



**INTERACT**  
**Reducing plastic consumption and pollution**

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Further input: INTERACT Station Managers



# **INTERACT**

## **Reducing plastic consumption and pollution**



**D2.11** Pocket guide on how to reduce plastic consumption and pollution

# Contents of guide book

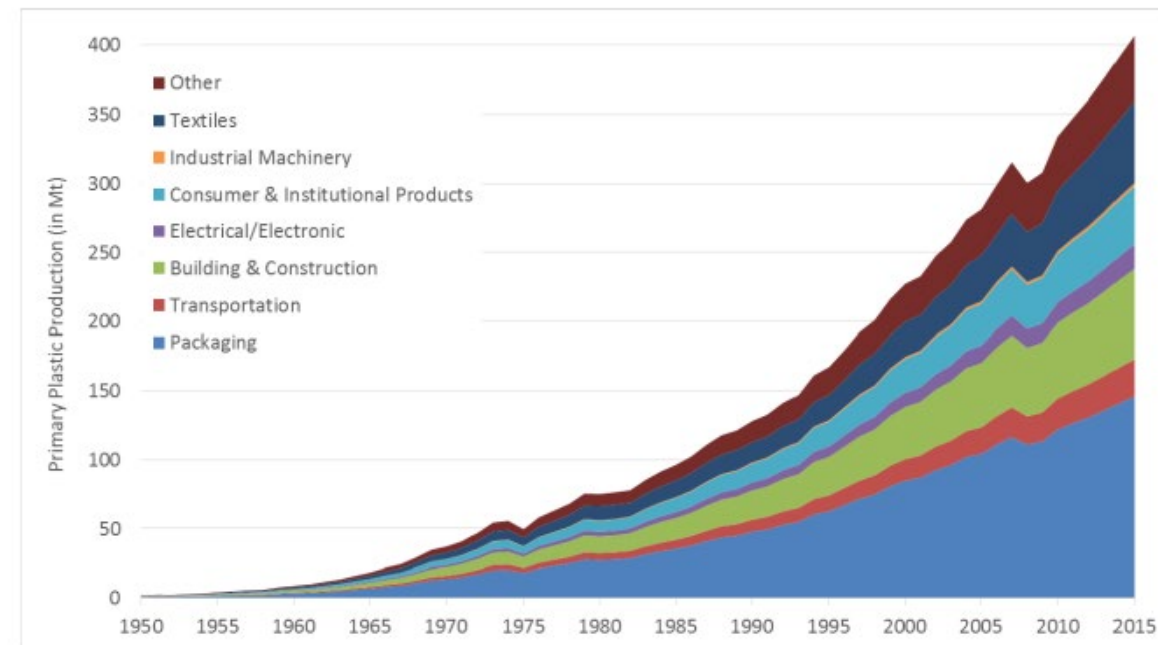
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# 1. What is the problem?

- Plastics are now found in all environments in the Arctic and alpine environments; e.g., on land, in water, in the seabed, in glaciers, and in the marine and terrestrial food chains.
- There has been a steady increase in plastic production since the 1950's and global plastic waste generation more than doubled between 2000-2019 to 353 million tons (OECD, 2023)
- Most plastic types do not decompose. Instead, plastic items will break down over time into smaller and smaller particles.

Figure 1. Plastics production from 1950 to 2015



Source: (Geyer, Jambeck and Law, 2017<sup>[4]</sup>)

# Plastic waste

- Around 40 percent of plastic products are garbage after less than a month and it is estimated that only 9% of plastic waste has been recycled since 2015 (Geyer *et al.*, 2017).
- The majority of the waste has been disposed of in landfills.
- COVID-19 pandemic generated 1,600,000 tons/day of plastic globally



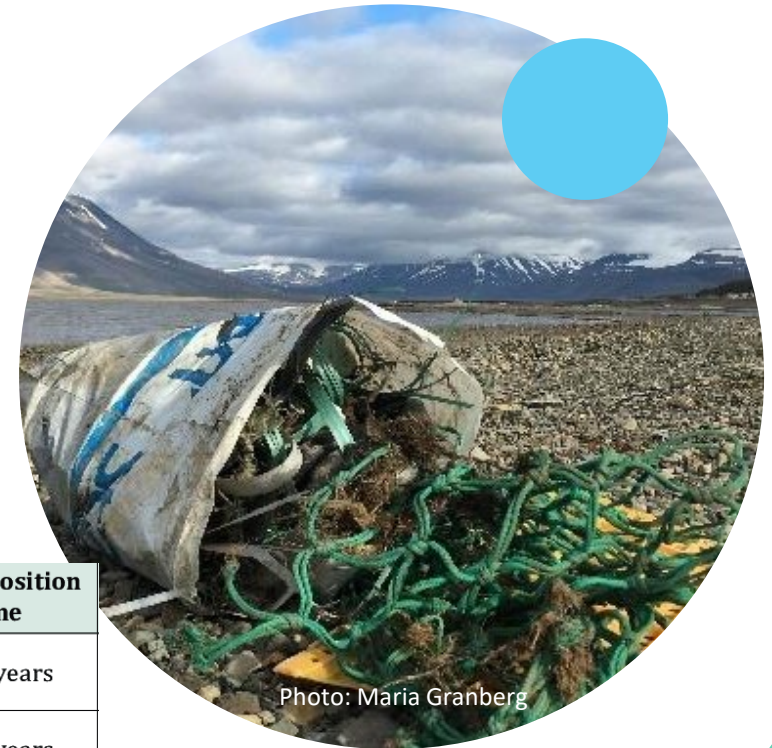
Landfills are widely used for disposal of plastic waste and receive close to half of all global plastic waste (Photo: Maria Granberg).

# Size classes of plastic

Plastic pollution comes in many different sizes, and each size class has different environmental effects.

- **Macro** plastic is generally defined as plastic items larger than 5mm, e.g. bottles, bags, straws, string/fishing net, shotgun shells, buckets or pieces thereof
- **Micro** plastics are generally defined as less than 5mm and come in different shapes, e.g. spheres, fragments, granules, pellets, flakes, beads, filaments, or fibres.
- **Nano** plastics are generally defined as  $< 1 \mu\text{m}$  but the identification of nanoplastic particles is still challenged by technical detection capabilities.
- micro- or nanoparticles are almost impossible to remove from the natural environment and could stay there for centuries to come

Kind of Plastic	Decomposition Time
Fishing line	±600 years
Plastic bottles	±500 years
Plastic cutlery	±400 years
Lighter	±100 years
Plastic glass	70-80 years
Plastic bag	±60 years
Shoe sole	10-20 years
Cigar butt	5-10 years
Balloon	±2 years



## 2. Environmental effects

- Some effects of plastic waste in the environment are obvious to see. Wildlife and fish can get entangled in plastic, eat plastic that fills up or block their digestive systems.
- Some plastic types contain chemicals with known negative effects on the natural environment and human health. (BPA, phthalates)
- The impacts of chemicals associated with micro- and nanoplastics are not fully understood yet.




Macroplastics can be found in the stomachs of animals (Photos: Maria Granberg).

# ***Plastic waste in the natural environment***


- Plastic pollution can be transported to the Arctic and alpine environments from far away via wet (ocean currents, rivers, rain) or dry (air) deposition, or waste emissions by industry and humans (tourists, researchers, locals).
- Micro- and nanoplastics are present in air, water, and ice. It is ingested by animals, including commercially important species of fish and shellfish eaten by humans.
- A recent study (Ross *et al.*, 2021) found that 73% of synthetic fibres found in the Arctic were polyester (like fleece)



Microfibre fleeces are the most commonly detected type of fragments in various water bodies (Mishra *et al.*, 2017)




This guidebook is made to increase awareness of the problem and provide guidelines for how stations, scientists, and local communities can reduce negative impacts of plastic use and pollution.







**Research stations have an obligation to ensure a clean environment, both for ethical and scientific reasons. Stations should therefore continuously work to reduce problematic plastic use and waste.**



# 4 General guidelines on how to manage plastic when working at research stations and in the field

The 'INTERACT 7R principles' for reducing plastic use and pollution:

- **Refrain** from using unnecessary, harmful, low quality and un-recycleable plastics
- **Replace** plastics with sustainable alternatives
- **Reduce** use of plastics where possible
- **Repair**
- **Reuse** for same or other purposes
- **Recycle** by ensuring proper sorting and disposal
- **React** - speak up to influence friends, family, colleagues, institutions, and politicians

# ***Implement proper waste handling system at station***

- Collect, sort and store plastic waste in relevant fractions for reuse, recycling, or disposal.
- Submit recyclable and disposable plastic to municipal treatment system (if these follow good environmental practices) or transport to proper treatment facility.
- Treatment on site should only be done if you have proper treatment equipment (e.g., incinerator that burns at required high temperatures, minimum 850C).
- Put filters on outlets to rivers, oceans, etc. (on washing machines to collect microplastic)

Develop a purchase policy that can guide station management and staff in relation to buying plastic products or products containing plastics

# 5 Field work - researchers

Make sure not to contribute to the plastic pollution in the environment by using only sturdy, durable and recyclable plastic for your fieldwork. Plastic pollution left behind from researchers will stay in the ecosystems for many years.



## Recommendations

- Do not litter and pick up trash you find in the environment.
- If needing to use plastic, prioritise sturdy, durable, and environmentally friendly plastic that does not deteriorate and spread to the environment.
- When possible, consider alternatives to plastic, e.g., using metal or wood sticks and pegs for plot identification.
- Duct tape – will not last in the field during the arctic winter! Do not leave it in the field for longer periods and bring it back for proper sorting.

# Recommendations for laboratories

Where contamination is less of an issue, consider reusing items, e.g., weighing boats, petri dishes, dispensers, and gloves.

- Reuse plastic tubes following chemical decontamination and autoclaving.
- Use alternatives to plastics where possible or prioritise recyclable plastics.
  - Replace plastic pots with compostable paperboard pots where possible.
  - Use natural rubber gloves.
  - Use pipette tips that can be washed before reuse.
  - Use glass centrifuge tubes instead of plastic.
  - Use glass syringes instead of plastic versions.
  - Replace plastic petri dishes for cell culture with glass ones.
- Use sustainable materials such as reusable wooden sticks for patch plating and metal loops for inoculation.

(adapted from Kilcoyne *et al.*, 2022)

# 6 Monitoring plastic pollution in the environment


On a global scale there is still much to be done to standardise/harmonise data collection and improve our knowledge on the distribution and effects of plastics in the natural environment. According to Brittany *et al.* (2020) the scientific community should focus on:

- Development of harmonised protocols and standardisation of data to measure trends over time
- Consistent monitoring throughout the year to account for seasonal fluctuations.
- Establishment of baselines from which to measure progress.
- Increased sampling of snow on ice floes to improve estimates of atmospheric transport of litter.
- Seafloor sediment monitoring since plastics of all sizes accumulate there.
- Improved use of satellite imagery to assess where ice forms and how it moves, thereby providing information about where ice picks up microplastics.
- Increased collaboration between Arctic communities and scientists in community monitoring of plastic pollution.

# 7. Influence local communities



- The most common citizen science projects that deal with plastic pollution are connected to clean-up initiatives



Ultimately, preventing plastic waste in the first place is the key to a cleaner and healthier environment.

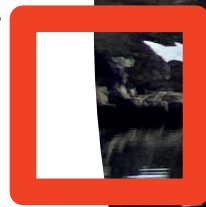


Photo: Mie winding. Nuup Kangerlua, Greenland.



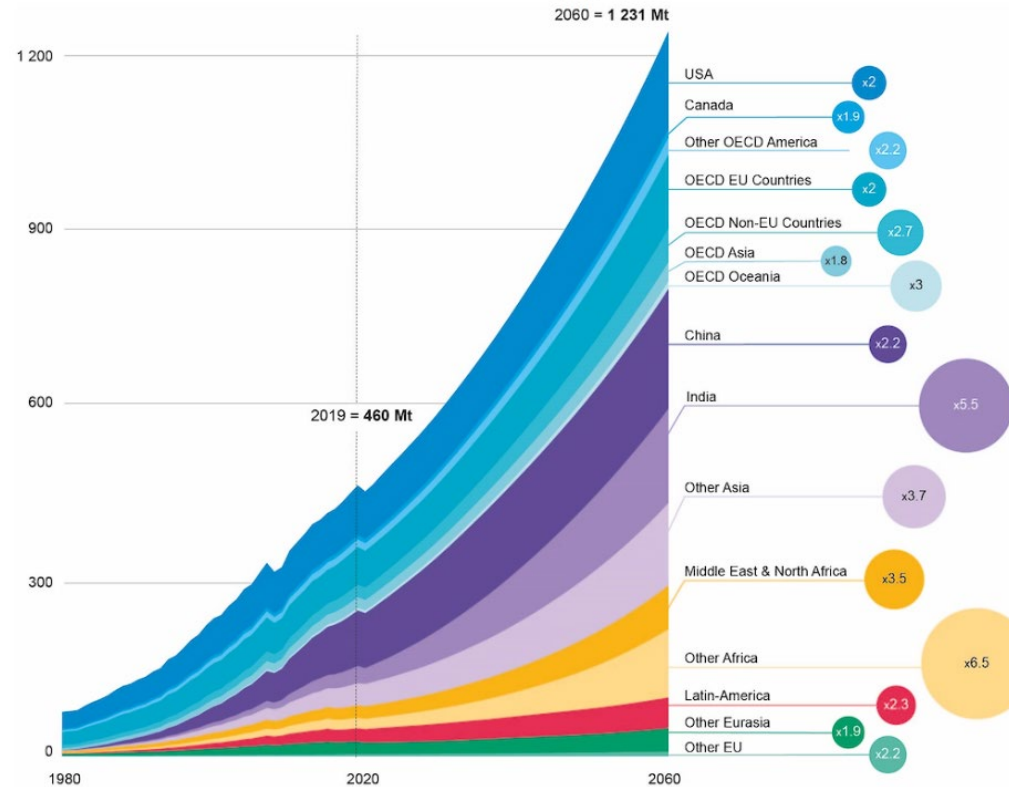


# Waste handling

- Collect, sort and store plastic waste in relevant fractions for reuse, recycling, or disposal.
- Waste shall not be buried, spread in the terrain or disposed to streams, lakes or the sea.
- Submit recyclable and disposable plastic to municipal treatment system (if these follow good environmental practices) or transport to proper treatment facility.
- Put filters on outlets to rivers, oceans, etc. to collect microplastic.

Figure 1.3. **Plastics use will grow fastest in developing and emerging economies in Africa and Asia**

Plastics use in million tonnes (Mt), Baseline scenario



Note: The numbers in the circle on the right-hand side of the graph indicate the growth of plastics use from 2019 (dashed line) to 2060 for each region (e.g. x2 means a doubling of plastics use).

Source: OECD ENV-Linkages model.

StatLink <https://stat.link/qrwkca>

Tjek op på forskellen i total tons på de to grafer

# Recommendations on clothes and washing

A recent study (Ross *et al.*, 2021) found that 73% of synthetic fibres found in the Arctic were polyester (like fleece)

- Buy natural fabrics (wool, cotton, silk, linen, cashmere), or environmentally certified clothing
- Use a washing machine equipped with filters or use a microplastic washing bag when washing synthetic materials (e.g., acrylic, nylon, and polyester).
- Remove single stains on the fleece by hand, instead of using a washing machine.
- Fill up your washing machine – a full load results in less friction between the clothes and less fibres will be released.
- Use washing liquid instead of powder – the powder will, through the ‘scrub’ function, loosen the fibres of the clothes.
- Air dry clothes where possible (which also saves energy) and use wooden clothespins.

# What can you do?

## Strategies to Reduce Plastic Waste

1. Refrain:  
Avoid unnecessary, harmful, low-quality, and un-recyclable plastics.
2. Reduce:  
Minimize the use of plastics whenever possible.
3. Repair:  
Fix and extend the lifespan of plastic items.
4. Reuse:  
Reuse plastic products for the same or different purposes.
5. Recycle:  
Ensure proper sorting and disposal to facilitate recycling.
6. React:  
Speak up and advocate for change among friends, family, colleagues, institutions, and politicians.

# Recommendations for researchers visiting a research station

- Avoid using personal care products that contain microplastics.
- Pick up the trash that you find in the environment.



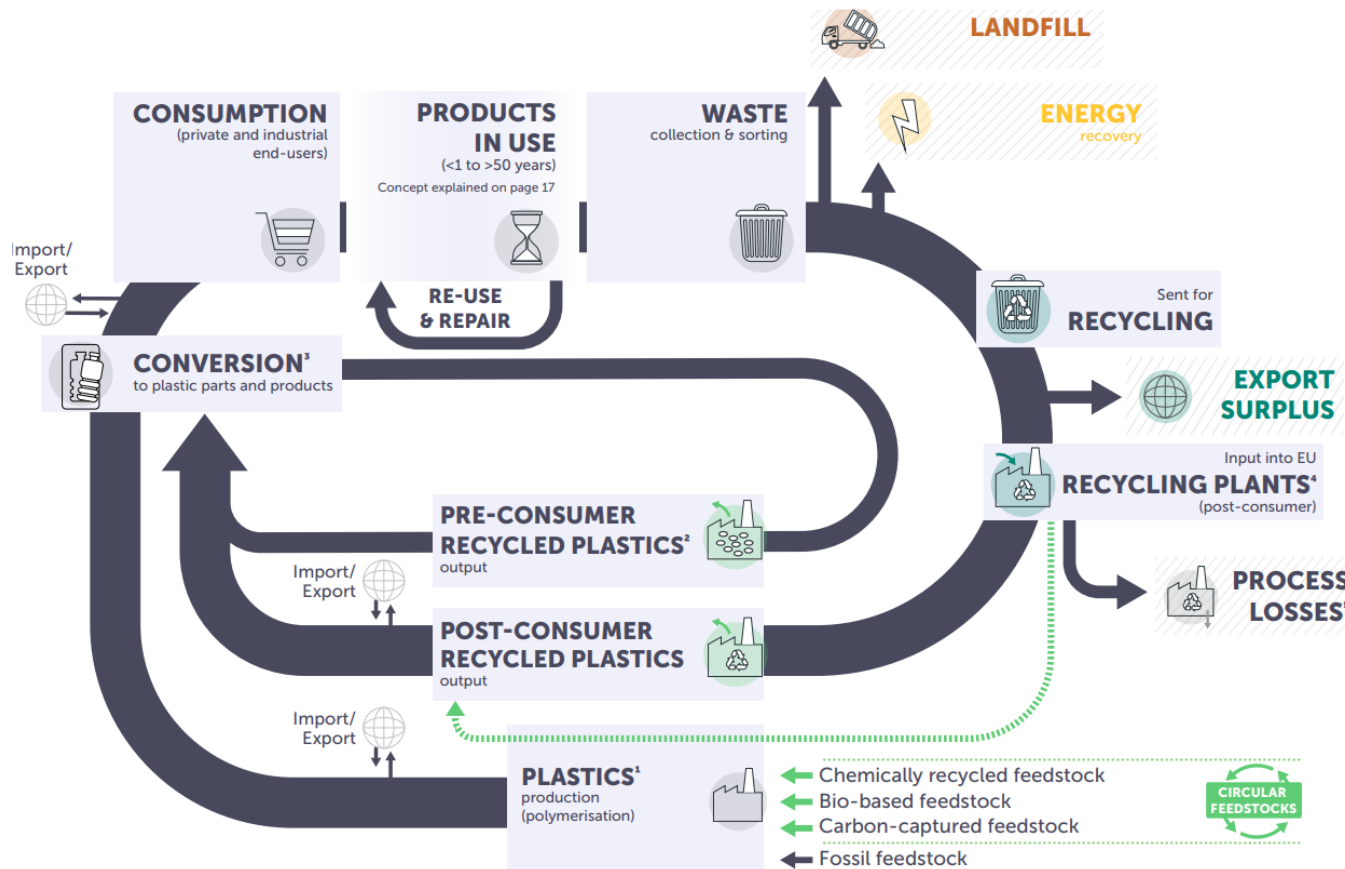
# Use of plastic

- If you need to use plastic, prioritise sturdy, durable, and environmentally friendly plastic that does not deteriorate and spread to the environment.
- Consider alternatives to plastic when possible
- Several apps can help you scan products for plastic, e.g. 'Beat the microbead', where you can find out if your personal care products contain microplastics.
- use a microplastic washing bag when washing synthetic materials (e.g. acrylic, nylon, and polyester).



# Solutions

## Develop a circular economy for plastics



- With the predicted increase in plastic production and increased volumes of plastics ending up in the natural environment, the global society faces significant challenges.
- We cannot remove all plastics from the environment, so we need to stop it from getting there.
- We need to develop a circular economy for plastics in which plastics are produced, converted, used and managed in a sustainable way

Source: [PlasticsEurope-CircularityReport-2022\\_2804-Light.pdf](#)