

# *Plastic recycling and carbon footprints*



# *Carbon Footprint*



caused by:

- Individual
- Event
- Organization
- Service
- Product



# *Plastic Production*

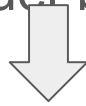
## Plastic



Fossil fuel-based plastic

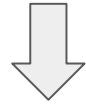


Bio-based plastic



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 products)

## Small plastics affect the operation of recycling equipment

→ 3 inches or smaller

E.g. Bread bag clips and pill packaging

- get caught or fall between the belts and gears of the machinery



# 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

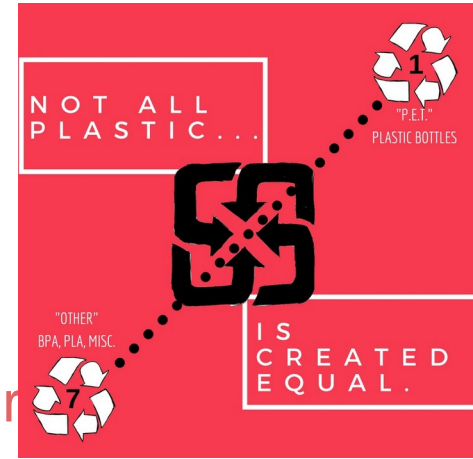
Result → Harmful to workers





## 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 CO<sub>2</sub> 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



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

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

 <b>1</b> <b>PETE</b>	 <b>3</b> <b>V</b>	 <b>6</b> <b>PS</b>	 <b>7</b> <b>OTHER</b>	
<p><b>Polyester fibres</b> Carpet Soft drink bottles Panelling</p> 	<p><b>Pipe</b> Flooring Shower curtains Non-food bottles</p> 	<p><b>Cafeteria trays</b> Plastic utensils Toys Styrofoam</p> 	<p><b>Industrial fibres</b> 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):

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

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