

Education Pack

Level 2
United Kingdom

**4 lessons to
help you engage,
educate and influence
others around the
subject of marine litter.**

We have selected activities
that require few facilities
and can be adapted to a range
of ages and circumstances.



Department
for Environment
Food & Rural Affairs



Centre for Environment
Fisheries & Aquaculture
Science



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**Clean
Atlantic**

Lesson 1: What is marine litter?

Objective: to give an introduction to marine litter and the problems that it causes to marine ecosystems.

Marine litter or marine debris is defined as any persistent, manufactured or processed solid material discarded, disposed of, abandoned or lost in the marine and coastal environment.

You may ask, how does it get there? Litter ultimately comes from humans. We use something, discard it and unless it enters landfill or is recycled, it ends up on the ground and could find its way to the sea. The most common way is by transport from rivers, sewage and storm outfalls. It can also enter the marine environment by being blown by winds or by being abandoned directly in the sea (as with fishing gear). Marine litter has been found in almost all marine environments on the planet and causes serious problems for marine life.

Animals often mistake litter for food, causing ill effects. Litter can cause habitat damage, entanglement and introduction of invasive species. Plastic is one of the most common materials found in the marine environment and over time, due to wave action and UV exposure, is broken down into smaller and smaller fragments called microplastics.

Microplastics are not only a concern for marine animals but also for humans as microplastics and toxins are part of our diet through some of the seafood we eat.

Plastic items have a wide variety of properties

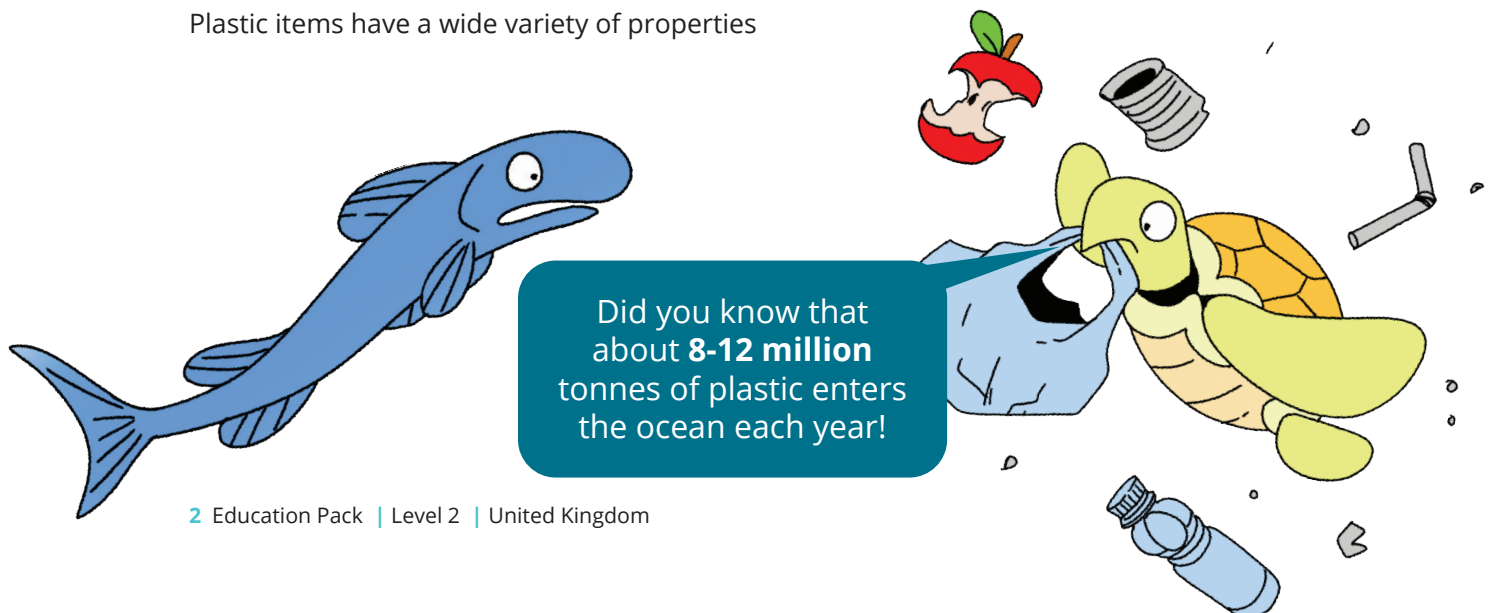
that affects what happens to them in the oceans. Dense items sink to the seabed and become buried in sediment, some items are suspended mid water column, while some items float on the surface. Oceanic currents and winds transport these items around the world, concentrating items in large oceanic gyres.

This lesson will introduce marine litter, how marine litter enters our seas and oceans and the problems that litter causes to marine life.

Resources

- [Marine Debris information \(NOAA\)](#)
- [Posters and factsheets \(NOAA\)](#)
- [Marine debris: sources, distribution and fate of plastic and other refuse \(CSIRO\)](#)

This education pack has been adapted to make it suitable as an awareness raising tool as part of the Clean Atlantic project. The original pack was created by the Commonwealth Litter Programme, which is a programme led by the UK through Centre for Environment, Fisheries and Aquaculture Science (Cefas) to support developing countries across the Commonwealth to take action on plastics entering the oceans.



Did you know that about **8-12 million** tonnes of plastic enters the ocean each year!

Marine Litter Factsheet

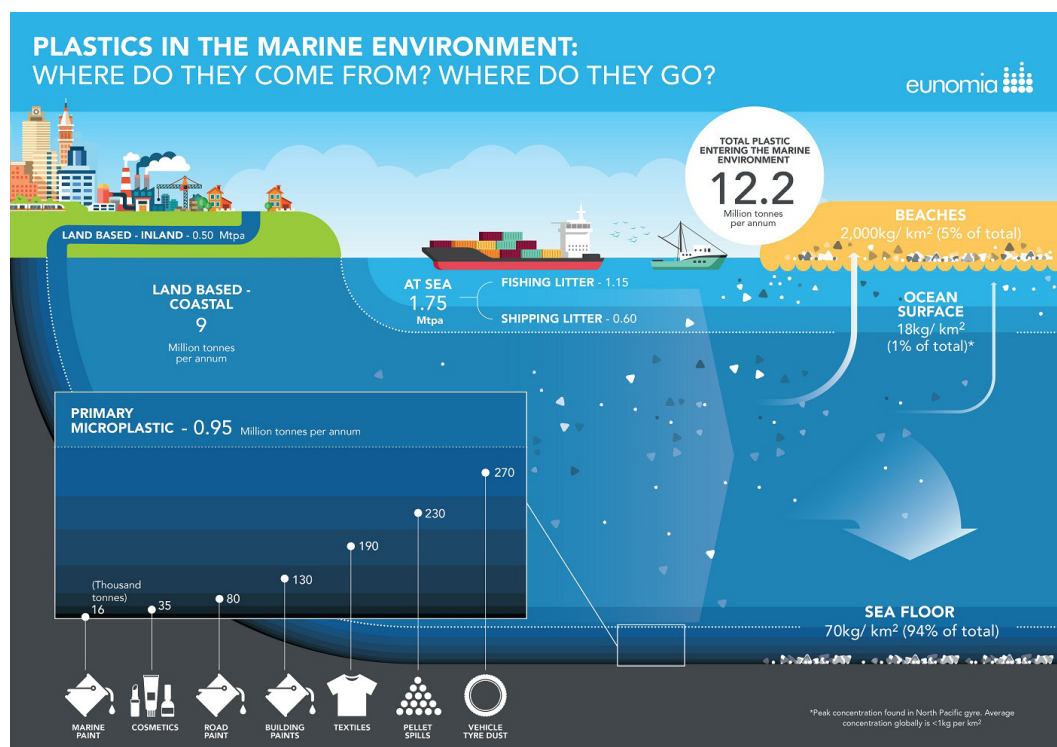
What is marine litter?

Marine litter is any item that humans have discarded that ends up on our beaches, or in our rivers, seas and oceans. This is a huge problem as around the world, approximately 8 million pieces of marine litter enter the marine environment every day!

1. Plastic makes up 80% of marine litter. The term 'plastic' covers a wide range of polymers that can be moulded into many shapes. Plastic bottles, food wrappers and abandoned fishing gear are among the most common items globally that are found in the marine environment. In the sea, UV exposure, wave and wind action break down larger plastic items into small fragments called microplastics and even smaller nanoplastics.
2. Glass is the second most common material found on beaches. It mostly comes from bottles and when broken can be a hazard to beach users and animals.
3. Aluminum drink cans and other metal objects are also frequently found on beaches and in our seas.

Where does it all go?

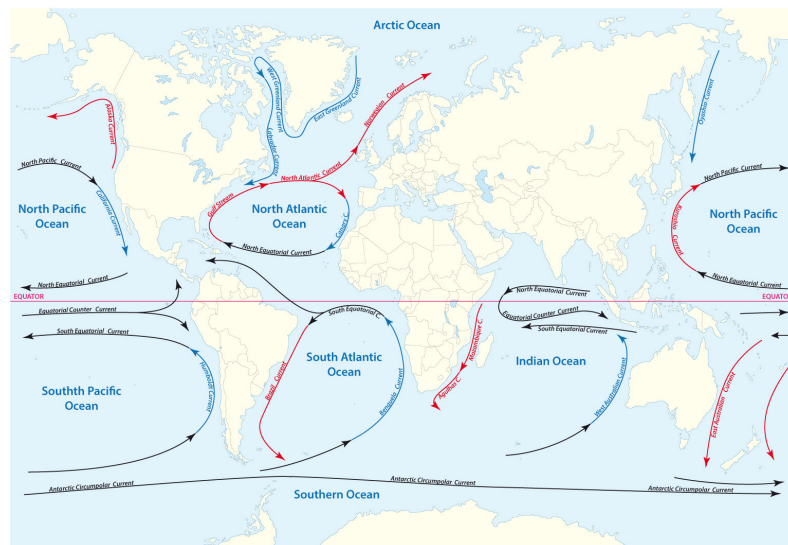
The density of an item of litter affects whether it will sink or float in water. Large items may initially trap air and float, but over time the material can become brittle and break up into smaller pieces. Research now suggests that 94% of plastics in the marine environment end up on the sea floor.



© Eunomia <http://www.eunomia.co.uk/reports-tools/plastics-in-the-marine-environment/>

Marine Litter Factsheet

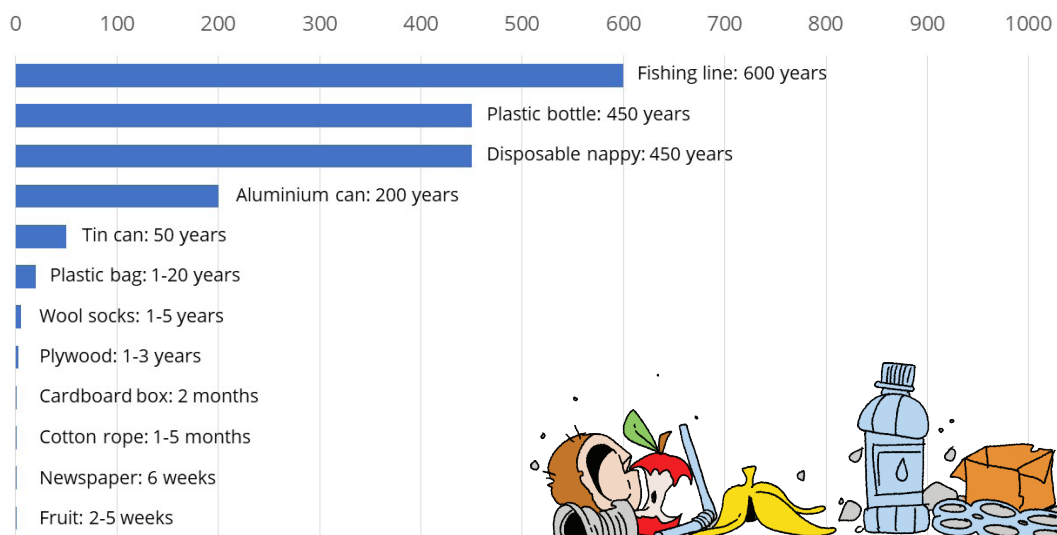
Winds, waves and currents move litter around our globe, depositing items onto our shoreline. Large oceanic currents move items around the oceans like conveyor belts. These currents form five oceanic gyres which bring together large amounts of marine litter. The most famous of these is the Great Pacific Garbage Patch where it is estimated that there are 1.8 trillion bits of plastic! Closer to the UK, the North Atlantic Garbage Patch is similar in size and amount of marine debris to the Great Pacific Garbage Patch. Precise measurements of the North Atlantic Garbage Patch are unknown, but scientists think it is hundreds of square kilometers in size. The patch is likely to have a particle density somewhere around 7,220 pieces per square kilometer.



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How long does it last?

Scientists have estimated how long litter items take to break down in the marine environment, although exact times are unknown and depend on conditions. Times are likely to be longer in cold, wet conditions like polar seas than in the tropics. Plastic is one of the most durable materials, and items such as plastic bottles are thought to last for 450 years!



Marine Litter Factsheet

Can marine litter harm animals?

Marine Litter can cause serious damage to marine life. Over one million animals are killed each year from marine litter. Here are the most common causes:

Animals can mistake litter for food which can harm them and cause death. A whale that recently washed up in Indonesia had 6kg of plastic in its stomach, including 100 plastic cups!



© Alamy

Marine litter can cause damage to animals' surroundings. Large litter items, especially lost or abandoned fishing gear can damage fragile areas like coral reefs, particularly during bad weather.



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Marine animals can become entangled in litter. Fishing nets and six-pack can rings are common items that cause harm. Animals become tangled and are unable to get out which can cause death. In the UK and the Atlantic, entanglement can impact many marine species such as turtles, seals, dolphins, and seabirds.



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Marine litter can carry 'alien' invasive species to new shores that can disrupt ecosystems, causing losses in biodiversity. Following an earthquake and tsunami in Japan in 2011, large amounts of litter washed up on the US coastline. Many of these items were carrying Japanese mussels, barnacles and sea squirts.



© Matt Ecklund

Activity: Sink or float?

The aim of this activity is to understand the properties of different materials and how this affects what happens to them over time once they enter the ocean.

Time: 1 hour

You will need:

- A variety of materials found from around the school / community centre. These should include a mix of man-made and natural items with different properties, e.g. hard and soft, flexible and rigid.
- A large container or tank filled with water.

Instructions:

Work with everyone as a big group or divide into smaller groups. Set up a tank of water. Gather a variety of items that might make their way into the marine environment and test what happens over time when they enter the water. Make initial predictions as to whether they will sink or float and test this by timing how long it takes for the items to sink to the bottom. Try to simulate ocean currents by swirling the water. Does this affect what happens to them?

Item description	Prediction: Sink or float?	Time taken for items to sink (seconds)	Describe how the item is affected by water movement

When completed: Answer these questions

1. What are the characteristics of items that sink or float?
2. Which items sank slowly and could therefore remain suspended in the water column for some time?
3. Research some marine animals that might feed on or come into contact with plastic litter at or near the surface; in the mid-water column; or on the sea floor. How might your litter items affect these animals?

Lesson 2: Marine Litter in the UK

Beach, river and community clean-ups are great ways to make people aware of the marine litter that is present in their local environment. All litter on the land has the potential to make its way to the sea, being blown by the wind or carried by rivers. Clean-ups help remove the litter. Also, data recorded about the type and number of litter items found can be fed into national and global programmes, which helps us understand sources of litter in different areas of the world. There are lots of recording platforms that you can feed into. For example in the UK, Marine Conservation Society has been running its Beachwatch programme since 1994 and has been collecting litter data from beach clean-ups for over 20 years. You can join in on a beach clean organised by others or you can organise your own, just make sure that you have carried out appropriate health and safety risk assessments if you organise your own.

Resources

- [Marine Conservation Society beach cleans](#)
- [Ocean Conservancy- Start a Cleanup](#)
- [Marine Conservation Society- become a beachwatch organiser](#)
- [OSPAR Guideline for Monitoring Marine Litter on Beaches](#)
- [Project Aware- use your phone to take action for a clean ocean](#)
- [Surfers against sewage Autumn beach clean](#)



Activity: Beach or river field-trip and categorisation exercise

The aim of this exercise is to get out and about to a local beach and record the types of litter that is present. If you do not live close to a beach, you could clean a river bank or a community area.

Time: 1-3 hours

You will need:

- Beach, river bank or a community area
- Gloves and litter pickers
- Notebooks and pencils
- Completed Health and Safety Risk Assessment

Instructions:

Select a local beach or stretch of river, ensuring that you have permission from the land owner for access. Check the tide times and select a date and time making sure it is 2 hours or more after high tide, and not on an incoming tide.

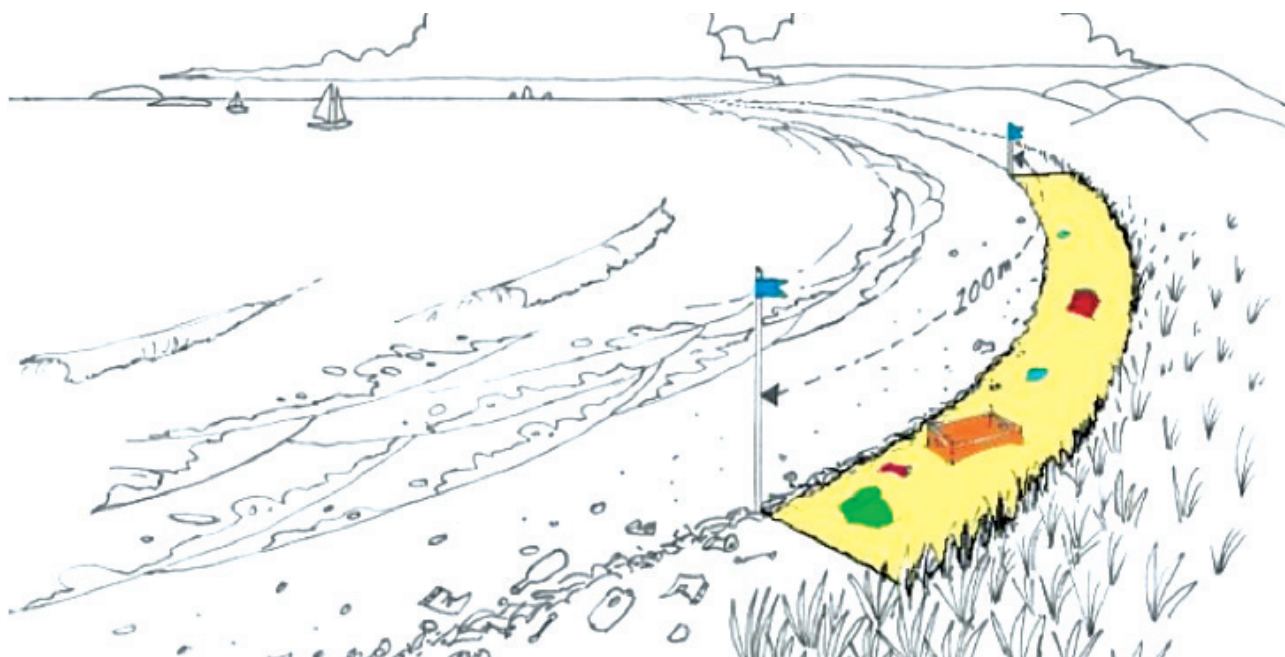
Select a 100m stretch of beach or river bank and mark out the area to survey. This should run from the strandline (the tide mark where you

often get a collection of seaweed and where the sand changes colour) to the back of the beach or bank where the plants start to grow.

Organize the participants in groups and pick up, record and tally all the marine litter they find in the designated area described above. Ask the group to record and tally each litter item in one of the categories in the table on the following page. New categories or sub-categories can be added if needed.

Once completed, make sure you dispose of the rubbish responsibly and bring a selection of clean, safe litter items back for additional activities and lesson 4.

Back in the class or community centre, collate all the records from the groups. Ask the participants to draw graphs to identify the most common categories. Reflect upon your findings. Is this what you were expecting? What is the most frequently recorded item? Is this item something that your community uses from day to day?



OSPAR ID	Items	Tally	Total
Plastic/Polystyrene			
1	4/6-pack yokes		
2	Bags (e.g. Shopping)		
3	Small plastic bags, e.g., freezer bags		
112	Plastic bag ends		
4	Drinks (bottles, containers and drums)		
5	Cleaner (bottles, containers and drums)		
6	Food containers include. Fast food containers		
7	Cosmetics (bottles & containers e.g. sun lotion, shampoo, shower gel, deodorant)		
	Cosmetics - Pharmaceutical packaging		
8	Engine oil containers and drums <50cm		
9	Engine oil containers and drums >50 cm		
10	Jerry cans (square plastic containers with handle)		
11	Injection gun containers		
12	Other bottles, containers and drums		
13	Crates		
14	Car parts		
15	Caps/lids		
16	Cigarette lighters		
17	Pens		
	Markers		
	Other plastic stationary		
18	Combs/hairbrushes		
	Toothbrush		
	Hair ties		
19	Crisp/sweet packets and lolly sticks		
20	Toys & party poppers		
21	Cups		
22	Cutlery/trays/straws		
	Plates		
23	Fertiliser/animal feed bags		
24	Mesh vegetable bags		
25	Gloves (typical washing up gloves)		
113	Gloves (industrial/professional gloves)		
	Plastic wrap non food (bubble wrap etc)		
26	Crab/lobster pots		
114	Lobster and fish tags		
27	Octopus pots		
28	Oyster nets or mussel bags including plastic stoppers		
29	Oyster trays (round from oyster cultures)		
30	Plastic sheeting from mussel culture (Tahitians)		

31	Rope (diameter more than 1cm) - Rope less than 1 metre		
32	Rope (diameter more than 1cm) Rope greater than 1 metre, (estimated length in metres)		
32	String and cord (diameter less than 1cm)		
115	Nets and pieces of net < 50cm		
116	nets and pieces of net > 50cm		
33	Tangled nets/cord/rope and string		
34	Fish boxes		
35	Fishing line (angling)		
36	Light sticks (tube with fluid)		
37	Floats/Buoys		
38	Buckets		
39	Strapping bands - scraps		
	Strapping bands - whole (record as single item)		
40	Industrial packaging, plastic sheeting		
41	Fibre glass		
42	Hard hats		
43	Shotgun cartridges		
44	Shoes/sandals		
45	Foam sponge - Foam Buoys		
	Foam sponge - Foam cups, food packs and trays		
	Foam sponge - Foam insulation & packing (whole and remnants)		
	Bait & tackle bags & packaging		
	Bait containers & lids, bait savers		
	Recreational fishing items (lure, floats, rods, reels)		
117	Plastic/polystyrene pieces 0-2,5cm		
46	Plastic/polystyrene pieces 2,5cm > <50cm		
47	Plastic/polystyrene pieces > 50cm		
48	Other plastic/polystyrene (please specify in box*)		
Rubber			
49	Balloons, including plastic valves, ribbons, strings etc.		
50	boots		
52	tyres and belts		
53	other rubber pieces (please specify in box)		
Cloth			

54	Clothing		
	Cloth, hats & towels		
55	Furnishing		
56	Sacking		
57	Shoes (leather)		
	Fabric shoes		
59	Other textiles (please specify in box)		
Paper Cardboard			
60	Bags (e.g. Shopping)		
61	Cardboard		
118	Cartons e.g. tetra Pak (milk)		
62	Cartons e.g. tetra Pak (other)		
63	Cigarette packets		
64	Cigarette butts		
65	Cups		
66	Newspapers & Magazines		
	Brochures		
67	Other paper items (please specify in box)		
Wood (machined)			
68	Corks		
69	Pallets		
70	Crates		
71	Crab/lobster pots		
119	Fish boxes		
72	Ice Lolly sticks/chip forks		
	Pencils, matches		
73	Paint brushes		
	Brooms, brushes		
74	Other wood < 50cm (please specify in box)		
75	Other wood > 50cm (please specify in box)		
Metal			
76	Aerosol/Spray cans		
77	Bottle caps		
	lids/pull tabs		
78	Drinks cans		
120	Disposable BBQ's		
79	Electric appliances		
80	Fishing weights		
81	Foil wrappers		

	Packets/bladders & aluminium foil		
82	Food cans		
83	Industrial scrap		
84	Oil drums		
86	Paint tins		
87	Lobster/crab pots and tops		
	metal fishing items		
88	Wire, wire mesh, barbed wire		
89	Other metal pieces < 50cm (please specify in box)		
90	Other metal pieces >50cm (please specify in box)		
Glass			
91	Bottles - Glass beer stubbies & pre-mixed alcohol bottles		
	Bottles - Glass jars & source bottles		
	Bottles - Glass wine, spirit and similar bottles		
92	Light bulbs/tubes		
93	Other glass items		
	Glass & ceramic broken		
Pottery Ceramics			
94	Construction material e.g. tiles		
94	Octopus pots		
96	Other ceramic/pottery items (please specify in box)		
Sanitary waste			
97	Condoms		
98	Cotton bud sticks		
99	Sanitary towels/panty liners/backing strips		
100	Tampons and tampon applicators		
101	Toilet fresheners		
102	Other sanitary items (please specify in box)		
Medical waste			
103	Containers/tubes		
104	Syringes		
105	Other medical items (swabs/bandaging etc.) (please specify in box)		
Faeces			
121	Bagged dog faeces		

Lesson 3: Solutions?

Objectives: to explore solutions to the marine litter problem and understand how our actions can help.

It is really important that we all help to reduce the amount of litter that enters the marine environment. In the first lesson, we learnt the difference between natural and synthetic materials. Years ago, our ancestors would drop their rubbish on the ground, but they were using natural materials like wood and clay that over time would become part of the soil. More and more materials we use these days are synthetic, which can take a long time to degrade and persist in the environment. We must put these items in the rubbish bin, or reuse or recycle them. Plastic can take up to 1000 years to disappear!

There are three actions that individuals can do to help reduce the amount of plastic that enters the marine environment: Reduce, Reuse and Recycle. Start the lesson by introducing these ideas that can be implemented in the UK and elsewhere in the world.

Reduce:

You can reduce the number of single-use items that you use. Simple ways to do this are:

- bring a reusable bag to the supermarket when you do your shopping
- bring water from home in a reusable water bottle
- don't use plastic straws or plastic cotton buds

Reuse:

There are many ways that you can creatively use things that you may otherwise throw away. Can you think of someone else that would be able to use it? Can you re-purpose it for another use?

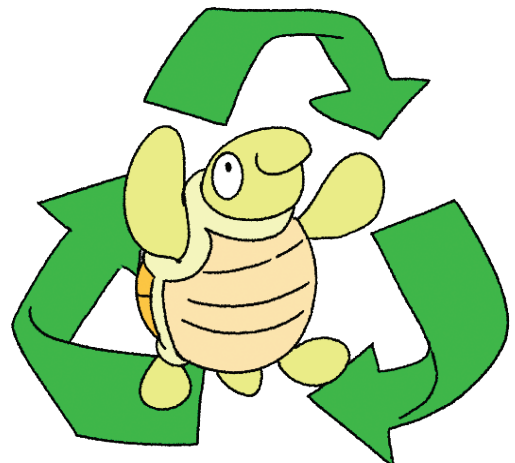
Recycle:

Many of the items that end up in our landfill sites can be re-made into other items. Check with your local area which items can be sent for recycling and make sure to separate these from your rubbish.

Did you know that the UK government has confirmed a ban on plastic straws, drink stirrers, and plastic cotton buds? These items cannot be easily recycled and don't break down. The new measures will ban the sale of plastic drinks stirrers and restrict the sale of plastic straws and cotton buds.

Resources

- [Reduce, Reuse and Recycle, to enjoy a better life](#)
- [The Three R's for Kids](#)
- [Reduce, Reuse and Recycle lesson ideas](#)
- [30 better ways to reuse and repurpose old stuff](#)
- [Pinterest recycling ideas](#)



Activity: Make your own marine litter solutions

The aim of this activity is to make the community aware of the three ways that they can make sustainable everyday choices to help combat marine litter by implementing the three R's: Reduce, Reuse and Recycle.

Instructions:

Introduce the activity by discussing the problem of marine litter and how the UK is tackling it. Are we doing enough? Ask the group to create three lists of solutions: What can we do as individuals; what can we do in our communities; and what can the government do in our country?

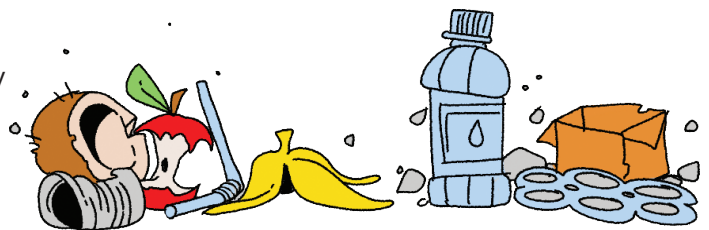
Extension:

Use the list you came up with to assign actions to some of the suggestions. Write a letter to businesses or the government, requesting they carry out your suggestions.

Time: 45 minutes

You will need:

- Worksheet
- Pencils



What can we do as individuals?	What can we do as a community?	What can the government do?

Lesson 4: What are the issues around the globe?



Objectives: to raise awareness of the global issue of marine litter and to create innovative solutions.

Around the world there are some great examples of innovative solutions to solve the global marine litter crisis. Here we introduce 5 of these solutions:

Name: Anna Du

Country: America

Invention: 12 year old Anna has created a prototype for an underwater rover that identifies microplastics using ultra-violet technology

<https://www.youngscientistlab.com/index.php/entry/1669>

Name: The Seabin Project

Countries: Europe

Invention: The Seabin is a floating trash can that is located in the water at marinas, docks, yacht clubs and commercial ports.

<https://www.seabinproject.com/>

Name: Ocean Cleanup

Country: Netherlands

Invention: Boyan Slat started the Ocean Cleanup when he was just 18. The concept involves a 600m inflatable tube that floats in oceanic gyres, collecting litter items in a net below.

<https://www.theoceancleanup.com/>

Name: 4Ocean

Countries: Bali & America

Invention: This simple idea involves selling bracelets made from recycled plastic which commits to remove one pound of marine litter per bracelet sold.

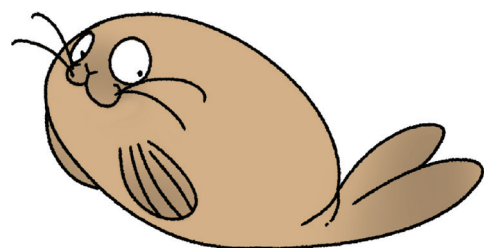
<https://4ocean.com/pages/our-story>

Name: SeaVax Robotic Ship

Country: United Kingdom

Invention: The robotic ship vacuums up plastic particles in the water column and uses energy from solar panels.

http://www.bluebird-electric.net/oceanography/Ocean_Plastic_International_Rescue/SeaVax_Ocean_Clean_Up_Robot_Drone_Ship_Sea_Vacuum.htm



Activity: Invent a marine litter solution

The aim of this activity is to get your group to invent a solution to help combat marine litter. Use the examples on the previous page and make a plan or drawing of your invention.

You will need:

- Paper
- Pencils

Instructions:

Use the previous examples to inspire students to develop a concept to tackle marine litter.

Activity: Spread the word!

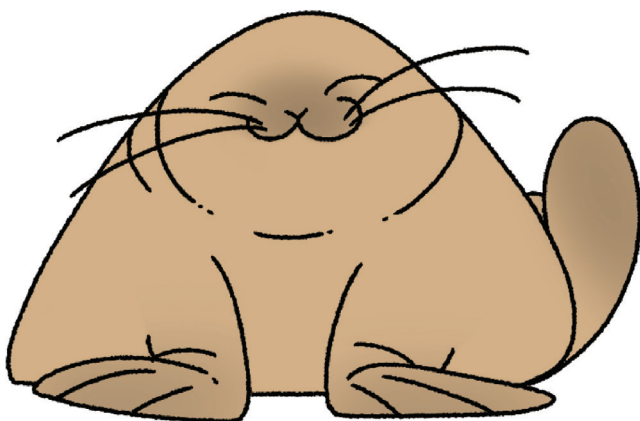
One crucial way you can help tackle marine litter is to spread the word to friends and family about the issues with marine litter.

You will need:

- Creativity

Instructions:

Work in groups to develop a method to communicate what you have learnt in the last 4 lessons and to educate others. This could be a poster, a song, a dance or artwork. Be creative! You could even use some of the litter you saved in lesson 2.



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