


Fig. CO_2 emission per kg-plastic wastes

- Energy consumption on MR+FR scenario is 84% of that on FR scenario
- CO_2 emission on MR+FR scenario is 80% of that on FR scenario

14)	FR of virgin resin
13)	Transport of post-consumer recycled resin to FR factories
11)+12)	Production of virgin resin from resource
10)	FR of plastic wastes
9)	Transport from compaction facilities to FR factories
7)+8)	Production of reducing agent etc. from resource
4)+6)	FR of plastic wastes
3)+5)	Transport of post-consumer recycled resin to FR factories
2)	MR of plastic wastes
1)	Transport from compaction facilities to FR factories

Conclusion

- On cascade recycling scenarios of feedstock recycling of post-consumer recycled resin produced by mechanical recycling (MR+FR scenario), energy consumption and CO_2 emission are lower than those on no cascade recycling (FR scenario).