

Plastic recycling and carbon footprints



Carbon Footprint



caused by:

- Individual
- Event
- Organization
- Service
- Product



Plastic Production

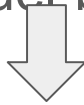
Plastic



Fossil fuel-based plastic

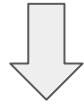


Bio-based plastic



1.8 gigatons of carbon dioxide equivalent (2015)

(3.8% of global emissions)



6.5 gigatons (15% of global carbon budget)

(2050)



Agenda

- Difficulties in plastic recyclings
- Other strategies
- Suggestions
- References

Difficulties (related to products)

Not 100% made with plastic

→ Difficult to separate the plastic and
aluminium layers

E.g. Flexible packaging



Potato chip bags

Difficulties (related to products)

Different types of plastic are used

→ Not easy to recycle a particular type of plastic

E.g. Deodorant

- Composed of adhesive label, protective cap and twistable gear

E.g. Yogurt and butter tubes

- Tubs are often made with a mix of plastic types



Difficulties (related to products)

Structure of plastics

→ Thermoplastics

- Can be remelted and remodeled

into new products

→ Thermoset plastics

- Contain polymers that cross-link

to form an irreversible chemical bond



the way clamshells are molded
affects the structure of the plastic

Difficulties (related to products)

Structure of plastics

→ Recycling plastics downgrades its quality

- Long chains of atoms are arranged repeatedly
- polymer chain grows shorter after recycling (quality decreases)
- Same piece of plastic can only be recycled 2-3 times



Difficulties (related to products)

Some parts need to be removed before recycling

E.g. Beverage bottles

- The plastic film labels are not recyclable

E.g. Other bottles

- Need to remove metal springs in the nozzle heads of spray cleaners





Difficulties (related to packagers)

The price of plastics is vulnerable to the ups and downs of the markets

→ packagers tend to buy raw, virgin plastics instead of recycled plastics



Limitation of recycling plastic (3)

- Insufficient equipment and technical

Example 1) Potato Chip Bags → Flexible pack

1. flattens out on the MRF's conveyor belt
2. Misclassified and mixed with paper
3. Unsellable



Example 2) POLYSTYRENE FOAM

1. Remove the air by a special machine/condense the material into a patty or block for resale
2. Very little material remains
3. Foam products only have very little value



Limitation of recycling plastic (



Example 3) Beverage Bottles

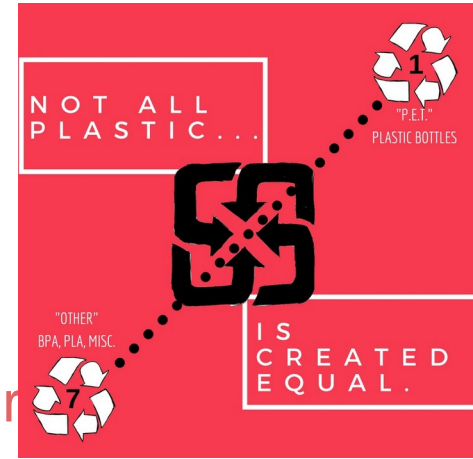
1. High pressure in the sorting and baling process
2. force caps off at high speeds

Result → Harmful to workers



Limitation of recycling plastic (4)

- Consumers have insufficient knowledge about recycling plastic



1. Did not put the recyclable plastic in the recycling bin
2. Recycle uncleaned plastic
3. Recycle the non-recyclable plastic



Limitation of recycling plastic (5)

- Local government's regulations

1. Plastic after recycled → lower quality

→ lower market value → Not recycled by the government

2. Not all recyclable plastic can be recycled



Suggested Strategies (Glass & Metal)

Pros:

- Can be recycled infinitely without losing quality
- No need to add extra material

Cons:

- Higher shipping cost
- Risk of breaking



Suggested Strategies

Use renewable energy instead of fossil-based energy:

- Halve the greenhouse gas emissions

Reduce the demand of new plastic in the market:

- Population growth will increase the demand, so we should increase the recycling effectiveness



Suggested Strategies (Bioplastic)

- Made by extracting sugar from plants like corn and sugarcane to convert into polylactic acids (PLAs)
- Absorb CO₂ during growing phase
- Decomposable in the ground

Bioplastics Lifecycle



Raw materials



Compostable Material



Compostable Bags



Becomes organic Fertiliser



No toxic gas or pollution

What we help with plastics recycling?

Focus on

- Procedure to gather the waste
- Reduce consuming on non-recycling plastic

How can we make sure our wastes can be recycled?

-Rinsing out of recyclables

-Make sure put into the right type of recycle bin



How can we reduce the non-recycling plastic?

Boycotting over-packaging product

Reduce consuming over-wrapping product



Promotion and education from the government



PLASTIC

the types we recycle



 2 HDPE	 4 LDPE	 5 PP	
<p>Bottles Dispensing bottles Recycling bins Playground equipment</p> 	<p>Plastic bags Grocery bags Tubing Laboratory equipment</p> 	<p>Reusable bags Food containers Dishware Ice cream containers</p> 	

 1 PETE	 6 PS	 7 OTHER	
<p>Polyester fibres Carpet Soft drink bottles Panelling</p> 	<p>Cafeteria trays Plastic utensils Toys Styrofoam</p> 	<p>Industrial fibres Headlight lenses Safety glasses Acrylic/Nylon</p> 	<p><i>*Replas adds small amounts</i></p>

 1 PETE	 3 V	 6 PS	 7 OTHER	
<p>Polyester fibres Carpet Soft drink bottles Panelling</p> 	<p>Pipe Flooring Shower curtains Non-food bottles</p> 	<p>Cafeteria trays Plastic utensils Toys Styrofoam</p> 	<p>Industrial fibres Headlight lenses Safety glasses Acrylic/Nylon</p> 	



PET
Polyethylene Terephthalate



Common Items: Water and pop bottles, some food packaging.
Recyclable: Yes, most common and easily recycled plastic. All Dakota County haulers accept PET in your curbside bin.



HDPE
High Density Polyethylene



Common Items: Milk jugs, detergent and cleaning bottles, hair care products.
Recyclable: Yes, HDPE is relatively simple to recycle and a cost-effective process. All Dakota County haulers accept HDPE in your curbside bin.



PVC
Polyvinyl Chloride



Common Items: PVC pipes, blister packs, children's and pet toys, and clamshell containers.
Recyclable: No, PVC contains numerous toxins and thus cannot be recycled. The exception to this rule is plastic clamshell containers as most Dakota county haulers now accept this material.



LDPE
Low Density Polyethylene



Common Items: Shrink wraps, squeezable bottles, and grocery, bread, and frozen food bags.
Recyclable: Depends on the item so check with your hauler. Items like plastic bags can be brought to drop-off locations like grocery stores to be recycled.



PP
Polypropylene



Common Items: Yogurt containers, straws, margarine and liquid bottles, and medicine bottles.
Recyclable: Depends on item so check with your hauler.



PS
Polystyrene



Common Items: Styrofoam, CD cases, meat trays, and plastic cutlery.
Recyclable: Generally no. Styrofoam is also extremely hazardous to the environment when thrown away, so it is best avoided if possible.



OTHER
Mixed/Miscellaneous



Common Items: Sports water bottles, baby bottles, lids, and electronic parts.
Recyclable: Usually not as it is such a broad category, but check with your hauler.

Promotion and education from the government

-Advertisement to public

-Education course to students

Label On every recycling bin



Conclusion

After readings:

- Limitations and Difficulties exist
- The world are trying to help with different way
- Start from ourselves and government

References

Everything you need to know about recycling plastics (recyclenow.com):

<https://www.recyclenow.com/recycling-knowledge/how-is-it-recycled/plastics>

Four strategies to tackle the carbon footprint of plastic (Anthropocene):

<https://www.anthropocenemagazine.org/2019/05/reducing-the-carbon-footprint-of-plastic-is-doable-but-not-easy/>

Plastic's carbon footprint (ScienceDaily):

<https://www.sciencedaily.com/releases/2019/04/190415144004.htm>

“Plastic recycling is a myth”: what really happen to your rubbish (Guardian):

<https://www.theguardian.com/environment/2019/aug/17/plastic-recycling-myth-what-really-happens-your-rubbish>

Plastic recycling (Wikipedia):

https://en.wikipedia.org/wiki/Plastic_recycling

Plastic: what's recyclable, what's becomes trashes, and why (npr):

<https://apps.npr.org/plastics-recycling/>

7 things you didn't know about plastic (and recycling) (National Geographic):

<https://blog.nationalgeographic.org/2018/04/04/7-things-you-didnt-know-about-plastic-and-recycling/>