BRS-NORAD PROJECT MARINE LITTER AND MICROPLASTICS: PROMOTING THE ENVIRONMENTALLY SOUND MANAGEMENT OF PLASTIC WASTES AND ACHIEVING THE PREVENTION AND MINIMIZATION OF THE GENERATION OF PLASTIC WASTES

PLASTIC IS FOREVER
LET'S GET CLEVER!

STUDENT WORKBOOK















BASEL / ROTTERDAM / STOCKHOLM
CONVENTIONS

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The book has been developed by the BRS Secretariat in the framework of the project "Marine Litter and Microplastics: Promoting the Environmentally Sound Management of Plastic Wastes and Achieving the Prevention and Minimization of Generation of Plastic Wastes". The project is funded by the Norwegian agency for development cooperation (Norad).

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INTRODUCTION







WHAT IS PLASTIC?

Plastic is usually a synthetic material, either a polymer or combination of polymers of high molecular mass modified or compounded with additives such as fillers, plasticizers, stabilizers, lubricants, pigments. According to the ISO 472 "plastic is a material which contains as an essential ingredient a high polymer and which, at some stage in its processing into finished products, can be shaped by flow" (ISO, 2013). A polymer is a chain of several thousand repeating molecular units or several different types of monomers which are either natural or synthetic organic compounds (Villanueva et al., 2014).

HISTORY OF PLASTIC

In the 1950s, plastics began to come into wide use and within a few years production rose at a high rate. The amount of plastic produced has grown constantly since then, increasing from 2 million tons in 1950, to 407 million tons in 2018 (UNEP, 2020c). Currently, consumers are exposed to a variety of plastic products. Plastics are lightweight, with varying degrees of strength, they can be both thermal and electrical insulators, they can be molded in various ways, and they offer a large range of characteristics and colors, which are achieved through chemical additives. Plastics are most commonly used for packaging and food containers, such as LDPE

(e.g. bags, containers, food packaging film), containers made from HDPE (e.g. milk bottles, shampoo bottles, ice cream tubs), and PET bottles for water and other drinks, as well as building and construction, transportation, electrical and electronic equipment, agriculture, healthcare, sport, energy generation.

However, plastics can also pose challenges related to impacts on human health and the environment. Larger pieces of plastics accumulate, for example, on beaches or sink to the ocean floor. These can cause harm directly to marine animals, for example by entanglement in debris. Many species of birds ingest smaller pieces of plastics. Other plastic waste is carried on ocean currents and can accumulate in ocean gyres. Under the influence of sunshine and saltwater, larger pieces can break into microplastics. Microplastics are now widely distributed through the oceans, and they can be vectors for pollutants and pathogens.

The value chain of plastic remains linear with less than 20% of plastics re-entering the value chain and huge amounts of plastics ending up landfills/dumpsites or in terrestrial and marine environments each year. (Geyer et al., 2017).

Management of plastic waste has been a constant challenge. By 2015, it was estimated that 79% of all plastic wastes generated worldwide had been landfilled or dumped, a further 12% incinerated and only 9% recycled (Geyer et al., 2017). Median waste collection coverage is still around 50% in developing countries and in some countries, the collection rate is even lower. Landfilling or open dumpsites pose problems, such as the leaching of plastics additives and whole plastics particles from landfill sites into the wider environment. The controlled incineration of plastic waste can also have environmental and climate impacts due to CO2 and POPs emissions, toxic pollution and unintentionally produced formation and release of POPs. In addition, the open burning of plastic waste releases toxic gases such as dioxins, furans, mercury and polychlorinated biphenyls into the atmosphere.

Moreover, the leakage of plastic into the environment can occur from a variety of land-based and ocean-based sources in the form of macro-plastics and microplastics (small plastic particulates below 5 mm in size). The sources are uncontrolled dumping of municipal waste, littering, wastewater, storm run-off and sewer, wear from tyres and road makings, and synthetic fibers.

In 2019, the Conference of the Parties to the Basel Convention adopted two important decisions to address plastic waste. These steps have strengthened the Basel Convention as the only global legally binding instrument to specifically address plastic waste. The decisions include a set of actions for preventing and minimizing the generation of plastic waste, improving its environmentally sound management and controlling its transboundary movement; reducing the risk from hazardous constituents in plastic waste; and public awareness, education and information exchange.

Section 1:
PLASTIC WASTE AND MICROPLASTICS



Activity 1:

What do you see?

What do you see?
What does it make you think about?
Are there any problems that you can identify?
What questions do the photographs raise for you?

You may wish to record your responses on flip chart paper or sticky notes.

Photo 2



Photo 1



Photo 4



Photo 5



Photo 3



Photo 6



Activity 1.1:

Microplastics on the seashore

In this activity students investigate microplastic pollutants in a sample of sand from a local seashore, lakeside or riverbank.

INSTRUCTIONS

Look at the sand sample with the naked eye. Can you see any plastic particles?

Look again at the sand with the magnifying lens. Can you see more plastic particles? What is the smallest plastic particle you can see?

Where do you think these plastic particles come from?

Do you think plastic particles pose some hazards to the environment, wildlife and human health?

After watching the video. Are you surprised by the possible hazards to the environment, wildlife and human health?

What can you do to prevent plastic pollution?



Activity 1.2:

Counting and categorizing microplastics

In this activity you will carry out a laboratory investigation to study different types of plastic particles based on their size, morphology, and colour.

INSTRUCTIONS

1. Working with your teammates, separate the plastic particles that you have found in the sand according to their size. Use the sieves (if available) or measure the plastic particles with the ruler.

   Number of microplastics:

   Number of mesoplastics:

   Number of macroplastics:

DEFINITIONS

Microplastics: plastic particles ≤5 mm

Mesoplastics: plastic particles between 5 mm to 2.5 cm

Macroplastics: plastic pieces > 2.5 cm

2. Choose one size class and categorize the plastic particles according to their morphology and colour.

Table for macroplastics

	Fragments	Films	Lines	Styrofoam	Pellets
Black/Grey					
Blue/Green					
Brown/Tan					
White/Cream					
Yellow					
Orange/Pink/Red					
Transparent					
Multicolour					

Table for mesoplastics

	Fragments	Films	Lines	Styrofoam	Pellets
Black/Grey					
Blue/Green					
Brown/Tan					
White/Cream					
Yellow					
Orange/Pink/Red					
Transparent					

DEFINITIONS

Fragments: irregular shaped hard plastic particles having appearance of being broken down from a larger piece of litter.

Films: flat, flexible plastic particle with smooth or angular edges.

Lines: long fibrous plastic material that has a length substantially longer than its width.

Foam: lear spherical or granular plastic particles, which deform readily under pressure and can be partly elastic.

Pellets: lard particle with spherical, smooth or granular shape.

Additives: substances added to a plastic polymer to give the desired properties. Some are added to make the plastic waterproof, or to resist to fire, or to give a particular colour. Some additives are known to be toxics.



Table for microplastics

	Fragments	Films	Lines	Styrofoam	Pellets
Black/Grey					
Blue/Green					
Brown/Tan					
White/Cream					
Yellow					
Orange/Pink/Red					
Transparent					

3. What are the most abundant combinations of plastic types?

Compare the plastic particles you have found in the sample of sand with those of your classmates.



Activity 1.3:

Microbeads from cosmetics

In this activity you will make a simple experiment to isolate and examine microbeads from cosmetics and personal care products. You will also learn what they do once they get in the environment.

INSTRUCTIONS

Read the composition of the products that have been given to you by the teacher.

Which one contains polyethylene?

Choose one of the products with polyethylene and examine the product by spreading it on an acetate sheet. Look at the product with the magnifying lens (or a microscope), and also by touching it.

Can you see/feel the microbeads?

DEFINITIONS

Microbeads: manufactured solid plastic particles of less than one millimeter in their largest dimension.

Buoyancy: the tendency of a body to float or to rise when submerged in a fluid.

Salinity: the saltiness or dissolved salt content of a body of water.

Put some of the product in three different liquids to test if the microbeads float, using the transparent cups. What do the microbeads do in:

Tap water:



Water plus detergent (1/2 spoonful per cup):



Water plus salt (1 spoonful per cup):



Based on these results, what do you think the microbeads will do in the natural environment? Will float or sink in freshwater (e.g. in a lake) and in saltwater (e.g. in the sea)?

How can you avoid using products containing microbeads?

How can you raise awareness among your family and friends to the dangers of microbeads?



Activity 1.4:

How many microbeads are we dumping at sea?

In this activity you will make a rough estimate of how many microbeads are being dumped each year by people in your town.

DEFINITIONS

Microbeads: manufactured solid plastic particles of less than one millimeter in their largest dimension.

INSTRUCTIONS

Measure 5 ml of a product containing microbeads and dissolve it in a cup half-filled with tap water plus 5 ml of dishwashing detergent. Stir the mixture for one minute, then filter the mixture with a coffee filter. Transfer the microbeads from the filter paper to an acetate sheet.
Now count the microbeads.

How many microbeads did you count in 5 ml of product?

Using this result and the volume of the product's original container, calculate how many microbeads are contained in a whole tube or bottle.

How many microbeads are contained in the whole container?

How many containers of this product does a person use in one year?

How many people do you think use this product in your town?

Multiply the number of containers used by a person in one year per the number of people you think use the product in your town.

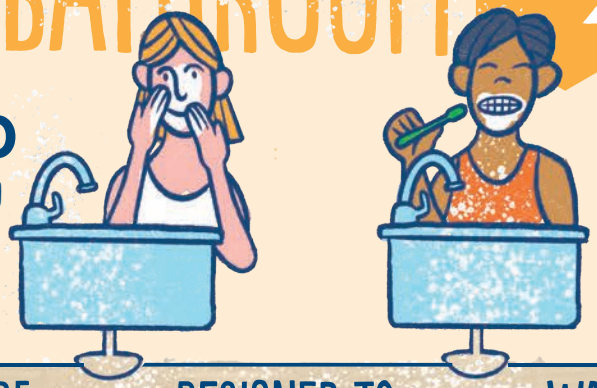
How many microbeads are being dumped into the sewage system (and then into the sea) per year from this one product?

Is there a sewage system in your town?
Do you think it can catch microbeads before they are released to the sea?

THE PATH OF MICROBEADS FROM BATHROOM → TO SEA

OVER
330,000
MICROBEADS CAN BE FOUND IN A TUBE OF FACEWASH

This means billions of plastic microbeads are flowing into our global waterways.



1,147
PERSONAL CLEANSING PRODUCTS CONTAIN MICROBEADS

1,147 personal cleansing products in the US and around the world contain micro-plastic particle abrasives (MICROBEADS), employed as exfoliant.

MICROBEADS ARE DESIGNED TO WASH DOWN THE DRAIN

1 WASTE TREATMENT

Many sewage treatment facilties **do not capture synthetic, floating particles** the size of microbeads that are only about a .5 mm in diameter.

2 SEWAGE OVERFLOW

During heavy rains some treatment facilities let sewage overflow go directly into our water ways.

3 SLUDGE & FERTILIZER RUNOFF

Sewage sludge used as fertilizer, beads seep into soil, get into rivers/aquiters.



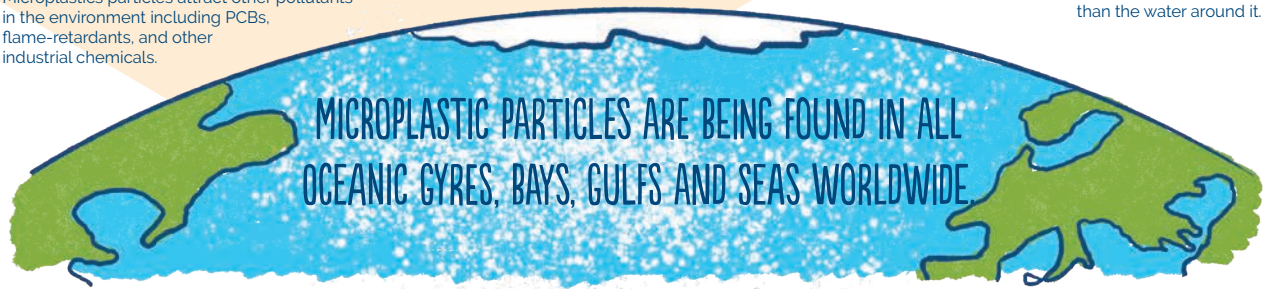
663 SPECIES OF MARINE WILDLIFE ARE AFFECTED BY PLASTIC POLLUTION

Over 663 species of marine wildlife are affected by plastic pollution through ingestion or entanglement. Microplastics particles attract other pollutants in the environment including PCBs, flame-retardants, and other industrial chemicals.

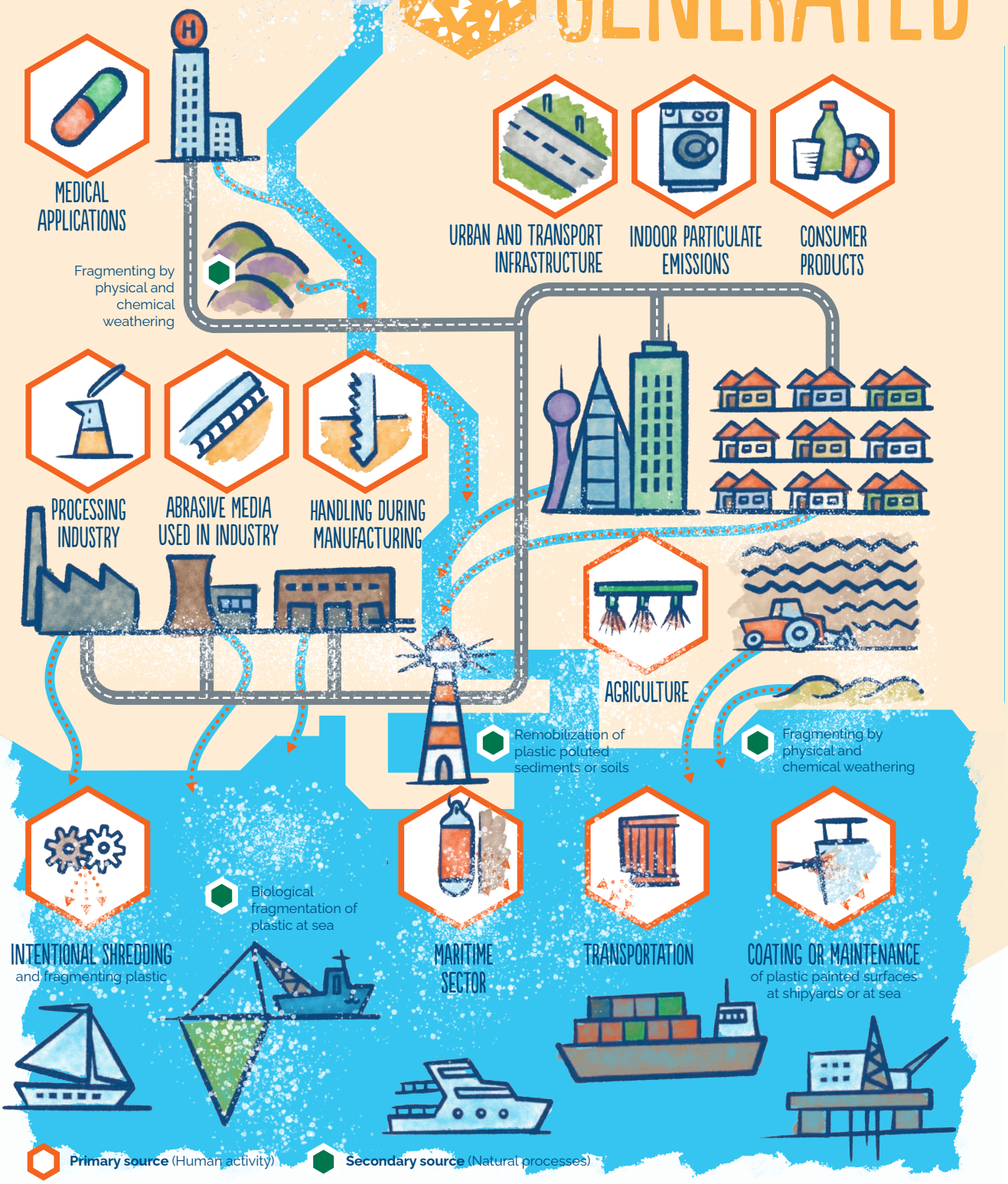
43,000
PLASTIC PARTICLES

5 gyres found an average of 43,000 plastic particles/km² in Lake Erie.

A single plastic particle can absorb up to
1,000,000
TIMES MORE TOXIC CHEMICALS
than the water around it.



HOW MICROPLASTICS ARE GENERATED



Section 2:
EXPLORING PLASTICS







Activity 2.1:

Identifying plastics

In this activity you will learn to sort and to identify different types of plastics.

INSTRUCTIONS

1. Look for the symbol moulded on the plastic items and complete the first column in the table.
2. Using scissors, cut pieces of plastic approximately 5 cm^2 from each plastic item.
3. Carry out the tests and record your results in the table below.

Sample	1	2	3	4
Is there a symbol moulded on the plastic waste item? If yes, draw it in the box.				
What is the full name of the plastic type? Use the plastic information chart to help you.				
Is the plastic piece translucent or opaque?				
What happens when you bend the plastic piece? Is it flexible or stiff and difficult to bend?				
What happens when you scratch the plastic piece? Does it cut cleanly or are there white marks along the cut?				
Does the plastic piece float in the water?				

Plastics information chart

Symbol	Uses	Type of plastic	Recycling
1 	Engineering polymers are used in bonnet parts, window wiper holders and exterior mirrors for cars.	Polyethylene terephthalate also known as polyester	Usually accepted by most curbside recycling providers.
2 	Chemical drums, jerricans, toys, picnic ware, cable insulation, carrier bags and food wrapping material.	High density polyethylene (HDPE)	Often accepted by curbside recycling providers. However, some providers will only accept bottles, not liners or bags.
3 	Window frames, drainage pipe, water service pipe, medical devices, automotive interiors and seat coverings, fashion and footwear, packaging, cling film and credit cards.	Polyvinyl chloride unplasticised polyvinyl chloride	Typically, not accepted by curbside recycling providers. It's occasionally accepted by plastic lumber makers.
4 	Squeeze bottles, toys, carrier bags, general packaging, gas and water pipes.	Low density polyethylene (LDPE)	Not often recycled through curbside programs and is a significant source of plastic pollution. LDPE can often be returned to many stores for recycling.
5 	Coffee pot and washing m/c parts (where high temperature and moisture are critical).	Polypropylene (PP)	Picked up through most curbside recycling programs.
6 	Toys and novelties, rigid packaging, refrigerator trays and boxes, cosmetic packs and costume jewellery.	General purpose polystyrene (GPPS)	Often not recycled through curbside programs as it is too lightweight to be economical to recycle, usually incinerated instead.
7 	Miscellaneous category that applies to items like large water bottles, DVDs, and computer cases.	A catch-all group that contains all other types of polymers	Usually not accepted by curbside providers in most locations.

DEFINITIONS

Translucent: object or substance that is almost transparent, allowing some light through it in an attractive way.

Opaque: preventing light from travelling through, and therefore not transparent or translucent.

Activity 2.2:

How long does it take for plastics to degrade?

In this activity you will investigate the time that it takes for different types of plastic material to degrade.

INSTRUCTIONS

Together with your teammate(s), cut out the cards below and place them in the order from quickest to longest time it takes them to decompose.



DEFINITIONS[1]

Degradation: the partial or complete breakdown of a polymer as a result of e.g. UV radiation, oxygen attack, biological attack. This implies alteration of the properties, such as discolouration, surface cracking, and fragmentation.

Biodegradation: biological process of organic matter, which is completely or partially converted to water, CO_2/ methane, energy and new biomass by microorganisms (bacteria and fungi).

1 The following definitions were taken from UNEP (2015) Biodegradable Plastics and Marine Litter. Misconceptions, concerns and impacts on marine environments. United Nations Environment Programme (UNEP), Nairobi.

What do you think will happen at the items in each card once people have finishes using them? What will happen to the items if they are thrown in the "normal" bin, in the "recycle" bin or if they are abandoned in the environment? Which object will be more likely to go through the process of biodegradation?

Item: 

Item: 

Item: 

Item: 

Item: 

Item: 

Item: 

Item:

Now order the cards with the different items in front of you, from the fastest to the slowest to go through the process of degradation and create a "Degradation timeline". How long do you think it will take for each object to degrade?

Compare your degradation timeline with the ones from the rest of your class.

Do you think it's a problem that some things take many years to decompose?

What might the solutions be?

Activity 2.3:

Composting investigation

In this experiment you will study the degradation time of different types of items by observing changes through time.

INSTRUCTIONS

Physical toughness and predictions on the time to decompose: Compare the physical toughness of item A, B, and C

Which one is more rigid? Which one is easier to bend/break?

Based on these observations, what do you think is the relative resistances of each item to degradation in the environment?

DEFINITIONS[2]

Degradation: the partial or complete breakdown of a polymer as a result of, for example, UV radiation. This implies alteration of the properties, such as discolouration, surface cracking, and fragmentation.

Biodegradation: biological process of organic matter, which is completely or partially converted to water, CO_2/methane, energy and new biomass by microorganisms (bacteria and fungi).

Mineralization: the complete breakdown of a polymer as a result of the combined abiotic and microbial activity, into e.g. CO_2, water and other compounds.

Biodegradable: capable of being biodegraded.

Compostable: capable of being biodegraded at elevated temperatures in soil under specified conditions and time scales.

Oxo-degradable: physical toughness: ability to experience deformation before breaking

2 The following definitions were taken from UNEP (2015) Biodegradable Plastics and Marine Litter. Misconceptions, concerns and impacts on marine environments. United Nations Environment Programme (UNEP), Nairobi.

Preserve the controls: Together with the class, select one of each item A, B, and C and preserve them away from the sun and the soil. These will be your controls in this experiment.

Composting experiment: Bury one of each the 3 items in the soil. Each week, dig them out and observe changes in their physical appearance. Do they show signs of degradation? Take pictures.

Compare the physical appearance of the buried items with the controls samples. Record your observations in the "Composting Observations Table".

Based on the extent of decomposition observed, extrapolate your findings to come up with predictions for the time it would take for the three types of items to completely decompose. How do these compare with your initial predictions?

Composting Observations

Week	Item A =	Item B =	Item C =
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Activity 2.4:

Know your plastics

In this activity you will learn to distinguish the 6 different types of plastic with a unique Resin Identification Code (RIC) on the base of their different density and through a flame test.

The identification of the different kinds of plastic allows separate collection and therefore the possibility of mechanical recycling. Polymer recycling is part of the policy of saving energy and protecting the environment. But it is not easy to recognize the various types of plastic, even if the beverage containers are usually made of PET, bags are made in LDPE, and pipes in PVC. An additional problem in separating and recycling plastic waste is due to the presence of additives.

DEFINITIONS

Additives: chemical substances added to a plastic polymer to provide desired properties, such as colour, stiffness/flexibility, water/flame resistance.

Archimedes Principle: in the presence of a gravitational field, a body immersed in a fluid receives a thrust from the bottom upwards equal to the weight of the displaced fluid volume.

Recycling: it is the process of converting plastic waste materials into new materials and objects through mechanical shredding and remoulding.

Resin Identification Code (RIC): it is a series of symbols appearing on plastic products that identify the plastic resin out of which the product is made.

1 PETE	2 HDPE	3 PVC	4 LDPE	5 PP	6 PS	7 OTHER
polyethylene terephthalate	**high-density polyethylene**	**polyvinyl chloride**	**low-density polyethylene**	**polyethylene**	**polystyrene**	**other plastics, including acrylic, polycarbonate, polyactic fibers, nylon, fiberglass**
softdrink bottles. mineral water, fruit juice containers and cooking oil	milk jugs, cleaning agents, laundry detergents. bleaching agents. shampoo bottles, washing and shower soaps	trays for sweets, fruit, plastic packing (bubble foil) and food foils to wrap the foodstuff	crushed bottles, shopping bags, highly-resistant sacks and most of the wrappings	furniture, consumers, luggage, toys as well as bumpers, lining and external borders of cars	toys, hard packing, refrigerator trays, cosmetic bags, costume jewellery, audio cassettes, CD cases	an example of one type is a polycarbonate used for CD production and baby feeding bottles
						

INSTRUCTIONS

Prepare 3 transparent containers with:

- Pure water
- Ethanol/water solution by adding 6 parts of alcohol, 4 parts of water
- Saturated NaCL solution

In the container with pure water add the six pieces of plastic.

Which pieces float?

Which pieces sink?

Remove the pieces of plastic that float in the pure water container and put them in the ethanol/water solutions.

What do they do?

Add still pure water (half a millilitre at a time) in the ethanol/waster until the piece that is on the bottom floats.

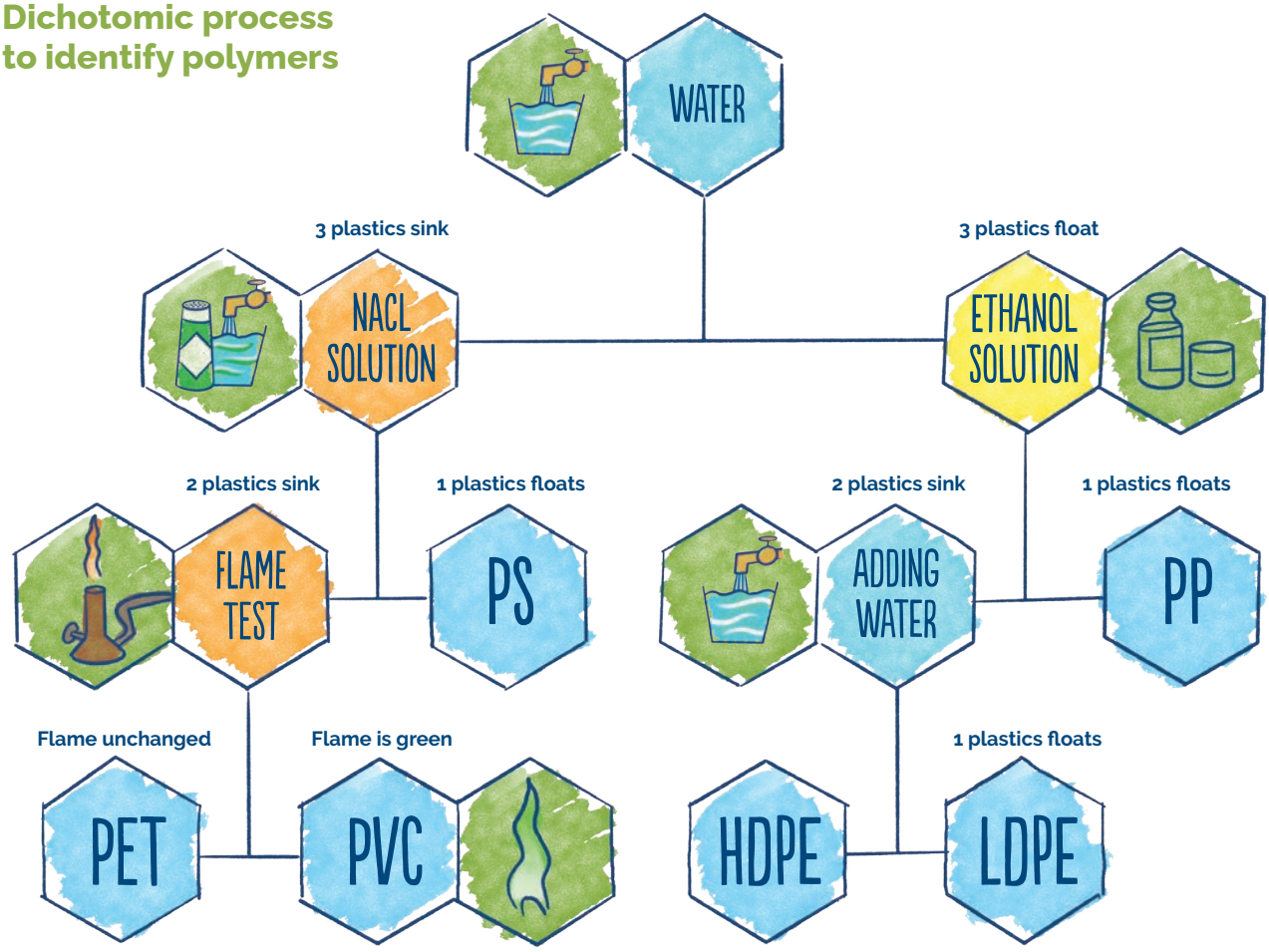
Recover and dry the three samples of plastic that sank in the pure water container. Insert them in the saturated NaCl solution.

What do they do?

Table 1. The density of polymers, water, and of solutions

POLYMERS	Poly(ethylene terephthalate)	PETE 1	**1.38-1.39**
	Polyvinyl chloride	PVC 3	**1.16-1.35**
	Polystyrene	PS 6	**1.05-1.07**
	High-density polyethylene	HDPE 2	**0.95-0.96**
	Low-density polyethylene	LDPE 4	**0.92-0.94**
WATER			**1**
SOLUTIONS	Ethanol-water (60-40)		**About 0.9**
	Saturated NaCl solution		**About 1.2**

Dichotomic process to identify polymers



Activity 2.5:

Making bioplastics

In this activity you will learn how to make bioplastics.

DEFINITIONS

Additives: chemical substances added to a plastic polymer to provide desired properties, such as colour, stiffness/flexibility, water/flame resistance. In this activity, food colouring is an additive. Many additives are known to be toxic, however food colouring is not.

MATERIALS

INGREDIENTS

- 1.5 tablespoons corn starch
- 1 teaspoon vinegar
- 1 teaspoon glycerine
- 5 tablespoons of water
- food colouring (optional)

EQUIPMENT

- 1 saucepan
- 1 wooden spoon
- 1 round edged knife
- A selection of pastry cutters or moulds to shape the plastic
- Non-stick baking sheets or greaseproof paper

INSTRUCTIONS

Place all the ingredients in a saucepan, including a few drops of food colouring if you want coloured plastic.

Before heating, stir the ingredients until they are all combined.

Place the pan over a low heat and continue to stir until the mixture turns sticky and translucent.

Allow the mixture to cool a little. Use a spoon to place the sticky mixture on a non-stick baking sheet or greaseproof paper.

Use a knife to spread the mixture to the required thickness and leave to cool.

Once cooled the bio plastic can be cut with pastry cutter and left to dry.
Drying takes about 4-5 days.

Activity 2.6:

Investigate bioplastics

In this activity you will research oil-based plastics and so called "bioplastics".

INSTRUCTIONS

1. **Internet search and Graphic Organizer**

   Search the internet for information relative to oil-based plastic versus bioplastics.

   Use the Graphic Organiser to help you carry out your researcher and record your findings. Make sure you are looking for answers to all the questions. It is possible that some answers are not easy to find out and need further research after the class.

DEFINITIONS

Renewable resource: a natural resource which will replenish to replace the portion depleted by usage and consumption, either through natural reproduction or other recurring processes in a finite amount of time in a human time scale. Example: solar energy, wind energy, etc.

Non- renewable: a natural substance that is not replenished with the speed at which it is consumed. Example: coal.

Graphic Organizer

OIL BASED PLASTIC	QUESTION	BIOPLASTIC
	What is it made from?	
	Is it made from a renewable source?	
	What can you make from it?	
	How long does it take to decompose?	
	Is it recyclable?	
	Are there infrastructures to recycle it in your country?	
	What are the problems associated with recycling it?	

2. Positive, Minus, Interesting (PMI) analysis about bioplastics

Following your research, do a Positive, Minus, Interesting (PMI) analysis of the two plastic types and then take a class vote on which material they feel, on balance, is best for the environment.

Positive, Minus, Interesting (PMI) analysis table

PLUS **List all the positive aspects of bioplastics** Advantages/benefits/strengths/postives/good things	MINUS **List all the negative aspects of bioplastics** Disadvantages/deficiencies/weaknesses/minuses/negatives	INTERESTING **List anything that you think is interesting about bioplastics and need future investigation** Implications and possible outcome/attention-grabbing/out of the ordinary/appealing

3. Create a definition of bioplastics

Based on your findings, can you provide a definition of bioplastics?

Compare your definition with the one developed by other students/groups.

Section 3:
HUMAN AND ENVIRONMENTAL HEALTH







Activity 3.2:

How microplastics affect your health

In this activity you will learn what are the impacts of microplastics and substances contained in them on human health.

INSTRUCTIONS

Look at video "How microplastics affect your health" by UNEP and then answer the questions

Q1. What are microplastics?

Q2. How do they originate?

Q3. How many plastic particles float in the ocean?

Q4. What are the two types of chemicals added to plastics that scientists think have impacts on health?

Q5. Why would it be bad if microplastics were toxic?

Q6. Make an example of a food chain with microplastic in it.

Q7. In which food items have microplastics been found?

Q8. What types of additives have been found in human bodies?

Q9. Where have these additives been found and in what quantities?

Q10. Do we have to panic?

Once you have answered the first 10 questions individually or within your group, discuss them with the whole class.

Q11. Look at the definition of plasticizers and list the every-day use items that contain them. What can be done to avoid the problems linked with the plasticizers?

Practical tips to avoid exposure to plasticizers



Limit the use of single-use plastics (silverware, glasses, dishes, food containers)



Limit, when possible, the use of PVC products and preferring alternatives



Limit the time playing with plastic toys, including electronic games



Limit the use of take-away food if prepared and served in plastic containers



Do not use microwave for food in plastic containers



Do not eat hot food in plastic dishes and with plastic silverware, but prefer alternative materials

DEFINITIONS

Additives: chemical substances added to a plastic polymer to provide desired properties, such as colour, stiffness/flexibility, water/flame resistance.

Plasticizers: a wide variety of chemical substances used to provide flexibility, workability, or stretchability to plastics for their application in several fields (construction, pharmaceutical, fashion and design sectors, furnishing articles, containers including those for food).

- Phthalates (DEHP), widely used in plastics due to their low cost and versatility, are among the most known plasticizers, used in virtually every category of flexible PVC, including medical devices (medical tubing to blood bags), footwear, electrical cables, food packaging, cosmetics and flooring.
- Bisphenol A (BPA) is used to produce rigid plastics and resins - such as polycarbonate - used for food containers (bottles, plastic crockery, etc.).

DEHP and BPA can be released from the products in which they have been used, affecting the exposure of people through the use of everyday products, the living environment, and alimentation.

Trillion: 1,000,000,000,000; or one million; or 10^{12}





Limit the consumption of water from plastic bottles



Limit the use of plastic wrap and only use safe to contact one



Make physical activity, if possible outdoor in green spaces

Activity 3.3:

Microplastics and environmental health

In this activity you will learn about microplastics and their impacts on environmental health.

INSTRUCTIONS

Read the questions in the table below. Then watch the video proposed by the teacher and try to answer to as many questions as possible. You can work alone or in team with your schoolmates.

Questions/answers table

	QUESTION	ANSWERS
I. PLASTICS PRODUCTION AND FATE OF PLASTIC WASTE (Up to min 2:29)		
1	**When is the nominal start of plastic production?**	
2	**How does plastic production relate to the production of steel, cement, and aluminium?**	
3	**How much plastic has been produced since the conventional start of commercial production?**	
4	**How does the curve of plastic waste generation relate to the curve of plastic production?**	
5	**How much of all plastics produced have become waste?**	
6	**What is the fate of plastic waste?**	
	6.1 **Recycled**	
	6.2 **Incinerated**	
	6.3 **In landfills or the natural environment**	
7	**Considering the plastics still in use and the plastics in landfill and the natural environment, how much plastics are still in existence on the planet?**	

QUESTION		ANSWERS
II. PLASTICS DETECTION IN THE NATURAL ENVIRONMENT (From min 2:29 to 6:39)		
1	When was the first seabird found with plastic debris in his gut?	
2	What was the plastic production level at that time?	
3	When was plastic debris first found floating in the ocean and in which ocean?	
4	What was the plastic production level at that time?	
5	When was plastic debris floating in the North Atlantic Ocean first recorded?	
6	When was the term "garbage patch" first used? To refer to plastic pollution in which ocean?	
7	What was in the bellies of albatross chicks photographed at Midway atoll?	
8	How does the garbage patch look like?	
III. MICROPLASTICS: DEFINITION, CHARACTERISTICS AND DISTRIBUTION AT SEA (From min 13:05 to 17:20)		
1	Which instrument is used to collect microplastics in the surface ocean?	
2	What is the scientific consensus definition of microplastics?	
3	What are some common shapes of microplastics?	
4	How are the majority of plastic particles produced?	
5	Is it possible to tell the origin of plastic particles collected with a plankton net?	

QUESTION		ANSWERS
III. MICROPLASTICS: DEFINITION, CHARACTERISTICS AND DISTRIBUTION AT SEA (From min 13:05 to 17:20) **continued**		
6	**What are the categories of plastics that are produced from wear?**	
7	**How many types of synthetic polymers are made of microplastics?**	
8	**What is the Resin Identification Code (RIC) of a milk jug and what synthetic polymer is it?**	
9	**What is the Resin Identification Code (RIC) of a detergent bottle and what synthetic polymer is it?**	
10	**Are they chemically the same? Why so?**	
11	**Why are additives used in plastic products?**	
12	**How do microplastics evolve in the environment?**	
13	**Why is the scientific community so interested in microplastics?**	
14	**Where have microplastics be found in the marine environment?**	
15	**In which other environments have they been found?**	
16	**Where is the highest concentration of microplastics in the North Atlantic Ocean?**	
17	**What are the ocean mechanisms that explain this pattern of concentration?**	
18	**What are the patterns of concentration in the North Pacific Ocean?**	
19	**What are the garbage patches?**	

QUESTION		ANSWERS
IV. IMPACTS OF MICROPLASTICS ON MARINE ORGANISMS AND THE ENVIRONMENT (From min 17:20 to 20:42)		
1	What is the major concern with microplastics?	
2	What organisms can be impacted by microplastics?	
3	How many species of marine organisms have been impacted?	
4	What are the possible impacts?	
5	What is the complication associated with the potential impacts of microplastics?	
6	Do laboratory experiments show evidence of impacts from microplastics to organisms that ingested them?	
7	Do studies conducted in nature show evidence of impacts from microplastics to organisms that ingested them?	
V. MICROPLASTICS AND HUMAN HEALTH (From min 20:42 to 25:15)		
1	Is there evidence that the things we eat, and drink are contaminated by microplastics?	
2	List some examples	
3	What did a study on human stools from 8 individuals from different geographies and diets show?	
4	What program has been promoted by the World Health Organization?	
5	Is there evidence that humans are retaining microplastics after ingestion and that are they causing harm (according to the presentation)?	
6	What is the wide consensus about plastics?	

Activity 3.4:

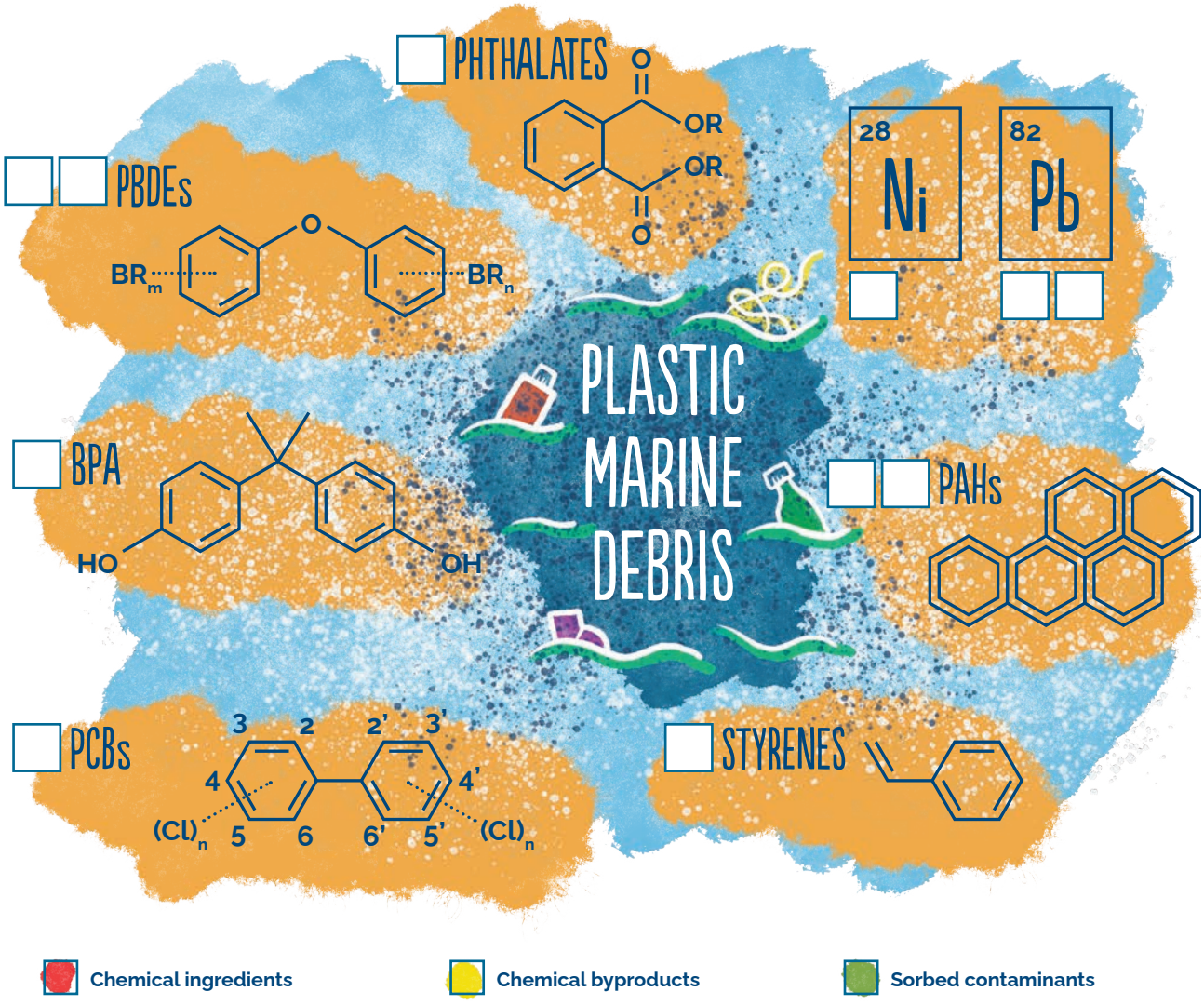
Toxic cocktails

In this activity you will learn what are the additives and environmental contaminants that make microplastic a potential toxic cocktail for marine organism that ingest them.

INSTRUCTIONS

Make an internet search and identify if the chemicals illustrated in the figure Cocktail of contaminants are chemical ingredients (or additives) of plastics, chemical by-products, or environmental contaminants adsorbed at the surface of plastic debris. Colour the white squares at the side of the name of each chemical.

Cocktail of contaminants



Contaminants ID

Name of chemical	How did it get on plastic marine debris?	If chemical ingredient, what was is it used for?	If environmental contaminant, what was used for? Was it banned from use? Since when?	Effects on mammiferes (humans included)

Section 4:
POLICIES TO REDUCE PLASTIC POLLUTION





Activity 4.1:

The Basel Convention and plastic waste

DEFINITIONS

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is an international agreement that seeks to protect human health and the environment against the adverse effects of hazardous wastes and other wastes. The Basel Convention provides a legally binding framework that obliges the States that signed the Convention to do three things:

1) Minimize the generation of hazardous and other wastes;

2) Treat and dispose of hazardous and other wastes as close as possible to where they were generated;

3) Minimize international movements of hazardous wastes.

The Basel Convention has 9 annexes:

- ANNEX I - CATEGORIES OF WASTES TO BE CONTROLLED
- ANNEX II - WASTES FOR SPECIAL CONSIDERATION (for plastic waste, see entry Y48)
- ANNEX III - HAZARDOUS CHARACTERISTICS OF WASTES
- ANNEX IV – DISPOSAL OPERATIONS
  A. Operations which do not lead to the possibility of resource recovery, recycling, reclamation, direct re-use or alternative uses
  B. Operations which may lead to resource recovery, recycling, reclamation, direct re-use or alternative uses
- ANNEX V -
  A. Information to be provided on notification
  B. Information to be provided on the movement document
- ANNEX VI – ARBITRATION
- ANNEX VII – THE BAN AMENDMENT (Parties and other States which are members of OECD, EC, Liechtenstein)
- ANNEX VIII – HAZARDOUS WASTE (for plastic waste, see entry A3210)
- ANNEX IX – NON-HAZARDOUS WASTE (for plastic waste, see entry B3011)

Environmentally Sound Management (ESM) of waste: implementation of a series of Best Available Techniques (BAT) and Best Environmental Practices (BEP) to ensure that waste is managed in a manner that is protective of human health and the environment. The Basel Convention gives prescriptions for the ESM of waste, including plastic waste. The exporter and the disposer of the waste must conclude a contract specifying that the waste will be disposed of in an environmentally sound manner.

Transboundary movement (TBM): any movement of hazardous wastes or other wastes from an area under the national jurisdiction of one State to or through an area under the national jurisdiction of another State or to or through an area not under the national jurisdiction of any State, provided at least two States are involved in the movement.

Mechanical recycling: this involves mechanically treating the waste (e.g. grinding) to reduce it into smaller particles. The resulting granules can be melted and remoulded into different products, usually the same product from which it came.

Plastic Waste Amendments: amendments to Annexes II, VIII and IX of the Basel Convention that were decided by governments during the Basel Conference of the Parties from 29 April to 10 May 2019. The amendments include plastic waste under the scope of the Convention and will make the global trade in plastic waste more transparent and better regulated, whilst also ensuring that its management is safer for human health and the environment.

Prior Informed Consent: a procedure with strict requirements for transboundary movements of hazardous wastes and other wastes. This means that imports, transits and exports of wastes that fall under the Basel Convention are only allowed when all concerned Parties have given their consent before the movement is initiated. The PIC procedure is clearly defined under the Convention, with a number of steps to be followed by the exporter, importer and any transit State.

In this activity you will learn what the Basel Convention is and how it can help protect the environment and human health from hazardous waste, including plastic waste.

TEAM QUIZ - TEST YOUR KNOWLEDGE!

10 points for each game if ALL answers are correct.
For each wrong answer, the team gets -1 point.

Game I:

Sort the following waste in their respective category:
(1) hazardous waste; (2) other wastes and (3) excluded from the scope of the Convention. Useful references: Annex II and Annex VIII.



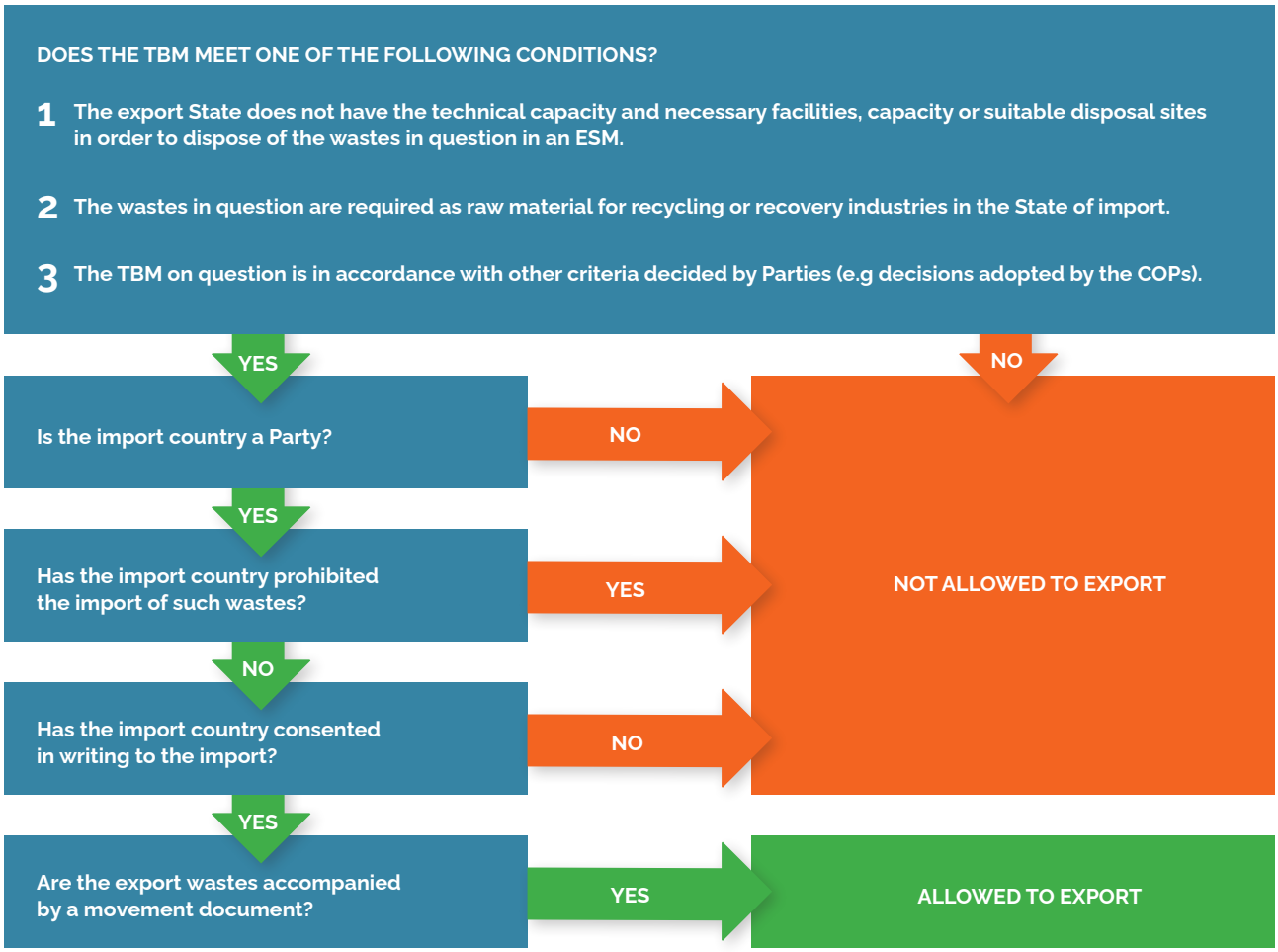
Game II:

Link the key player to its role (one choice possible)

The BRS Secretariat	Review and evaluate the implementation of the Convention
Focal Point (FP)	Proved capacity building and technology transfer
Competent Authority (CA)	Submit the annual national reports
Regional Center	Receive and respond to notification of TBM
Conference of the Parties (COP)	Prepare for and service meetings of the COP

Game III:

Following the flowchart below, decide if the waste should be exported for each case studies and fill the last column of the table.



	1 Export of biomedical waste	2 Export of used oils	3 Export of PET bottles
Are one the three conditions prior to the export fulfilled?	YES	YES	YES
Is the import country a Party?	YES	NO	YES
Is the waste allowed to be imported by the import country?	YES	YES	YES
Has the export party received a writing Consent from the import party?	YES	YES	YES
Are the export waste accompanied by a movement document?	NO	YES	YES
Can the waste be exported?	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO

Game IV:

With the help of Annex II, VIII and IX, indicate three types of plastic waste which are exempt from the PIC procedure:

1

2

3

MATERIALS

- Overview of the Basel Convention
- Text of the Basel Convention
- Overview of the Basel Convention and plastic waste
- Story Map of Plastic waste and the Basel Convention
- Addressing plastic pollution under the Basel Convention
- FAQ on plastic waste amendments
- Guidance materials for ESM of plastic waste
- Online course: Plastic Waste and Basel Convention



Activity 4.2:

Bans to microbeads, plastic bags, and single-use plastic products

In this activity you will learn which countries in the world have put in place bans to the use of microbeads and single-use plastic bags.

DEFINITIONS

Single-Use Plastic (SUP) products: single-use plastics are goods that are made primarily from fossil fuel–based chemicals (petrochemicals) and are meant to be disposed of right after use—often, in mere minutes. Single-use plastics are most commonly used for packaging and service ware, such as bottles, wrappers, straws, and bags.

Trillion: 1,000,000,000,000 or 1 ,000 million

Did you know?





...that in South Africa, there are so many plastic bags littering the environment that many joke that plastic bags are "the new national flower"



It was estimated that in Mauritania 70 percent of cattle and sheep deaths were due to plastic bag ingestion



It is estimated that 1 to 5 trillion plastic bags are consumed worldwide each year. Five trillion is almost 10 million plastic bags per minute. If tied together, all these plastic bags could be wrapped around the world seven times every hour.



The amount of plastic is greater in mass than all land animals and marine creatures combined.

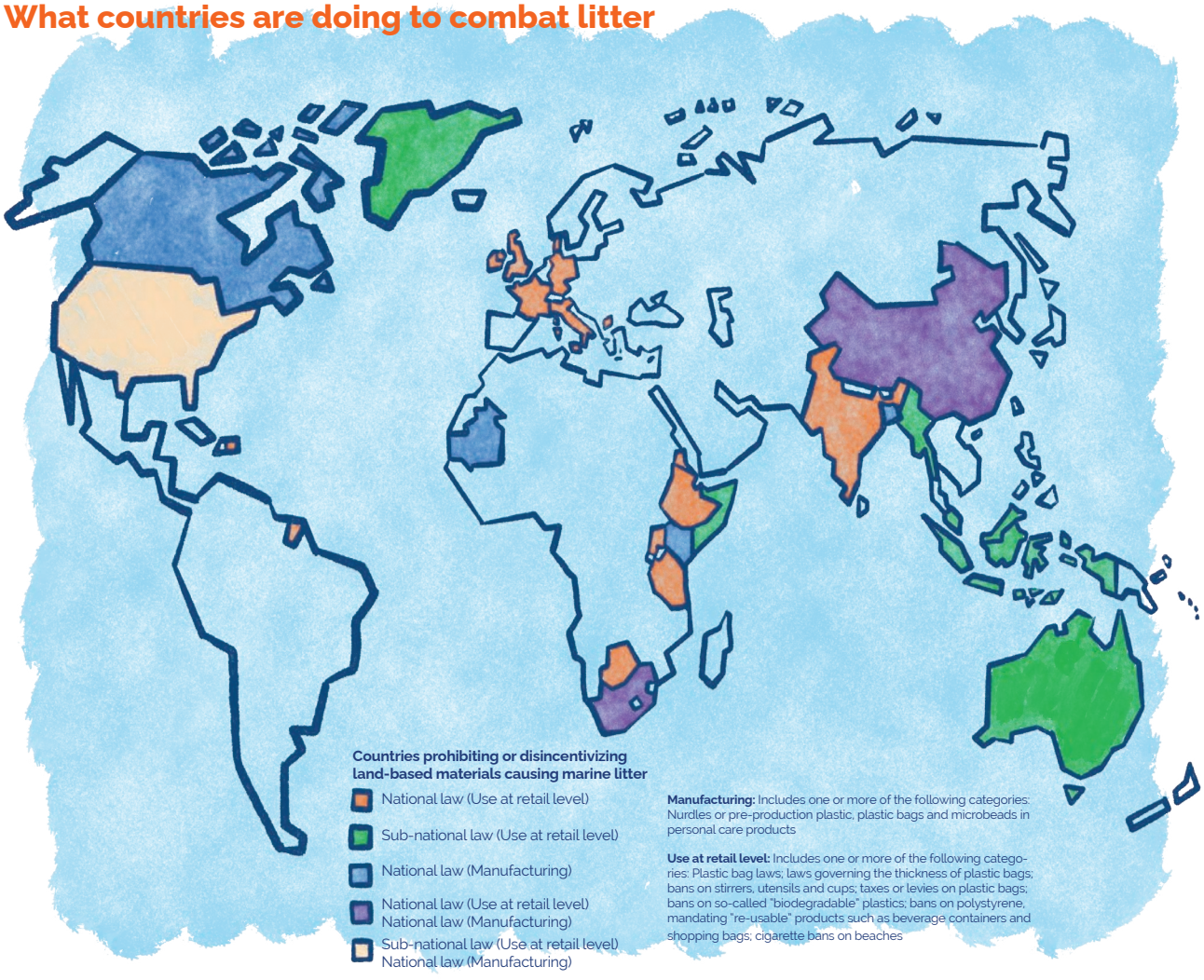
INSTRUCTIONS

Write down the number of plastic bags produced so far in the world:

	TODAY	THIS WEEK	THIS MONTH	THIS YEAR
Beginning of the class				
End of the class				
Difference (end of the class – beginning of the class)				

https://www.theworldcounts.com/challenges/waste/plastic-bags-used-per-year

What countries are doing to combat litter



SOURCE: UNEP Marine Litter Legislation: A Toolkit for Policymakers, document in preparation, 2016; The Independent, The Guardian, National Geographic press review

Look at the map of countries that have prohibited or disincentivized the use of plastic (e.g. plastic bags, microbeads, single-use plastics) through national and/or subnational laws then answer the following questions:

1. Which countries have banned the use of microbeads in cosmetics?

2. Which countries have banned the use of single-use plastic bags?

3. Which countries have banned the use of foamed plastics?

4. Which countries have banned the use of single-use plastic packaging?

Do you think there are alternatives to the use of microbeads in cosmetics, to the use of single-use plastic bags, and to the use of single-use plastic packaging. Together with your team, think about alternative options to the use of these products.

5. If your country has not banned microbeads in cosmetics, do you think it should? What would you tell to policy makers to ask them to ban microbeads from cosmetics? What alternative options are available?

6. If your country has not banned the use of single-use plastic bags, do you think it should? What would you tell to policy makers to ask them to ban single use plastic bags? What alternative options are available?

7. If your country has not banned the use of foamed plastics, do you think it should? What would you tell to policy makers to ask them to ban foamed plastics? What alternative options are available?

8. If your country has not banned the use of single use plastic packaging, do you think it should? What would you tell to policy makers to ask them to ban single-use plastic packaging? What alternative options are available?

Section 5:
SOLUTIONS TO PLASTIC POLLUTION













Activity 5.1:

Lifecycle of a plastic drink bottle

In this activity you will understand the environmental impact of a plastic drink bottle at different stages of its lifecycle.

INSTRUCTIONS

Step 1

How many plastic drinks bottles do you use in an average day or week?

If you do not use plastic drinks bottles, in which container do you keep water?

Step 2

Look with the class at a short video on how most plastic bottles are made and processed and check it with your story line.

Cut out the cards on page 52 and organize them so that they tell the story of a drink bottle from beginning to end.

Compare the order of your cards with the Lifecycle of a plastic bottle on page 53.

DEFINITIONS

Lifecycle Analysis (LCA): a tool used to work out the environmental impact of a product throughout its whole life.

Step 3

Answer the questions in the Lifecycle Analysis sheet.

In which step of its lifecycle do you think a plastic drinks bottle has the biggest impact on the environment?

Do you have any idea on how to reduce the environmental impact?

Lifecycle cards

Cut out the icons and arrange them in the correct order reflecting the lifecycle of a plastic bottle.



Lifecycle of a plastic bottle



Lifecycle analysis

Answer the questions about different stages in the lifecycle of a plastic bottle.
You can use pictures to illustrate your answers too.

1 Raw materials and extraction:
Which raw materials are used to make a plastic bottle?

2 Production:
How is the material used in the plastic bottle made?

3 Manufacture:
How is the plastic bottle made?

4 Packaging:
How is the plastic bottle packaged?

5 Distribution:
How is the plastic bottle distributed throughout its lifecycle?

6 Use:
How is it used?

7 End of life:
How can it be disposed of or recycled?





Activity 5.2:

Everyday comparison debate

In this activity you will explore the impact of everyday objects and see the relationship between your choices and the impact on the environment.

INSTRUCTIONS

Step 1. Chose a product and make a Lifecycle Assessment

After you have chosen an everyday object, as suggested by the teacher, research the different kinds of environmental impact of chosen product together with your teammates.

Make an internet search, using valid sources such as articles from respected newspapers and scientific studies (Google Scholar is a great resource for scientific studies) to uncover the different characteristics of tour product.

To make sure to cover all aspects of a product lifecycle, consider these different aspects:

1. **Raw materials and extraction:** Which raw materials are used to make the product?

2. **Production** (including design/manufacturing)**:**
   How is the raw material used in the product made?

3. **Packaging:** How is the product packaged?

4. **Transportation/distribution:**
   How is the product transported from the factory to the place where it is sold?

5. **Use:** How is it used? For how long?

6. **End of life:** What happens after the product has been used? Can it be sent to recycling? Are there recycling plans for the product in your area? If it cannot be recycled, how can it be disposed off properly?

Step 2. Develop a Plus, Minus, Interesting analysis of the product

Together with your team, develop a Plus, Minus, Interesting (PMI) analysis of your product.

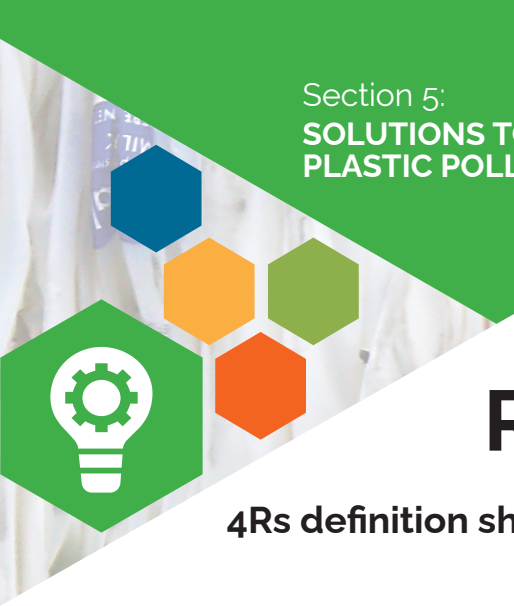
PLUS	MINUS	INTERESTING
List all the positive aspects of the product Advantages/benefits/strengths/ postives/good things	**List all the negative aspects of the product** Disadvantages/deficiencies/ weaknesses/minuses/negatives	**List anything that you think is interesting about the product and need future investigation** Implications and possible outcome/ attention-grabbing/out of the ordinary/ appealing

Step 3. Score the pairs of products

Illustrate to the whole class the Lifecycle Analysis (LCA) and the Plus, Minus, Interesting (PMI) analysis of your product. Ask your classmates to add positive/negative/interesting assessments regarding your LCA and PMI analyses.

After having finalized the PMI chart with the inputs of the other team, proceed to score the product to make a decision about the fact whether it is good or not to continue producing and using it. Each idea in the Plus-Minus-Interesting category will be given scoring that will range from +5 to -5. This scoring is subjective in nature, so you might want to explain to your classmates why one ideas scores well or badly. After scoring each idea, sum the scorings up to decide if an object should be used or not.

Compare the score of the two pairs of products, the one on which you worked with your teammates and the one that was researched by the other team.



Activity 5.3:

The 4Rs: Rethink, Reduce, Reuse, Recycle

4Rs definition sheet

INSTRUCTIONS

Add one of the 4Rs **Rethink, Reduce, Reuse, Recycle** to match their definition.

	Looking at the whole system for the product and exploring ways to improve it that considers people and the environment
	Reprocessing the product or some of its parts to make something else
	Using the whole product or some parts of it to make something else
	Cutting down the amount of energy and/or materials used to make the product

Activity 5.4:

Is recycling worth it?

Let's look at the efficacy of recycling plastics.

INSTRUCTIONS

Cut out the cards and place them on the **Lifecycle analysis** identified on page 54.

Environmental impact of recycling plastic drink bottles

RECYCLING reduces the need for non-renewable fossil fuels (oil)

RECYCLING reduces the use of energy used by 90%

RECYCLING reduces the use of water

RECYCLING reduces the emission of gases like carbon dioxide in the atmosphere

RECYCLING reduces the cost of producing plastic drinks bottles

RECYCLING reduces the amount of plastic waste going to landfill

Plastic recycling: True or false?



Recycling 1 plastic bottle saves enough energy to power a 60W bulb for 3 hours

TRUE FALSE



Fleece fabric can be made from recycled plastic

TRUE FALSE



Only 9% of plastics ever made since the 1950s has been recycled

TRUE FALSE



If you lined up all the polystyrene foam cups made in just 1-day they would circle the Earth

TRUE FALSE



The 12% of all plastics made from 1950s has been sent to incineration

TRUE FALSE



Recycling a plastic bottle saves 90% of the energy taken to produce one

TRUE FALSE



70% of plastics ever made has become waste

TRUE FALSE



1.8 tonnes of oil are saved for every tonne of recycled polyethylene produced

TRUE FALSE



Activity 5.5:

Reduce your plastic footprint

In this activity students learn how much plastic waste they produce each day/week/year. By calculating your plastic footprint, you will discover that you produce a lot of plastic waste that is difficult recycle (either because it is not technically recyclable or because there are no recycling structures where you live). This is the first step to reduce your plastic footprint.

INSTRUCTIONS

Use the plastic footprint calculator developed by the Basel Action Network (**https://www.ban.org/plastic-waste-transparency-project-1**).
It takes into account plastic use from several categories of daily use.

STEP 1:

Calculate your plastic footprint in a day/week/year.

Calculate your plastic footprint in your whole life

DAY	WEEK	YEAR	LIFE

STEP 2:

Compare the daily/weekly and yearly footprint with your classmates.

STEP 3:

Calculate average yearly footprints for all the students at schools/for all citizens in your city and your country

STUDENTS	CITIZENS IN CITY	CITIZENS IN COUNTRY

STEP 4:

Try to reduce your daily footprint. For each of the four categories of plastic waste (food and kitchen needs, bathroom and laundry, disposable containers, and packaging, other) inspect which one you could eliminate next week from your consumption.

Take note of everything you use in the following week.

DAY 1:

DAY 2:

DAY 3:

DAY 4:

DAY 5:

DAY 6:

DAY 7:

STEP 5:

After a week, re-do the calculation of your plastic footprint and compare with the other students who have reduced the most its plastic footprint.



Activity 5.7:

Change is in our hands

In this activity you will learn what are the main sources of marine pollution as well as their degradation time and will reflect on the major threats to the marine environment. You will understand that you can help reducing plastic pollution!

Know, Think, Act!

TYPE OF MARINE LITTER	
SOURCE OF POLLUTION	
SLOGAN OF THE CAMPAIGN	
CAMPAIGN GOALS	
ENTITIES INVOLVED	
ACTIONS	
TARGET AUDIENCE	
TYPE OF MARINE LITTER	

Activity 5.8:

Video making to fight plastic pollution

In this activity you will create short videos to raise awareness about plastic pollution and possible solutions.

INSTRUCTIONS

Create a video (max. 2 min) on the issue of marine litter (you can use your smartphone).

Some key themes to be considered:

- Why is marine litter a concern?
- What can be done?
- What has been done in our school/community to deal with it?

Other ideas can include:

- Results from the Packaging-Free Lunches, showing the comparison of plastic packaging used in normal days or about the plastic free lunch. The work is done in small groups.
- A video on the campaign proposal(s) that were created in the activity "Change is in our hands" (Activity 5.7).

The best videos will be selected through voting!





GET INSPIRED:

> Microplastic madness: **https://www.youtube.com/watch?v=s0jlH1fUqZU** (1.10 min)

> Microplastic madness – Youth comments from Around the world: **https://www.youtube.com/watch?v=dAByVOIowo0&feature=youtu.be** (2:32 min)

> Bye-bye plastic bags: **https://www.youtube.com/watch?v=Sr_ZaKRx5Hg** (3:06 min)



Activity 5.9:

Tweet it, bump it, haiku it, draw it!

Use your creativity to express what you have learnt about plastic pollution and possible solutions through art!

TWEET, BUMP, HAIKU, DRAW!

Tweet:

Synthesize and summarize the work into 1-3 tweets. #creative and #funny #hashtags are #encouraged

Bump:

Use words and images to create a bumper sticker encapsulating what you have learnt.

Haiku:

Summarize the work in haiku form,
17 total syllables in three lines, following the structure:
5 syllables, 7 syllables, 5 syllables.

Draw:

Use large paper and colored sharpies to draw an image that summarizes what you have learnt.

HAIKU STRUCTURE

> There are only three lines, totalling 17 syllables:

The first line is 5 syllables.

The second line is 7 syllables.

The third line is 5 syllables like the first.

PERCEPTION SURVEY



PERCEPTION SURVEY (Age 8-18)

Do you think litter on the beach and in the sea is a problem?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

Are you worried about the problems that litter on the beach and in the sea might cause?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

What percentage (%) of litter on the beach and in the sea do you think is plastic?

0-25% | 25-50% | 50-75% | 75-100%

How long do you think it takes a plastic bottle to breakdown/decompose?

Hours | Days | Months | Years

Do you think litter on the beach and in the sea is bad for:

(a) Marine wildlife?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(b) Tourism?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(c) Human health?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(d) The fishing industry?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(e) The appearance of the coast?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

Why is there litter on the beach and in the sea?

(a) Because people drop litter on the beach

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(b) Because there are not enough bins

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(c) Because businesses (cafes, restaurants, shops) cause litter at the coast

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(d) Because the fishing industry causes litter at the coast

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(e) Because lots of things we buy have too much packaging that is difficult to recycle

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

Have you done the following things in the last week?

(a) Disposed of litter properly?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(b) Picked up litter lying around?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(c) Recycled/separated trash for collection?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(d) Bought goods with less packaging?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

(e) Encouraged family and friends to do any or all of the things above?

NOT AT ALL | A LITTLE BIT | QUITE A BIT | A LOT

ADDITIONAL RESOURCES



SCIENTIFIC VISUALIZATIONS

A list of scientific visualizations to help understanding surface ocean circulation and the movement of floating plastic debris. They also help visualizing how much plastic there will be in the ocean in the future if we continue with business as usual. These visualizations have been made by scientists using scientific data.

Perpetual Ocean by NASA

Do you want to know where a plastic waste item that is thrown in the ocean will end up in the future?
https://www.nasa.gov/topics/earth/features/perpetual-ocean.html

Plastic adrift

Want to know where a plastic waste item that is thrown in the ocean will end up in the future?
http://plasticadrift.org/?lat=18.6&lng=-40.6&center=-1.1&startmon=jan&direction=fwd

Interactive Mapping application for marine microplastics

How much of the microplastics would end up in the ocean if we keep on increasing the plastic production as we are currently doing?
https://rshiny.lifewatch.be/ng-ocean-plastic-challenge/

Number of plastic bags produced daily, weekly, monthly, in a year

https://www.theworldcounts.com/challenges/planet-earth/waste/plastic-bags-used-per-year/story

VIDEOS ON PLASTIC POLLUTION

A series of videos on plastic pollution. Some of these videos have been integrated in the proposed educational activities. Others can be used to complement them or as assignments to be seen at home.

Plastic pollution in the ocean - what we know and what we don't know about
by Waves by thecamp - **https://www.youtube.com/watch?v=MKQjO0H4nI8&feature=emb_logo (2:41 min)**

The story of microbeads
by the Story of Stuff - **https://www.storyofstuff.org/movies/lets-ban-the-bead/** (2.11 min)

What is marine debris?
A cartoon crash course by PEW - **https://www.pewtrusts.org/en/research-and-analysis/video/2016/what-is-marine-debris-a-cartoon-crash-course** (1:54)

Charting the garbage patches of the sea
https://www.youtube.com/watch?v=M4UK9Yt6A-s (3.21 min)

World Animal Protection's Sea Change Campaign
https://www.youtube.com/watch?v=uVWdOt1vS4g (2.14 min)

Are Microplastics in Our Water Becoming a Macroproblem?
https://video.nationalgeographic.com/video/news/00000150-9641-dd5e-a751-bf4517e80000 (2.51 min)

Plankton eating plastic caught on camera for the first time
https://www.youtube.com/watch?v=mGzIz9Ld-sE&feature=emb_logo (0.50 min)

Turtles and plastic pollution
https://www.youtube.com/watch?v=JIklRSR0ov4 (1:19 min)

Plastic Ocean
by UN - **https://www.youtube.com/watch?v=ju_2NuK5O-E** (7:28 min)

Plastic Pollution: How Humans are Turning the World into Plastic
by Kurzgesagt – in a nutshell and UNEP Clean Seas campaign -
https://www.youtube.com/watch?v=RS7IzU2VJIQ (9:01 min)

How microplastics affect your health
by UNEP - **https://www.youtube.com/watch?v=aiEBEGKQp_I** (1:57 min)

PODCASTS ON PLASTIC POLLUTION

A series of podcasts on plastic pollution. They might be useful with high school students.

Plastisphere: A podcast on plastic pollution in the environment
https://anjakrieger.com/plastisphere/

The Plastic Tide: exploring plastic waste in our environment
https://www.npr.org/series/684530164/the-plastic-tide

Plastic pollution with Richard Thompson
https://www.bbc.co.uk/programmes/m000674n

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A series of reports about plastic waste and their impacts on environmental health and human health.

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https://www.ciel.org/reports/plastic-health-the-hidden-costs-of-a-plastic-planet-may-2019/

CIEL (2019b). **Plastic & Health: the hidden costs of a plastic planet**
https://www.ciel.org/reports/plastic-health-the-hidden-costs-of-a-plastic-planet-february-2019/

GAIA (2018). **Discarded: Communities on the Frontlines of the Global Plastic Crisis**
https://zerowasteeurope.eu/2019/04/discarded-communities-on-the-frontlines-of-the-global-plastic-crisis/

UNEP (2015a). **Biodegradable Plastics and Marine Litter. Misconceptions, concerns and impacts on marine environments**. United Nations Environment Programme (UNEP), Nairobi -
https://wedocs.unep.org/handle/20.500.11822/7468

UNEP (2015b). **Plastic in Cosmetics**
https://wedocs.unep.org/handle/20.500.11822/9664

UNEP and Grid-Arendal (2016). **Marine Litter: Vital Graphics**
https://wedocs.unep.org/handle/20.500.11822/9798

World Health Organization (2019). **Microplastics in drinking water**
https://www.who.int/water_sanitation_health/publications/microplastics-in-drinking-water/en/

WWF (2020). **Stop Ghost Gear**
https://www.worldwildlife.org/publications/stop-ghost-gear-the-most-deadly-form-of-marine-plastic-debris

BASEL / ROTTERDAM / STOCKHOLM
CONVENTIONS

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CONVENTION

Norad





BRS-NORAD PROJECT MARINE LITTER AND MICROPLASTICS: PROMOTING THE ENVIRONMENTALLY SOUND MANAGEMENT OF PLASTIC WASTES AND ACHIEVING THE PREVENTION AND MINIMIZATION OF THE GENERATION OF PLASTIC WASTES