



Commonwealth
Litter Programme

Community Pack on Marine Litter

Sri Lanka

This community education pack contains:

- **Leader pack for community educators providing background knowledge and further reading on the subject of marine litter**
- **Lesson pack for educators to lead students through around the subject of marine litter specific to Sri Lanka**
- **Activities for educators and students to participate in, linked to the lessons previously presented**



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Leader pack for community educators on the subject of marine litter

Sri Lanka

This section provides an introduction and background information for educators in Sri Lanka on marine litter related to the CLiP education packs' material, with guidelines for the packs' tasks



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The pupose of this pack

This pack was created for educators, teachers and trainers who can use the CLiP education packs, to enable students to broaden their knowledge on the problems caused by marine litter in seas, oceans, estuaries, coral reefs, mangroves, flora and fauna by marine litter in Sri Lanka. The educators and trainers can share the activities included in the CLiP education packs with students to raise awareness of the hazards caused by marine litter to the environment.

What is marine litter?

Marine litter is a type of environmental pollution caused by the presence of human waste in the sea, that may have been deliberately or accidentally released. We call 'marine litter' any man-made, long-lasting solid material that humans have incorrectly disposed of and that has ended up on our beaches, in our estuaries, rivers, seas, and oceans.

The waste that can become marine litter is made of many materials including plastic, rubber, paper, processed wood, textile, metal, glass, ceramic and sometimes a mix of them. Plastic is the main component of marine litter in the world and it is estimated to comprise up to 80% of all the items. Some plastic items are particularly frequent in the sea and on the beaches because of their widespread use in today's society: soda and water plastic bottles, cigarette butts, food wrappers, cotton buds and plastic bags are some of the most common examples. Glass is the second most common material found on beaches, mostly coming from whole and broken bottles. Metal can also be abundant and aluminium drink cans can frequently be found on beaches and in our seas. Organic waste like food scraps (both vegetable and animal) is not considered marine litter because it decomposes in the environment, disappearing over time.

Marine litter includes both very big and very small items, ranging from tens of meters to millimetres. Microplastics are a particular type of marine litter. They are plastic and polystyrene pieces smaller than 5 mm that can be produced when large items break down because of sun exposure (UV rays), wave and wind action. Some microplastics are released directly into the environment, for example, when cosmetic products containing plastic beads as exfoliating agents are used. Recent studies are also investigating the effects of even smaller fragments called nanoplastics, smaller than one thousandth of a millimetre.

Where does it come from?

Approximately 8 million pieces of marine litter enter the marine environment every day! Marine litter can be created both on land and on the sea, but the general agreement is that the majority comes from land. The principal land-based source is the mismanagement of solid waste such as littering or using unregulated dumpsites. The



Figure 1. Types of marine litter organised after a beach clean trip.



Figure 2. Plastic, the main component of marine litter in the ocean, can last for centuries and break down in small particles.

waste accumulates on the ground without protection, and rainwater runoff and wind can then transport it to the sea. Litter can also arrive in the ocean indirectly, transported by rivers and streams.

Some marine litter can be created directly on the beach by people visiting the coast. A type of litter commonly created by beachgoers during recreational activities is cigarette butts. These are the most frequent recognisable beach litter in the world, not only because they are produced in high quantities but also because they are small and are often not collected during the beach clean-ups. These items are particularly bad because they are full of toxins from smoking tobacco and they can break down into microplastics too.

Sea-based activities can also create litter. Fisheries can be a source of a particular type of litter called ALDFG, that stands for 'Abandoned, Lost or otherwise Discarded Fishing Gear'. This includes the nets, ropes, lobster traps, crates and all other object that are used during fishing. ALDFG can be created by accident, for example when fishing nets are lost at sea or traps that cannot be recovered because of bad weather. However, some ALDFG can be created on purpose when nets break and are discarded in the sea instead of being properly disposed of back on land. Another way of creating litter in the sea is through the incorrect disposal of waste produced by shipping and leisure boats. The items created in this case are very similar to the ones produced on land, including plastic bottles and food wrapping.

How long does it last?

Scientists have estimated how long plastic items take to break down. Although the exact times are unknown and depend on the conditions, it is likely to be longer in the sea where wet and much cooler conditions than on the land inhibit the natural decomposition process. Plastic is one of the most durable materials with hard items like bottles thought to last 450 years! Some items could last up to 1000 years.

Where does it all go?

Marine litter is a global problem. It has been found in every part of the ocean, on the coasts of all continents, including Antarctica, and in remote islands far from obvious sources and human contact. Marine litter is particularly studied on beaches, where it accumulates. A lot of litter is often accumulated on beaches near cities, rivers or places visited by many tourists. However, remote beaches with less direct human visits can also be full of waste because they are cleaned less often. Some of the litter will stay on the beach for a short time before being moved by waves, tides and wind, either more inland or into the sea. However, some litter can be covered by sand and remain buried there for a long time.

Different items have different densities which affects their final fate once they enter the sea. Some items float on the surface because they are light (for example, pieces of polystyrene) or because they trap air (for example, empty water bottles sealed with lids). Winds, waves, and currents can move this floating litter great distances and sometimes deposit items onto our shoreline. However, currents can also move litter to particular areas in the open ocean called 'gyres', that are like giant very slow whirlpools. There are five main gyres, one being in the Indian Ocean, where large amounts of marine litter can be found. The largest and most famous of them is the Great Pacific Garbage Patch, located in the North Pacific Ocean, where it is estimated that 1.8 trillion bits of plastic are accumulated!

Heavier items sink down to the seafloor, which is now considered the main place where plastic is accumulating. Research now suggests that over 90% of plastics in the marine environment end up on the sea floor. Plastics and microplastics can also sink to the bottom because algae and small animals grow on them, making them heavier. Marine litter has sadly even reached the deepest point of the ocean, the Marianas Trench, where a plastic bag was photographed.

How does it affect animals and the environment?

Marine Litter can cause serious damage to marine life, wildlife, and the natural environment in several different ways and over one million animals are killed each year due to marine litter. Animals can mistake litter for food and if they ingest it, harm and potentially death might occur. Marine turtles, mammals and birds can mistake indigestible plastics for prey and eat it, filling their stomach with waste and starving. Sharp and bulky litter can also damage the organs or release toxic chemicals and introduce diseases in the animals' body. A recent whale washed up in Indonesia had 6kg of plastic in



Figure 3. Litter in the environment

its stomach, including 115 plastic cups, 25 plastic bags, 2 flip flops and over 1000 pieces of string. However, ingestion of marine litter is not only a problem for big animals, with smaller species such as fish, jellyfish and plankton being affected too.

Marine animals can also become trapped in litter, a phenomenon called 'entanglement'. Fishing nets keep trapping fish and other animals even after they have been abandoned in the sea. Animals that become entangled in ropes and nets have their ability to feed reduced and to escape predators, and marine mammals may even drown. Some items wrapped around animals' limbs can also affect the animals during its growth, leading to deep wounds. Plastic can-rings are another common item that can cause this type of harm.

Marine litter can carry 'alien' (also known as 'invasive') species to new shores and 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.

Marine litter effects on the human economy and health

There are several human activities that can be affected by the presence of marine litter in the ocean. Vessels fishing in areas full of litter lose a lot of time taking out the waste caught in their nets before being able to fish again. Time and money are also spent on fixing nets and boats that can be damaged by litter. If marine litter affects the fish, fishermen will also catch less and fish from polluted areas might have to be sold at a cheaper price, reducing income.

Tourism can also suffer because of marine litter. Tourists do not like to spend their time on beaches surrounded by a lot of waste. There are more visitors in locations where the environment is pristine. The same happens for coral reefs, which lose their appeal when they are damaged by waste. Cities and resorts often clean their beaches to attract tourists, but this means that a lot of money must be spent for that activity.

How does marine litter affect Sri Lanka?

There are not many data on the amount and composition of marine litter in Sri Lanka. The few studies that have been published show that there is a lot of waste around the island and that the abundance could be higher than in other countries. In 2015 Sri Lanka has also been classified as the top 5th producer of marine litter in the whole world. The impact of marine litter in Sri Lanka, however, is not only due to its abundance but also to the presence of many important and fragile habitats that could be affected. The island is dotted with estuaries and lagoons, coral reefs and mangroves. It is important to keep all these environments healthy and they are also important to fishing and tourism.

Coral reefs

Coral reefs have some of the highest levels of biodiversity in the world. A quarter of all species in the ocean rely on coral reefs at some point in their lives. Worldwide, more than 500 million people rely on coral reefs for their food or income through fisheries. Coral reefs have a complex three-dimensional structure that creates a high surface area for photosynthetic corals to catch sun rays as energy, and many specific niches for creatures to live. Their upright structure traps food particles washed by in the currents and many forms of life on coral reefs filter these particles to feed. This highly efficient particle trapping has earned coral reefs the label of a “wall of mouths”. However, this characteristic structure makes coral reefs particularly sensitive to marine litter.

The branching and plate corals which form much of the reefs’ surface can easily catch large litter items such as plastic bags, ropes and nets as they wash by. This can lead to breakage of coral colonies which have taken decades to reach their size, or to smothering which takes away their access to solar energy and ability to catch food particles, leading to starvation. Abrasion of coral tissue can also occur as the litter items get dragged around the colony by the ocean surge leading to wounds. It was even discovered that



Figure 4. Photo of fishing wire removed during a beach clean. Fishing wires and nets can be eaten by animals or entangle animals.

plastic litter can build up a layer of bacteria as they float around the sea which they then transfer to the corals they entangle on. This leads to higher levels of disease in coral reefs with more litter.

As corals and many other species in coral reefs catch particles from the water to eat, small microplastics can easily be trapped by them. Studies have found that confused corals eat microplastics when normal food items are also present. This may impact their energy uptake as corals which had been eating microplastics did not want to eat normal food afterwards. Other research also found that potentially harmful chemicals which make plastics more flexible ended up in coral tissues. Reef fish are also affected, and some specimens sometimes show more dangerous behaviour after they eat microplastics. They end up being eaten more often by predators because they swim about more as they had full bellies but do not get any nutrition.

In Sri Lanka coral reefs are estimated to cover 2% of the coastline. Coral reefs are balanced ecosystems and when the corals at the foundation of that system lose energy, or take up toxins and processes such as predation between fish species are altered, this can lead to dramatic changes in the system as a whole, which will impact its capacity to support so much life and people's livelihoods.

Mangroves

Mangroves are among the most productive ecosystems in the world and have been defined as the 'rainforests of the sea'. They are a group of woody tree species living in the Tropics with the unique ability to live in saltwater. Mangroves create an important habitat that provides many ecosystem functions. These areas are feeding, breeding and nursery grounds for many animals, providing food and shelter. Mangroves reduce erosion from wind and waves, and therefore support and protect the lagoons and the estuaries. They are also important to fight climate change since



Figure 5. Marine litter among mangroves

they absorb CO₂ (carbon dioxide) from the atmosphere more efficiently than terrestrial habitats. The mangroves also provide communities with fuel wood, medicines, timber for construction, and boat building material.

Mangrove's plants contribute to reducing pollution of near-shore coastal waters by trapping pollutants before they can enter the estuaries and lagoons, leading to improved water quality. Recent studies showed that mangroves can also trap marine litter. Big pieces of plastics are frequently found among the mangrove's trees, often caught by the aerial roots (pneumatophores) that stick out of the ground. Object that can wrap around these roots such as plastic films, plastic bags and food wrapper are particularly abundant. Very little pieces of plastic also accumulate in the mud and sand in between the mangroves' roots. The majority of this litter seems to arrive here from the sea rather from the land. The mangrove forests are then a 'net' that traps marine litter for the long term.

In Sri Lanka mangroves grow along the sheltered coastlines associated with estuaries and lagoons. The largest of the mangrove habitats in Sri Lanka are found in Puttalam Lagoon, Kala Oya basin and Trincomalee. The impact of marine litter on mangroves and to the species that live in this ecosystem has yet to be fully investigated, and the interest of scientists is growing, along with the number of published studies.

Monsoons

The intensification of the rainfall due to the monsoons occurs every year in Sri Lanka. The Summer Monsoon (or Southwest Monsoon) lasts from March to August and affects the southwest of the country, while the Winter Monsoon (or Northeast Monsoon) has major impacts between September and February in the northeast. The abundant rain increases the water runoff from land to the oceans and in the rivers. This water transports the litter accumulated on land to the sea and disperses it in the marine environment. The litter can also be a problem if it clogs storm pipes, decreasing the amount of flood water that can be drained away.

Sri Lanka's elephants and litter

Marine litter is only part of the problem. Litter is affecting wildlife on land as much as those at sea. There are estimated to be less than 7,500 wild elephants in Sri Lanka, which usually walk over 30 kilometres per day and can seed up to 3,500 trees. However, it is now a common sight to see large herds of wild elephants walk daily on to three main litter dump sites in Sri Lanka. Rummaging through mounds and mounds of rubbish looking for food scraps and mistakenly also eating plastic, litter, and twine. They consume the litter along with the food scraps. The elephants' faecal matter has been found to contain microplastics, twine and plastic bags. This will slowly and painfully kill them. The dump sites are getting so large they are encroaching onto the forests. Electric fences were put in place, but this was no deterrent for the determined animals. Sri Lanka's government are now trying a trench method around the dump sites to deter not only the elephants but also other wild animals.

What can we do to reduce marine litter?

There are several things you can do to tackle the problem of marine litter. One option is removing the litter from the environment where possible. Beach clean-ups have become popular around the world and the scientific community has recognised their importance not only to decrease the amount of waste that can enter (or re-enter) the sea, but also to increase the awareness of participants about the effects of marine litter. Beach clean-ups can also be useful to collect data, and millions of citizens around the world have volunteered to help scientists carry out surveys picking and recording litter on beaches over several years.

However, cleaning is not enough. What we should aim at instead is stopping the marine litter at its generation stage. Some countries have decided to ban some items completely, prohibiting production, import, sale and use. With this type of legislation governments hope to reduce the production of waste pushing towards the use of more sustainable alternatives like reusable containers. In September 2017 Sri Lanka banned polythene (a type of plastic) for products like food wrappers that are too thin (20 microns or less) to be recyclable. From 1st January 2021 Sri Lankan government also bans a series of plastic products such as plastic sachet, inflatable toys and packaging of PET and PVC (two types of plastics) for chemicals and pesticides.

There are however initiatives that everyone can embrace to improve the way in which we deal with waste. The five most effective actions you can take are known as the 5 Rs:

1. REDUCE: produce less waste and, in particular, use less single-use items. Do not buy food that is excessively wrapped in plastic, like fruit that could be easily sold protected just by its natural peel. Avoid buying single-use cutlery and cups if you can use metal and glass ones instead. Packaging made from several materials together, such as the single dose sachets for condiments, should also be avoided because they are impossible to recycle and have to go in landfills. Remember, waste mismanagement is the main source of material ending up in the ocean so if we produce less waste, we are automatically producing less marine litter;

2. REUSE: if you can choose, buy packaging that can be reused. For example, if you have access to clean water, refillable water containers can be used over and over again instead of plastic bottles. You can also reuse your plastic bags instead of binning them after a single-use. Every time we reuse an item instead of binning it, we are saving it from potentially becoming marine litter;

3. RECYCLE: plastic bottles, aluminium cans and paper sheets are examples of items that might be recycled in your area. If recycling is occurring, remember to separate these items from the rest of the waste to make the collection and the recycling easier. You can also separate organic food and 'recycle' it through composting. Your waste will become fertilizer to grow more food again. You will give new life to the material, preventing it from lying in a landfill or, worse, in the sea;

4. REPAIR: if you break something, check whether it can be repaired before discarding it. Think about repairing also when buying new products: some objects might be designed to last longer and to be repaired more easily. Why not buy them instead of single-use items?

Teacher tip: ask students an item they could have recently repaired instead of throwing away. Such as sewing up a hole in your clothes or gluing something back together.

5. REFUSE: saying 'no' can sometimes be a powerful tool against marine litter. Say 'no' to useless single-use plastics that are offered to you. You can do this by not accepting plastic bags when you buy items that you can transport in a your purse or backpack, and saying 'no' to plastic straws if you can drink directly from the glass.

Last, but not least, you can raise awareness and educate! Speaking about marine litter in the community center during events and to the wider community around you will help kids and other people to open their eyes to the problems that marine litter is creating. The more people that change their behaviour towards reducing the production and the mismanagement of waste (for example, reducing littering or using single-use plastics), the better chances we have to tackle marine litter. The activities developed in the CLiP Education Packs will help you introduce pupils to marine litter and to the possible ways of solving the problem.



Figure 6. Removal of marine litter from the beach is a good start to combat marine litter and increase awareness

CLiP Community Education Pack

5 lessons around the subject of marine litter

This pack is aimed in the middle of this age range to cater for all – some activities will be split between lower and higher grades. E.g. lower grades can also do the higher-grade activity as an extension, but higher grades will focus on the one higher grade activity

1. An introduction to marine litter

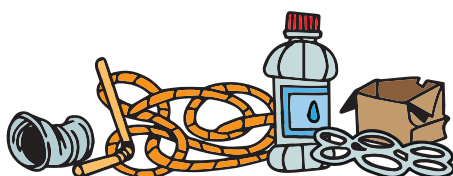
Marine litter is introduced to students. There is information on its composition, origins and effects, with a particular focus for Sri Lanka and its habitats. Plastic is introduced as the main marine litter type in the marine environment. It is the most diffuse and problematic marine litter in the world, including in Sri Lanka. Microplastics are also introduced explaining how they are formed through degradation of larger pieces due to wave action and UV exposure.

The activity allows the students to understand the properties of different materials and explore what happens to these items in water and over time (e.g. break-up, rust, biodegrade). Compare natural items which include food scraps and leaves, to man-made, synthetic items such as plastics and metals and show whether they would float or sink in the oceans. Mention how food waste and natural products will break-down and decompose over time. Different densities of materials, whether they have air in, or their shape all affect whether they float, sink slowly, or sink quickly.

2. Marine Litter in Sri Lanka

This lesson explores marine litter origins, and it is focused on a field trip and beach clean. The aim is to focus students on their community and the local environments that will be familiar to them. It focuses on the habitats impacted (focusing on mangroves) and why it is important we do not lose these habitats as they are vital to healthy ecosystems and livelihoods. The students will also be invited to speak about marine litter in their families and communities to spread the message even further.

For the activity of this lesson, students will be brought outdoor to replicate the work of marine litter scientists, who collect and categorise marine litter. Please pay attention during the collection because sharp and contaminated items could be hazardous. Use thick gloves if possible or litter pickers if available. Correct clothing and footwear is advised for all when outside the classroom, including sun protection. To reduce the risks of this activity, please consider the weather forecast, the characteristics of the location



you are visiting: beaches will have tide times to consider (better time is after the high tide) while rivers should be checked for floods. Community spaces and traffic should be also assessed.

Activity tip: this activity can be also used to teach the importance of not disturbing the natural environment, leaving shells and small animals on the beach rather than collecting them. If the whole activity takes too much time, you can carry out the collection and the counting at different times.

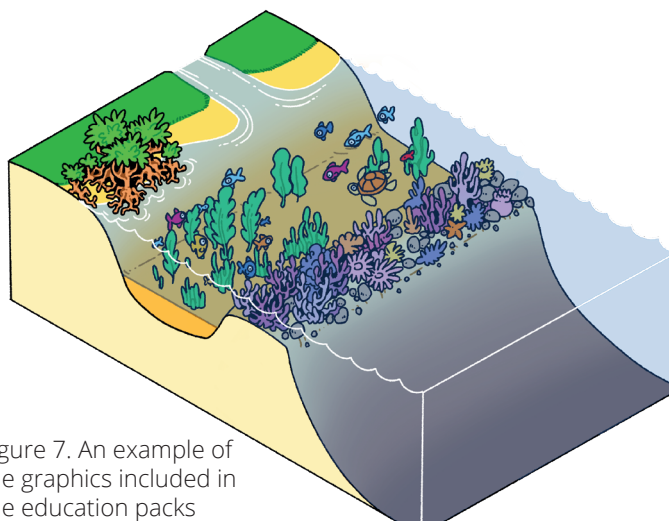


Figure 7. An example of the graphics included in the education packs

Beach and community cleans not only help remove the marine litter that has washed up on the beach, but recording the type and number of litter items found can also be fed into national and global programmes to help understand the sources of litter to the area. Look among the suggested further readings to discover how to join these campaigns.

A few graphs could be produced. For example, students can produce a bar graph with x-axis including type of litter, and y-axis being number the students found.

3. How does litter impact marine life?

This lesson wants to teach that marine life is harmed by marine litter. It introduces the detrimental effects that litter has on coral reefs and on food chain when animals ingest waste. The lesson also explains how monsoons increase litter discharge in the sea and how they can transport invasive species.

The lesson splits up topics on learning levels for younger and higher grades.

The activity is based on the concept of food chain and on how plastics and microplastics can disrupt this important process. Let students draw animals in the food chains (plankton->small fish->big fish->shark for example) and then discuss with them on what happens if any of the animals eats some plastic. Remember, every time an animal eats another animal that has plastic in its stomach, it ingests both food and litter. This is how plastic accumulates in predators. Since plastics can release toxins, which can cause illness and diseases in animals, larger animals at the top of the food chain might be more exposed because accumulate larger quantities of plastic ("bioaccumulation").

Activity tip: Students might include humans in the food chain since we eat fish, lobster, clams and other seafood. Let them note that we remove the guts of many species and we only eat their flesh. Therefore, the exposure to microplastics and plastic is limited, and marine litter is not a reason to reduce seafood consumption.

4. What are the solutions?

This lesson will help explore solutions to the marine litter problem and help students understand how their actions can help tackling this issue. Students will be invited to pay more attention to how they manage their waste providing examples of the 5R's. If the community center has any programme for recycling, this would be a perfect time to introduce it to the students.

There are four activities. The first activity is based on items found during beach clean-ups and aims at raising awareness of the beneficial impact they would have making sustainable choices in their everyday life. The activity shows how much reduction in marine litter could have been achieved if items they found on the beach had been disposed of correctly using the 5R's. When handling waste, please pay attention to sharp or contaminated items.

Activity tip: if your community center does not have a recycling scheme, you can sort items like metal cans, metal caps, plastic bottles, plastic caps, hard plastic containers/ drums and glass bottles in the 'recycling' pile, since these are all recyclable. If your community center has a recycling scheme, divide the 'recycling pile' between what is actually recycled in your community center and what can be potentially recycled. If you have not collected any litter, you can also let children draw the type of litter they have observed or they produce in their household and use those drawings to do the sorting. Ask students to identify these initiatives and to think of more ways that they could help their communities reduce, re-use and recycle.

The second activity will involve the active research of initiatives from around the world about the removal of marine litter or the correct management of waste. The research of initiatives that could be reproduced in the students' communities should be encouraged. Students should understand where the initiatives are occurring, what type of organisation carry them out, what are the costs involved and how they can be replicated.

The third activity will ask students to invent a marine litter solution or to adapt one of the solutions found in the previous activity.

The fourth activity is for awareness raising purposes. Students should think of a method to communicate what they have learnt in the previous four lessons and to educate their local community. Suggest to them a poster, a song, a dance, or artwork. Creativity is at the centre of this activity! The litter saved from lesson 2 could also be used as part of the art.

5. Invasive species (For Advanced Learners)

The fifth lesson is meant to be an expansion for students of advanced learning. The lesson will raise awareness of the global issue of invasive species, often transported in new habitats by drifting marine litter.

There are no activities but there are a couple of examples of invasive species that will explain to clarify to students what the possible effects of introducing animals in non-native habitats are.

Further reading

A list of websites linked to some beach clean-ups organised around the world are provided below. These websites are useful tools to understand how to organise a clean-up, how to connect with the international community, how to collect data and to have general information about marine litter.

UK: Marine Conservation Society - www.mcsuk.org/beachwatch/

South Africa: The Beach Co-op - www.thebeachcoop.org/

US: Ocean Conservancy - www.oceanconservancy.org

Australia: Tangaroa Blue - www.tangaroablue.org/

For more information about the Commonwealth Litter Programme, please visit www.cefas.co.uk/clip/



Figure 8. An example of the graphics included in the education packs



Commonwealth
Litter Programme

Lesson pack for learners on the subject of marine litter

Sri Lanka

**5 lessons to educate and influence students
around the subject of marine litter**



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UK Government

Community Educational Pack

Marine Litter Factsheet

What is the marine environment and why is it important?

The seas and oceans around the world are called the marine environment. The word marine means saltwater, like seawater! The marine environment covers more than 70% of our planet and is the biggest habitat in the world, hosting the highest number of animal and plant species. Since there are a lot of different creatures living in the sea, we say that the marine environment has high 'biodiversity'. Many of these species that live in the seas and oceans do not even exist on land.

Marine animals and plants rely completely on the seawater and many would perish once taken out of the sea. Marine animals live, eat, and reproduce in the marine environment interacting with each other, with plants and with other creatures and forming what we call 'communities'. In each community, each species has a specific function. Different part of the sea such as the water, the mud at the bottom of the ocean or the sand of the beaches host different types of animals and plants. We call these different places 'habitats'. Each habitat has a different community.

The diversity of marine animals, plants and of their habitats is very important to keeping biodiversity high and a successful and healthy environment. Humans also rely on this high biodiversity that is found in the oceans for food, business and fun!

Sri Lanka is surrounded by the sea and its waters are home to many marine animals and plants, such as sea turtles, coral reefs, and mangroves. They attract tourists and the fish provide an important source of food! The marine environment should be a healthy and lively place for these animals and plants to live, so that humans can benefit too. However, marine litter can impact the marine environment and therefore the animals, plants and habitats it hosts.

What is marine litter?

Marine litter, or marine garbage, 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 around the world, and approximately 8 million pieces of marine litter enter the marine environment every day!

Plastic makes up most of marine litter in the world, up to 80% in some places. The term 'plastic' covers a wide range of materials ('polymers') that can be moulded into many shapes. Plastic bottles, food wrappers and old fishing gear are among the most common items that are found as marine litter in the marine environment around the globe.

In the sea, UV exposure, wave and wind action break down larger plastic items into small fragments called microplastics and even smaller nano-plastics.

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. Aluminium drink cans and other metal objects are also frequently found on beaches and in our seas.

Where does it all go?

Different items have different densities which means that they can either sink or float. Large items may initially trap air and float, but over time the material can get brittle and break up into smaller pieces which and sink. Research now suggests that 94% of plastics in the marine environment end up on the sea floor.

Winds, waves, and currents move litter around our globe. Some of it ends up deposited onto our shorelines. However, large oceanic currents can move items around the oceans like conveyor belts. These currents can sometimes form huge whirlpools called 'oceanic gyres' which can trap together large amounts of marine litter. There are five gyres around the world and the largest and most famous of these is the Great Pacific Garbage Patch, where it is estimated that there are 1.8 trillion pieces of plastic! The Indian Ocean Gyre is smaller in size; however, large amounts of marine litter can be found there.

How long does marine litter last?

Scientists have estimated how long man-made items take to break down in the marine environment, although the exact times are unknown and depend on the conditions. Times are likely to be longer at sea where conditions are wet and much cooler than on land. Plastic is one of the most durable materials, with harder items such as bottles thought to last in the environment for 450 years!

How does marine litter harm animals?

Marine litter can cause serious damage to marine life. Every year millions of marine animals are entangled, harmed, and killed by marine litter. Animals can mistake litter for food which if eaten can harm them and cause illness or even death. Big animals like marine turtles, birds, dolphins, and whales can ingest big items of plastic, while smaller animals like small fish, jellyfish and even plankton can also feed on microplastics. A recent whale washed up in Indonesia had 6kg of plastic in its stomach, including 100 plastic cups!

Marine animals can become entangled (trapped) in litter. Fishing nets and a six-pack can ring are common items that cause harm. Animals become tangled and are unable to get out, feed, escape predators and even breathe, which can cause death.

Marine litter can cause damage to habitats too. Large litter items such as lost or abandoned fishing gear can damage fragile areas like coral reefs, particularly during bad weather. Furthermore, 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.

Marine litter and Sri Lankan marine habitats

Corals

Coral reefs have some of the highest levels of biodiversity in the world. A quarter of all species in the ocean rely on coral reefs at some point in their lives. Worldwide, more than 500 million people obtain their food or income through coral reefs.

Coral reefs have a complex three-dimensional structure that creates a high surface area for photosynthetic corals to catch sun rays as energy, and many specific niches for creatures to live. Their upright structure traps food particles washed by in the currents and many forms of life on coral reefs filter these particles to feed. This highly efficient particle trapping has earned coral reefs the label of a “wall of mouths”. However, this characteristic structure makes coral reefs particularly sensitive to marine litter.

In Sri Lanka coral reefs are estimated to cover 2% of the coastline, but they need a balanced ecosystem to thrive. When the corals at the foundation of that system lose energy or take up toxins, the processes they support such as predation between fish species are altered. This can lead to dramatic changes in the system which will impact the corals capacity to support so much life and people’s livelihoods.

Mangroves

Mangroves are among the most productive ecosystems in the world and have been defined as the ‘rainforests of the sea’. They are a group of woody tree species living in the tropics with the unique ability to live in saltwater. Mangroves create an important habitat that provides many ecosystem functions. These areas are feeding, breeding and nursery grounds for many animals, providing food and shelter. Mangroves reduce erosion from wind and waves, and therefore support and protect the lagoons and the estuaries. They are also important to fight climate change since they absorb carbon dioxide (CO₂) from the atmosphere more efficiently than terrestrial habitats. The mangroves also provide communities with fuel wood, medicines, timber for construction, and boat building material.

What about the mangroves in Sri Lanka?

In Sri Lanka, mangroves grow along the sheltered coastlines associated with estuaries and lagoons. The largest of the mangrove habitats in Sri Lanka are found in Puttalam Lagoon, Kala Oya basin and Trincomalee. The impact of marine litter on mangroves and to the species that live in this ecosystem has yet to be fully investigated, and the interest of scientists is growing, along with the number of published studies.

LESSON 1

An Introduction to Marine Litter

Key words

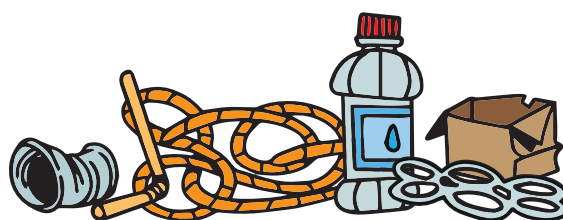
- Marine Litter
- Ecosystem
- Material
- Plastic

Lesson aim

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

What is marine litter?

The Environmental Programme of the United Nations defines marine litter (garbage) or marine debris as any persistent, manufactured or processed solid material discarded, disposed of, abandoned, or lost in the marine and coastal environment. In summary, marine litter is any solid waste that does not naturally decompose and that ends up in the marine environment.



Garbage found near the beach which could enter the sea by rain, wind or a river.

Where from?

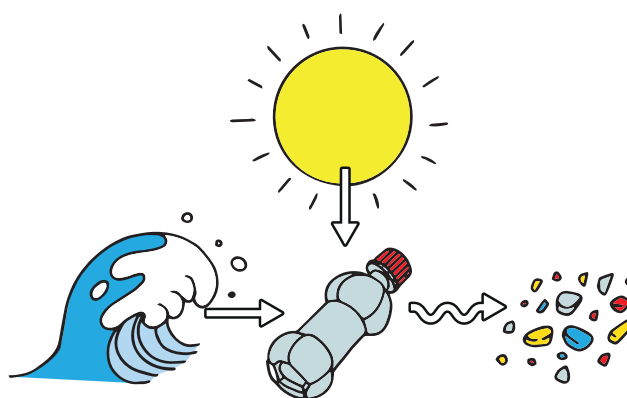
You may ask, how does waste get in the ocean? Litter, or garbage, ultimately comes from humans. When we correctly discard of something after use, it will enter the waste-stream and either be recycled or go to a landfill or to be incinerated (burnt). However, sometimes it ends up loose on the ground and eventually finds its way to the sea.

How?

Litter is often dropped by or discarded by humans improperly around their communities and in public places. This means that it is common for litter to arrive in the ocean by transport through rivers, sewage, and storm outfalls. Litter can also enter the marine environment by being blown by winds or it can be also abandoned directly in the sea (as with fishing gear).

What is the most common type of marine litter?

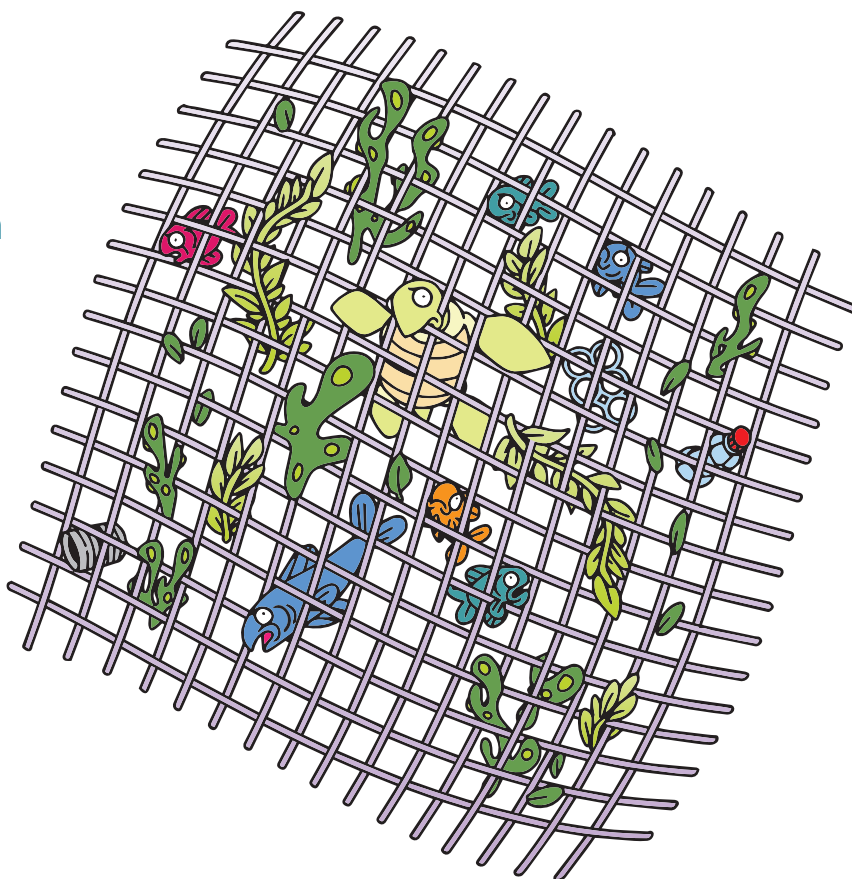
Plastic is the most common materials found in the marine environment, sometimes making up to 80% of all litter found on beaches. Over time, due to wave action and UV exposure (from the sun), plastic breaks down into smaller and smaller fragments called microplastics. Glass is the second most common material found on beaches. It mostly comes from bottles and when broken can be a hazard to beach users and animals.

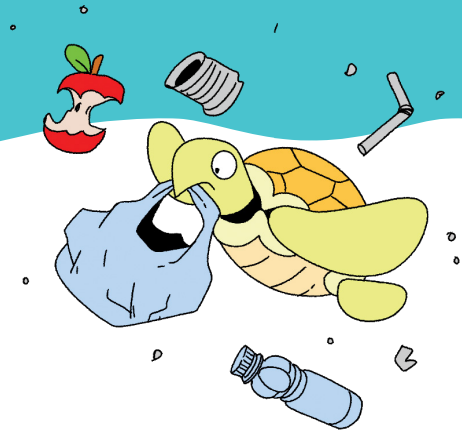
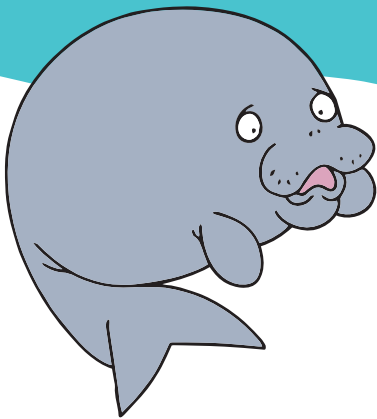


Aluminium drink cans and other metal objects are also frequently found on beaches and in our seas.

Can marine litter harm marine animals?

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, which can cause ill effects





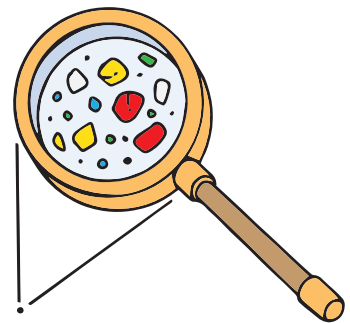
and sometimes starvation. Litter can also cause entanglement and habitat damage, for example through the introduction of invasive species.

Can marine litter harm humans?

Marine litter can harm humans in many direct and indirect ways.

Litter on beaches, riverbanks and in oceans looks unappealing to people, and this means that people can enjoy less being on the beach. In this way, litter can affect tourism and income to areas because less people want to visit dirty beaches. Sharp objects like pieces of metal and glass can also hurt people.

Marine litter can also create problems for fisheries because it can damage the boats used by fishers and can harm the fish, decreasing how much that can be caught.



What does marine litter do when in the oceans?

Marine litter items have a wide variety of properties that affects what happens to them in the oceans. Dense and heavy items (glass, heavy plastics) sink to the seabed and become buried in sediment, some items are suspended mid water column, while some items (usually light plastic items) float on the surface. Oceanic currents and winds transport these floating items around the world, concentrating items in large oceanic whirlpools called gyres.



A beach with a lot of litter. Not many people might want to visit this place unless the litter is removed. © Cefas.

LESSON 2

Marine Litter in Sri Lanka

Key words

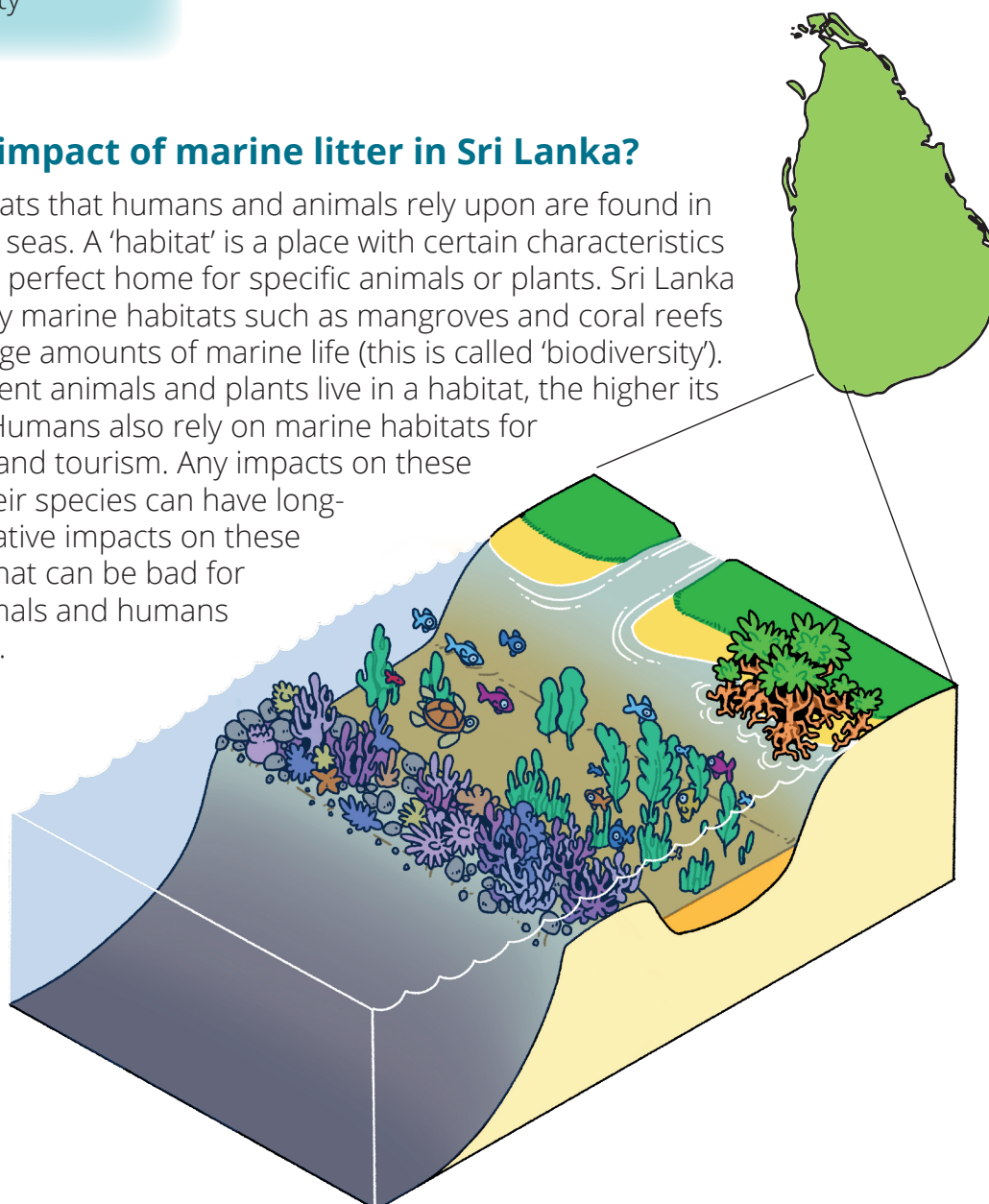
- Beach clean
- Field trip
- Community
- Beach and river
- High-tide
- Coral reefs
- Mangroves
- Biodiversity

Lesson aim

This lesson we will explore marine litter and how it enters important habitats and environments in Sri Lanka.

What is the impact of marine litter in Sri Lanka?

Important habitats that humans and animals rely upon are found in our oceans and seas. A 'habitat' is a place with certain characteristics that make it the perfect home for specific animals or plants. Sri Lanka is home to many marine habitats such as mangroves and coral reefs that support large amounts of marine life (this is called 'biodiversity'). The more different animals and plants live in a habitat, the higher its biodiversity is. Humans also rely on marine habitats for fishing, leisure, and tourism. Any impacts on these habitats and their species can have long-lasting and negative impacts on these environments that can be bad for the marine animals and humans relying on them.



How are mangroves impacted?

Mangrove's plants contribute to reducing pollution of near-shore coastal waters. The mangroves' roots and trunks create a natural net that trap pollutants before they can enter the estuaries and lagoons, improving water quality. Recent studies showed that the net created by the mangroves can also trap marine litter. Big pieces of plastics that can wrap around the trunks and the roots (plastic films, plastic bags and food wrapper) are frequently found among the mangrove's trees. Little pieces of plastic also accumulate in the mud and sand in between the mangroves' roots where grazing animals such as crabs, fish and snails risk to eat them instead of their normal food.



Image of mangroves and their many branching aerial roots which can trap marine litter. © Cefas

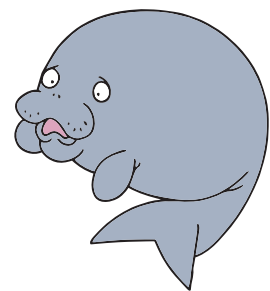


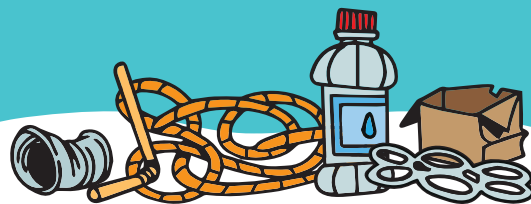
Mangrove and their branching aerial roots which have trapped marine litter. © Cefas

Monsoons can increase the amount of marine litter entering our marine environments.

The intensification of the rainfall due to the monsoons occurs every year in Sri Lanka. The southwest Monsoon lasts from March to August and affects the southwest of the country, while the northeast Monsoon has major impacts between September and February in the northeast.

The abundant rain increases the water runoff from land to the oceans and in the rivers. This water transports the litter accumulated on land to the sea and disperses it in the marine environment. The litter can also be a problem if it clogs storm pipes, decreasing the amount of flood water that can be drained away.





What is a beach clean-up?

We now know that different materials can become marine litter and how they might enter the environment. In lesson 4 we will discover how we can prevent waste from becoming marine litter disposing of it in the proper way and producing less of it. However, we can remove the one that has already been created via community litter picks and beach clean-ups.

Beach clean-ups have a lot of functions on top of removing litter from the environment. For example, they are a great way to make people aware of the marine litter that is present in your local community and environment. Through clean-ups, you can also help scientists that collect and categorise marine litter. You can learn where litter comes from. Nets, for example, could have been lost by fishermen. You might be also able to notice that the frequent use of disposal medical equipment, like face masks, due to Covid-19 means that masks are becoming increasingly frequent in some areas and on beaches.

Sometimes you might find a lot of similar items all together. These might come from containers falling off ships. In the past, large numbers of specific items, such as rubber ducks or trainers, washed up on beaches around the world after having been lost at sea in this way.

During beach clean-ups, shells and small animals on the beach should not be disturbed. They are part of the natural environment and not marine litter, so they should not be collected.



LESSON 3

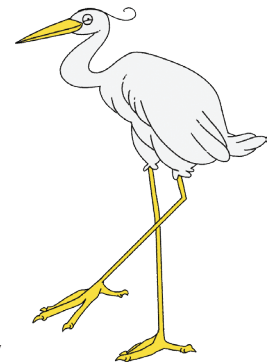
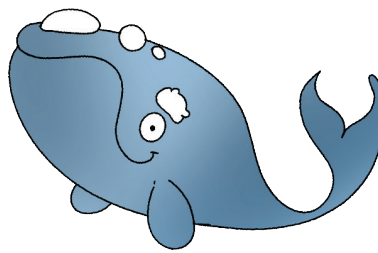
How does Litter impact Marine-Life?

Key words

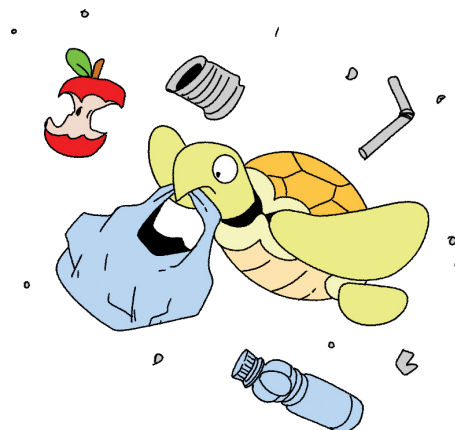
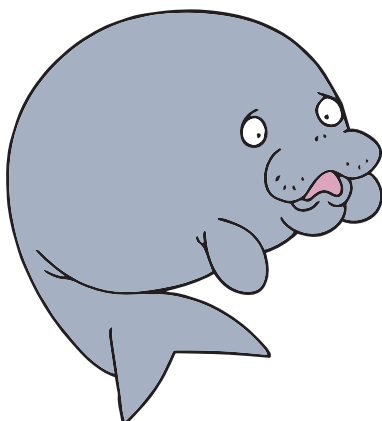
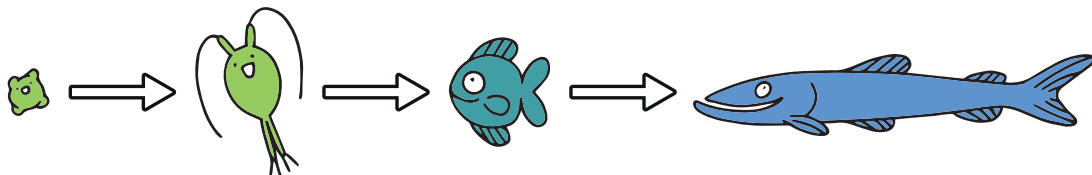
- Food-chain
- Food-web
- Phytoplankton
- Microplastics
- Toxins
- Habitats
- Climate change
- Sea level rise

Lesson aim

This lesson will help explore the effects marine litter can have on marine life.



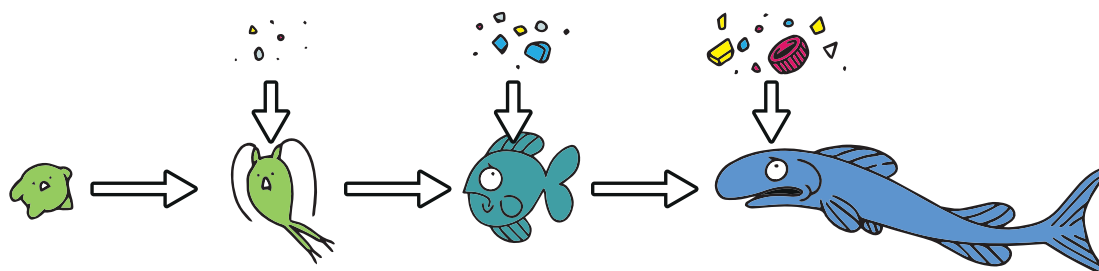
Our seas and oceans are bursting with life, hosting plants and animals of all shapes and sizes. These organisms range from tiny algae ('phytoplankton') which you would need a microscope to see, to larger fish, sea turtles, manta rays, dugongs, and whales! They are all linked in a giant marine food-web which can be affected by marine litter at many different levels.



How does marine litter fit into the food-web?

Different sized animals eat different things, e.g. some large fish eat smaller fish and they risk to eat different types of marine litter. The tiny zooplankton and small fish can ingest 'microplastics', that we mentioned a few lessons ago. Bigger animals like sea turtles and whales can ingest larger litter items, such as plastic bags.

What happens when animals eat plastics?



Plastics release toxins, harmful chemicals, which can cause animals to become ill. Plastic can also take up a lot of space in an animal's stomach, this means there is less space for food, then the animal does not eat enough and can become very ill. These side effects can last in the animals and plastics can even be passed to predators if the prey they eat have eaten plastic themselves!

Advanced learners:

Plastics release toxins, which can cause negative side effects to animals. As animals get larger and are higher up the food-chain, these toxins bioaccumulate (become larger in concentration) and can cause greater and greater effects. Such effects include illnesses and disease like the presence of pathogens or inflammation of the organs.



Photo of fishing wire removed during a beach clean. Fishing wires and nets can be eaten by animals or entangle animals.

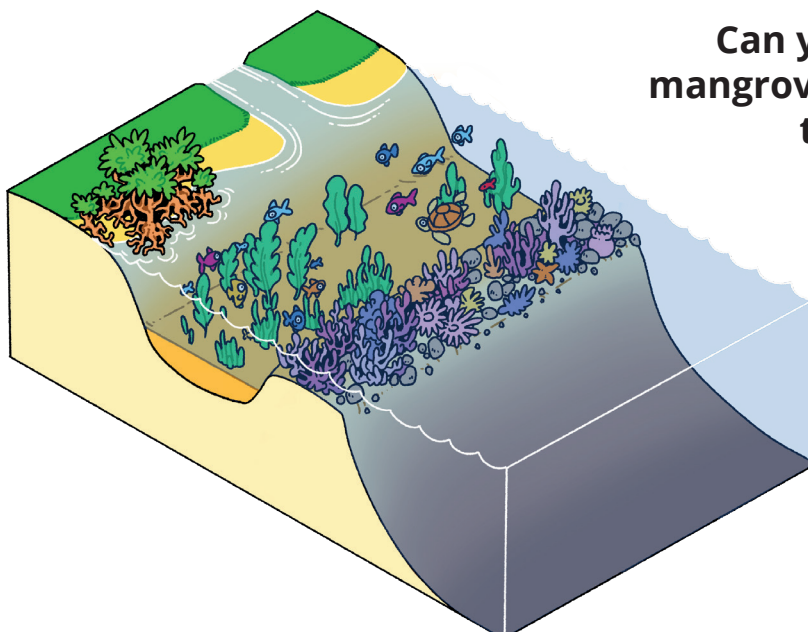


Healthy coral reefs with many fishes. Photo Courtesy of Daisy Buzzoni.

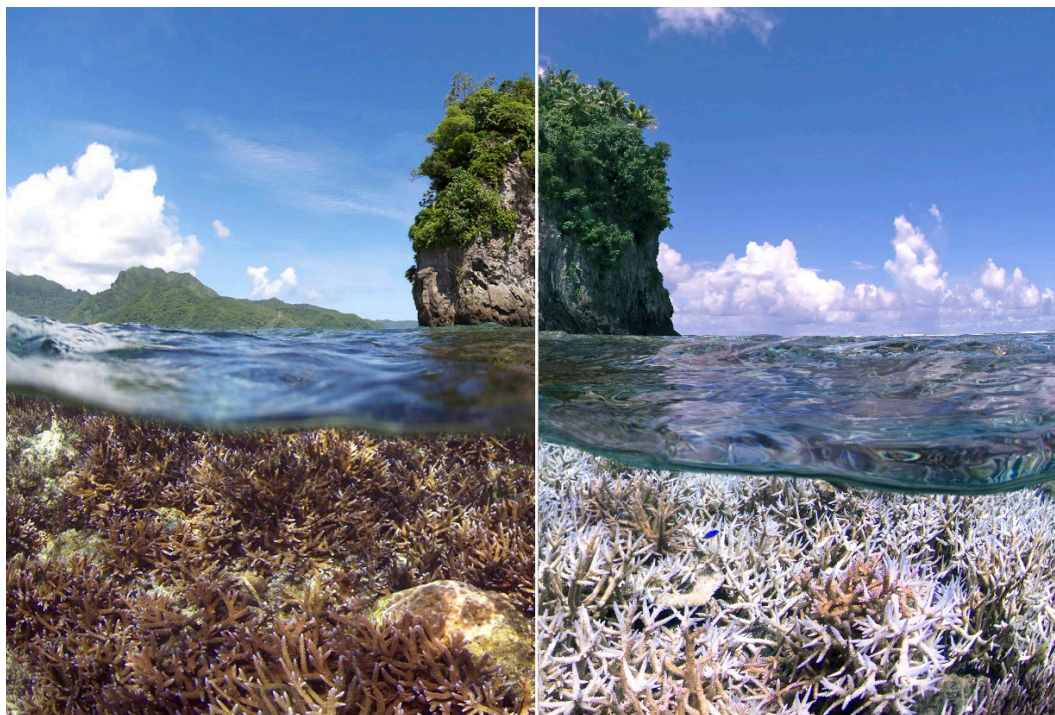
You may have learnt already about the harmful effects of climate change and rising sea water temperatures on mangroves and coral reefs but litter also poses a serious threat, which can have serious impacts on the biodiversity that these important habitats can support.

Impacts of marine litter on coral reefs

An important marine habitat of Sri Lanka are coral reefs, that cover 2% of its coastline. Coral reefs have some of the highest levels of biodiversity in the world. A quarter of all species in the ocean rely on coral reefs at some point in their lives!



Can you point to the mangrove and coral reef on this image?



Before and after the starvation and “bleaching” of a coral reef. Photo credit: The Ocean Agency

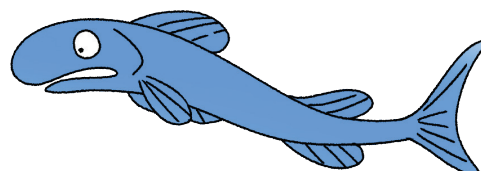
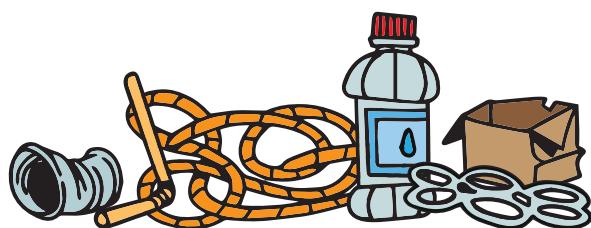
Coral reefs are made up of small animals (‘polyps’) that live together in hard structures that look like large rocks, flat plates or branches. Each structure of these is home to thousands of polyps that share their home with small organisms called microalgae. These organisms work together to provide food and shelter for each other. The coral animal feeds from the water column, whereas the algae use ‘photosynthesis’ to get their food and energy from the sun like a plant would do in its leaves.

Coral reefs can be particularly affected by all sizes of marine litter. The branching and plate corals which form much of the reefs’ surface can easily catch large litter items such as plastic bags, ropes, and nets as they wash by. This can lead to breakage of colonies which have taken decades to reach their size. Plastic can also cover the corals stopping the light from reaching the algae, blocking the photosynthesis (‘smothering’). Smothering also interfere with the polyps’ ability to catch food particles, leading to starvation.

Abrasion of coral tissue can also occur as the litter items get dragged around the colony by the ocean surge leading to wounds. It was even discovered that the bacteria that grow on plastic litter floating around the sea can infect the corals wounded or entangled by the litter. This leads to higher levels of disease in coral reefs with more litter.



It may not be possible to see the impact of microplastics on a reef until it is too late! Photo Courtesy of Daisy Buzzoni.



How are coral reefs impacted by microplastics?

Coral animals have small tentacles to catch small zooplankton particles from the water to eat. Unfortunately, small microplastics can easily be trapped and eaten instead of food by the polyps. Studies have found that confused corals eat microplastics even when normal food items are also present. The accumulation of microplastics can stop corals from eating their normal food afterwards. Other research also found that potentially harmful chemicals (used to make plastics more flexible) ended up in coral tissues.

Can marine litter affect coral reef habitats in any other ways?

Coral reefs are balanced ecosystems. When the corals lose energy (because of breakage or smothering) or take up toxins through ingesting microplastics, there might dramatic changes because corals are at the foundation of the whole coral reef system. Marine litter impact on corals can therefore reduce the reef's capacity to support so much life and people's livelihoods.

Reef fish are also directly affected, and some specimens sometimes show more dangerous behaviour after they eat microplastics. They end up being eaten more often by predators because they spend more time swimming around since they have full bellies but do not get any nutrition. This alters processes of predation between fish species leading to dangerous unbalances (such as too few preys). Small pieces of marine litter such as the microplastics can also pass up the food-chain from the coral, to grazing fish, to larger predators.

Large pieces of marine litter such as bags and nets can also trap (entangle) animals such as fish, turtles, and sharks. Being entangled by plastics and eating litter can kill the animals by starvation, lack of oxygen, easy prey for predators and even illness and diseases.

Advanced learners:

The hard structures created by the polyp colonies are made of a material called calcium carbonate, which also commonly makes up seashells. Polyps live in symbiosis with algae, and they both benefit from each other. The algae photosynthesises for food and provide energy for the coral, and the coral provides shelter and protection for the algae. The animal part of the coral will feed directly from the seawater column on food, such as zooplankton. The polyp's tentacles are highly efficient particle trapping mechanisms, which has led to coral reefs being called a 'wall of mouths'.

Sri Lanka's elephants and litter

Marine litter is only part of the problem. Litter is affecting wildlife on land as much as those at sea. There are around 7,500 wild elephants in Sri Lanka, which usually walk over 30 kilometres per day and can seed up to 3,500 trees.

However, it is now a common sight to see large herds of wild elephants walk daily on to three main litter dump sites in Sri Lanka. Rummaging through mounds and mounds of rubbish looking for food scraps and mistakenly also eating plastic, litter, and twine. They consume the litter along with the food scraps. The elephants' faecal matter has been found to contain microplastics, twine and plastic bags.

Sadly, this will slowly and painfully kill them. The dump sites are getting so large they are encroaching onto the forests. Electric fences were put in place, but this was no deterrent for the elephants. Sri Lanka's government are now trying a trench method around the dump sites to deter not only the elephants but also other wild animals such as deer.

Invasive species

Plant and animals that do not belong to a habitat can be transported there by humans. If these organisms survive and thrive, they can become invasive. The invasive species can create problems to the equilibrium of the habitats. The species that originally lived there ('native species') might be impacted in several way, finding less food, less space to nest, or they might be even eaten by the new invasive species. You can learn about invasive species in lesson 6, which is dedicated to this topic.

What are the Solutions?

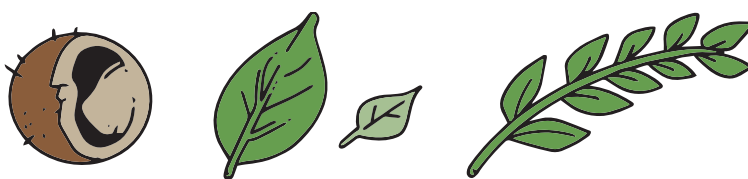


Key words

- Food-chain
- Food-web
- Phytoplankton
- Microplastics
- Toxins
- Habitats
- Climate change

Lesson aim

This lesson will help explore solutions to the marine litter problem and help us understand how our actions can help.

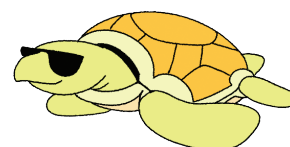


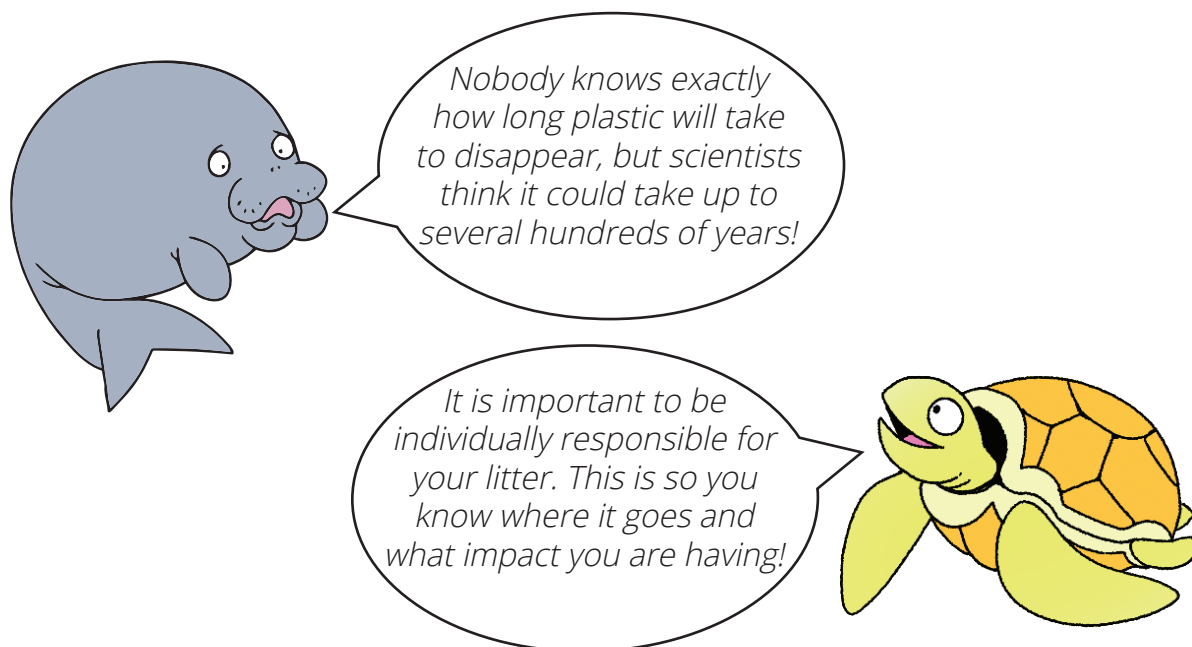
It is important that we all help to reduce the amount of litter that enters the marine environment. In the first lesson, we learnt the difference between natural and synthetic materials. In the second lesson, we learnt about marine litter entering the seas and oceans and conducting beach cleans. In our third lesson, we learnt about the harsh impacts marine litter can have on our marine ecosystems and the biodiversity they are home to. Now we shall learn what we can do to prevent marine litter.



Litter on the ground surrounded by natural materials such as leaves

If you drop your rubbish on the ground, two things might happen. If you dropped natural materials like leaves and coconut husks, over time they will biodegrade and become one with the soil. Instead, if you drop synthetic (man-made) materials, they will last a long time in the environment and might be transported to the ocean. Therefore, we must dispose of these items properly, starting with putting them in the bin or recycling them.

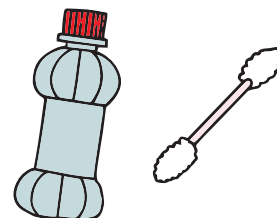




There are five actions that everyone can do to help reduce the amount of waste we produce and, in turn, the amount of plastic and other items that enter the ocean as marine litter. These actions all start with R and are therefore called the 5R's: **Refuse, Re-use, Reduce, Recycle** and **Repair!**

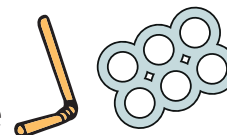
Refuse

Saying “no” can sometimes be a powerful tool against marine litter. Say “no” to useless single-use plastics that are offered to you. For example, say no to bags if you buy items that you can transport in your backpack. You can also say “no” to plastic straws if you can drink directly from the glass.



Re-use

There are many objects that can be re-used several times and there are ways to creatively use things that you may otherwise throw away. Bags can be re-used over and over again if they are intact and glass bottles can be washed and re-used. Even when things are broken, they can still be re-used! For example, bags, boxes, storage containers, can even make artwork! Can you think of someone else that would be able to use it before you discard of it? Can you re-purpose objects for another use?



Reduce

You can produce less waste reducing the number of items that you discard. Some items like single-use items end up in the bin very quickly, but there are alternative products that can last longer without creating any waste. Simple ways to reduce waste are bringing reusable bags or backpacks to the shop when you buy your groceries, bringing water from home in a reusable water bottle and not using plastic straws.



Recycle

Many of the items that end up in our landfill sites can be re-made into other items. Check if some items can be sent for recycling in your local area. If you want to recycle, make sure to keep these separated from your normal rubbish if possible because material not contaminated has higher value. Some community centers might have a recycling scheme. If your community center does, pay attention when you separate paper, plastic, metals from your normal waste.



Repair

If you break something, check whether it can be repaired before discarding it. Think about repairing also when buying new products: some objects might be designed to last longer and to be repaired more easily.

Why not buy the long-lasting options instead of single-use items?

Recent bans in Sri Lanka of plastic products

Have you heard about Sri Lanka's recent ban on the import of some plastic products? These items include cotton buds with plastic stem, many sachets, and most inflatable toys. In addition, Sri Lanka banned the import, sale, and use of polyethylene bags and polystyrene foam containers in 2017.

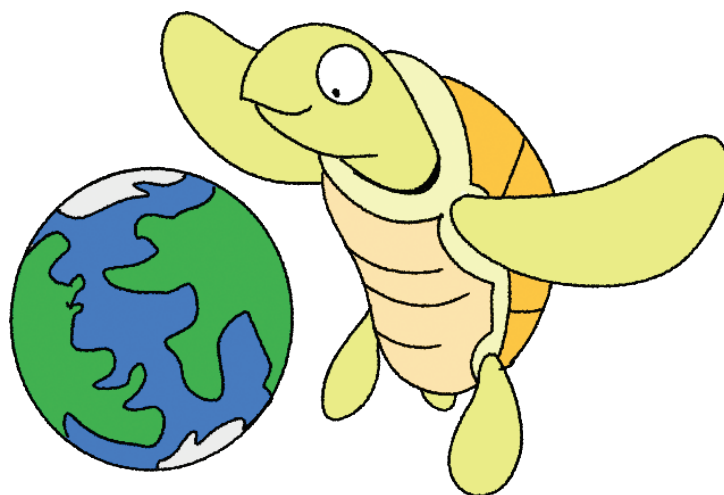
LESSON 5

Invasive Species

Optional for advanced learners

Key words

- Invasive species
- Native range
- Ballast water
- Aquaculture
- Biodiversity
- Ecosystem
- Rafts
- Filter feeder



What is an 'invasive species'?

Invasive species can be any animals or plants that are introduced, accidentally or intentionally, outside of their native range into areas where they do not naturally occur and cause negative impacts on either the environment or people. Invasive species are moved around the world by humans, for example on the bottom of boat hulls, in ballast water (water carried in the bottom of boats to stabilise them), via aquaculture, by the aquarium trade or stuck to drifting marine litter. Recently, this has become even more of a global problem due to increases in the movement of people and goods, and increased shipping around the world. Invasive species can have severe negative effects on the invaded environments and detrimental human health impacts and can result in high costs to local and national economies.

What impact can invasive species have on an environment?

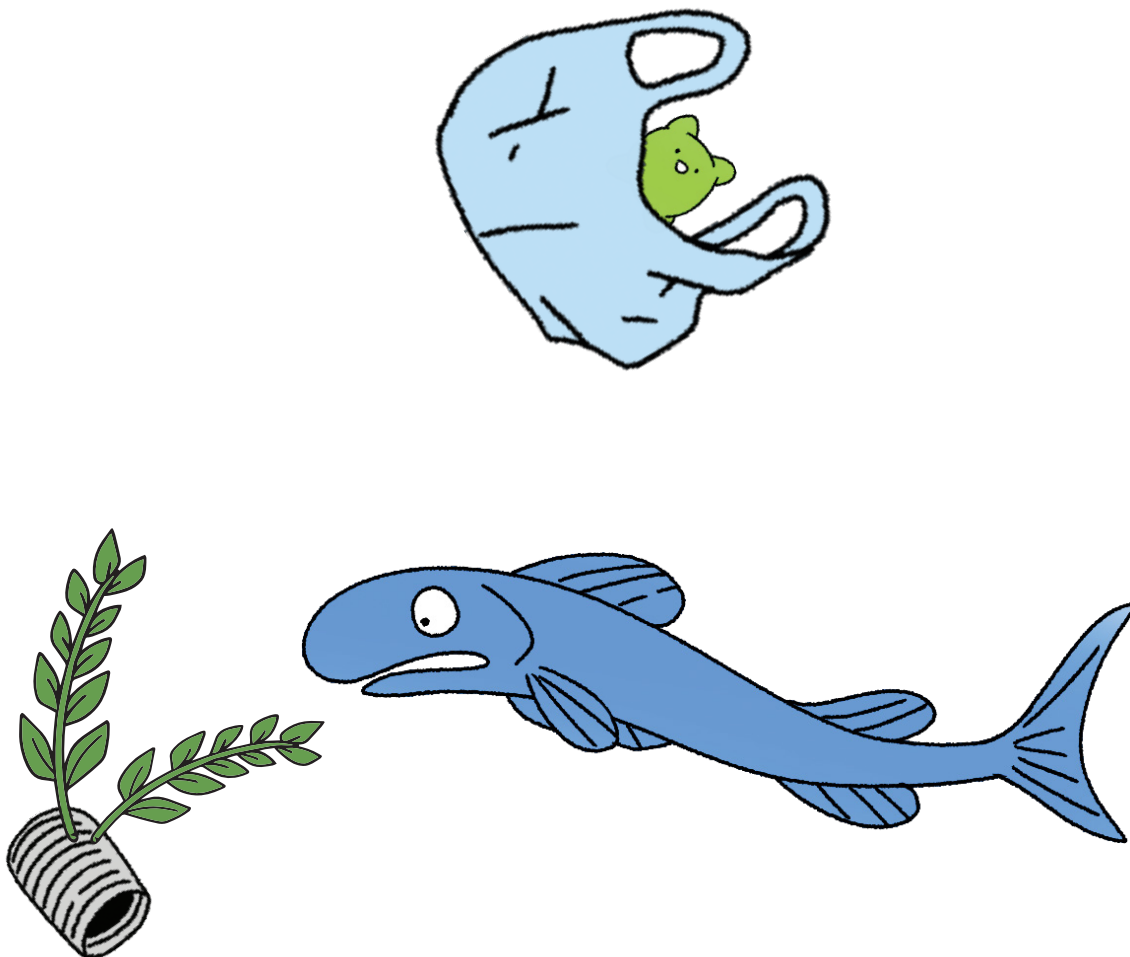
Invasive species are considered one of the greatest threats to global biodiversity. They can eat or compete with native species, sometimes causing them to become extinct. For example, in Africa the release of Nile Perch into Lake Victoria for fishing caused some fish species that were found only there to die out. In Sri Lanka, the introduced Clown Knifefish and predatory Walking Catfish have reduced the numbers of native fish species. Invasive species can also act as carriers of disease, which can be devastating to native wildlife, and to people. For example, in Sri Lanka, introduced ship rats spread the Leptospirosis virus, and feral cats and dogs are vectors of rabies. Invasive species also have the potential to change whole ecosystems. For example, the Green Seaweed *Caulerpa taxifolia*, a popular aquarium species, now carpets huge areas of seafloor in the Mediterranean. Sri Lanka has very biodiverse marine ecosystems like coral reefs and mangroves (including 1300 species of fish, and 208 species of hard coral), which could be harmed by invasive species.

How do invasive species and marine litter interact?

The interaction between invasive species and marine litter has only recently been discovered. Some marine animals and plants, like seaweeds and barnacles, have always travelled across oceans stuck to natural floating objects like logs or clumps of vegetation, in a process known as 'rafting'. With the recent increase in the amount of plastic and other marine litter in the sea, these 'rafting' species now have many more opportunities to move further than they would naturally. Plastic lasts longer in the sea than natural substances, so invasive plants and animals can be transported to more locations where they are not native, and potentially cause negative impacts on these new ecosystems. The distances that invasive species can travel on marine litter 'rafts' can be huge, and there have even been cases of fishes travelling in floating containers across the whole Pacific Ocean, from Japan to the North American coast.

We do not yet fully understand what types of plants and animals travel on what types of marine litter, but it is thought that the size of the object, and how it floats will affect what animals and plants can travel on it.

Do you know of any invasive species in Sri Lanka/Indian Ocean/Asia?



Case Studies

Examples of Invasive Species that could raft on marine litter/plastic in the Indian

1) Asian Kelp (*Undaria pinnatifida*)

Where is its native range?

This seaweed occurs naturally in Japan.

Where is its invasive range?

Asian Kelp is invasive in many parts of the world, including Taiwan, North and South Korea, Australia, North America, and Europe.

When was the species first reported outside its native range?

The species was first found in France in 1971. It is thought that it is transported on boats, and with aquaculture. It was also found attached to Japanese dock debris washed ashore in Oregon, USA after the Tohoku tsunami in 2011.

What problems can it cause?

Asian Kelp often decreases the number of native species present by competing for space on shores. It may also damage man-made structures where it occurs in high numbers.



Undaria pinnatifida Photo courtesy of John Bishop at Marine Biological Association, UK

2) The European Shore Crab (*Carcinus maenus*)

Where is its native range?

No surprises, the European Shore Crab occurs naturally in Europe.

Where is its invasive range?

The species has been transported by humans to many parts of the world, into Africa e.g., South Africa, Asia e.g. Japan and North America e.g. Canada and the United States.

When was the species first reported outside its native range?

The European Shore Crab was first detected outside its native range as long ago as the early 1800s. It often moves to new places on ships, including in ballast water and on the bottom of boats. It can also be moved with aquaculture and with live food used as bait for fishing.



Carcinus maenus Photo courtesy of David Fenwick

What problems can it cause?

The crab is a predator and eats many native species, sometimes wiping them out completely!



Commonwealth
Litter Programme

Activities for learners on the subject of marine litter

Sri Lanka

**6 activities around the subject of marine litter, associated
with the lessons previously taught in the pack**



Funded by
UK Government

ACTIVITY 1

What are things made of?

The aim of this activity is to understand different materials that we can find around us and explore what happens to these items in water.

Different materials can last for different amounts of time in the environment. Natural materials like food scraps (both vegetable and animal) are called organic waste. This type of waste is not considered marine litter because it decomposes and disappears over a relatively short time, becoming one with the environment. Instead, many man-made materials are long-lasting and they do not disappear because they do not decompose. These materials are the component of marine litter and include plastic, paper, wood, cloth, metal, glass, and sometimes a mix of them!

Examples:

Plastic is the main component of marine litter around the world. Some plastic items you may find are soda and water plastic bottles, food wrappers, cotton buds and plastic bags. Glass from broken and entire bottles is the second most common material found on beaches. Metal is also common as marine litter. Aluminium drink and food cans can be found on beaches and in our seas.

Natural materials like food scraps (both vegetable and animal) are called organic waste. This type of waste is not considered marine litter because it decomposes and disappear over time, becoming one with the environment.

Activity:

Compare how 'natural' items and man-made ('synthetic') items act in water. Collect a mix of man-made and natural items, hard and soft, flexible, and brittle.

You will need:

- A variety of materials found from around the community centre.
- 3 buckets per class
- Water
- Pencils and Paper



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Instructions:

Work together and each pick three objects from around your community space. Once you have collected them, fill in the table below. What did other students choose as their objects? Add them to your table too.

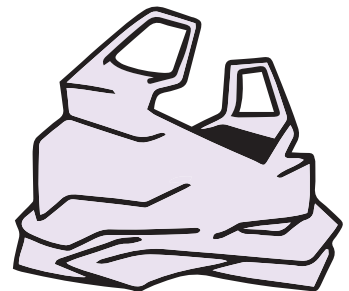
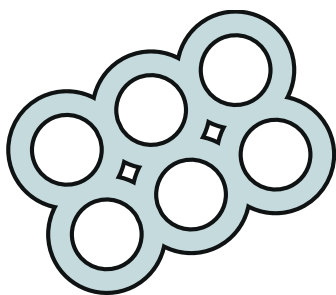
Name of item	Where did it come from?	What is it used for?	How long do you use it for? (once, 1 week, 1 year, 10+ years)

If space permits, set up three buckets of water.

In the table below, write the name of your item, e.g. plastic bottle, and guess what will happen when you place it in the bucket of water.

Take turns placing some items in each bucket of water and watch what happens! Did you guess correctly? Did the item you chose sink or float?

What do you think will happen to these items if they were left in the water for 1 month, or even a year?



ACTIVITY 1 • WHAT ARE THINGS MADE OF?

Name of item	What do you think will happen? Sink or float?	What did happen when you placed it in? Sink or float?	What do you think will happen over time? (decompose, break-up, fade, rust, stay the same)

When completed answer these questions:

Which items sank so slowly that they would be suspended in the water column for possibly days?

What are the characteristics of items that sank or floated?

What items do you think would be more difficult to remove from the sea once they become marine litter?

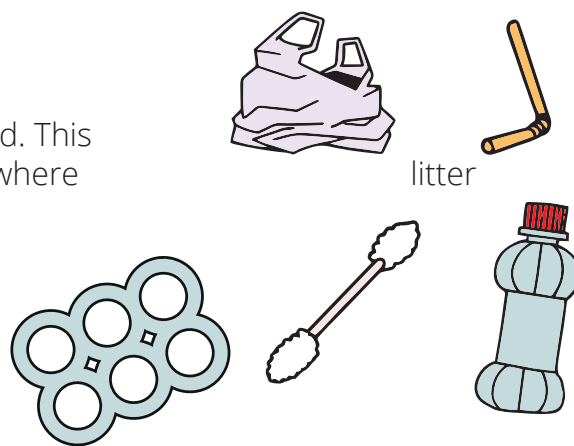
Research some marine animals that would feed on plastic litter at or near the surface, suspended in the mid-water column, and on the bottom.

How might your litter items affect marine animals?

Field Trip – Finding litter in your community

What to do on a field trip:

Think about some questions before you go:
What litter are you most expecting to find?



Do you think there will be a lot of litter around your community that could end up in the ocean?

You will need:

- A location to search for litter: beach, river, village.
- Notebooks and pencils
- Gloves
- Litter-pickers if available
- Bags/buckets to collect litter.

Instructions:

Make sure you go with your community leader and other adult helpers, and with your parent or guardian's permission.

With your community leader and maybe other adult helpers, go to your chosen location. Please make sure you have permission from your parent or guardian, the community center, and from the landowner for access.

If you are going to the beach: check the tide times. The beach is best to visit 2 hours or more after high-tide, and not when the tide is coming back in.

At your chosen location, get into groups set by your community leader.

- Select a large area (up to 100 metres) and mark out the area to look for litter.
- Record, count and pick up any of the marine litter you can find in the area.

Be careful as some objects may be sharp, ask an adult to collect these items. Please wear gloves, if possible, to reduce the risk of injury.

Sort marine litter on a nearby table or bench or on the ground, grouping together the items that are made of the same material (plastic, glass, metal). Create smaller groups if you would like (small plastic, large plastic) or even groups of specific items (bottles, caps, bags, straws).

Once completed, make sure you dispose of the rubbish responsibly and bring a selection of clean, safe litter items back to the classroom for additional activities and lessons!



Groups of marine litter organised after a beach clean trip.

Helpful Tip

If you are at the beach, start from the top of the beach where the plants and bushes start to grow, and go down to where the sand becomes wet and changes colour. That is called the 'high tide mark' and seaweed and shells normally collect there too.

Categorisation exercise

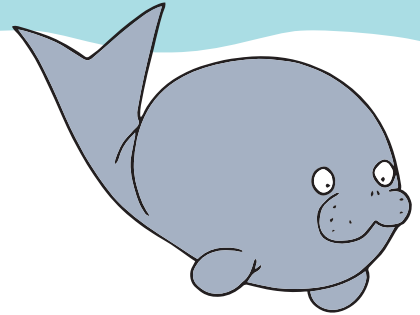
Material	Object	Tally
Plastic	Plastic food Container	
	Plastic bottles	
	Plastic straws	
	Fishing gear	
	Other	
Metal	Drinks can	
	Other	
Rubber		
Glass		
Wood		
Cloth		
Other		



Collection of marine litter in groups after a beach clean.

Back in the classroom

Collect all the records together and add up the numbers of all the items found. Try to work out the most common groups and items you found.



What was the most common object found?

Did you expect to find this?

Have you ever used this item before?

What did you bring back to the classroom?

Do you recycle in the community center or at school?

Were any items found on the beach found in your classroom?

Advanced learners

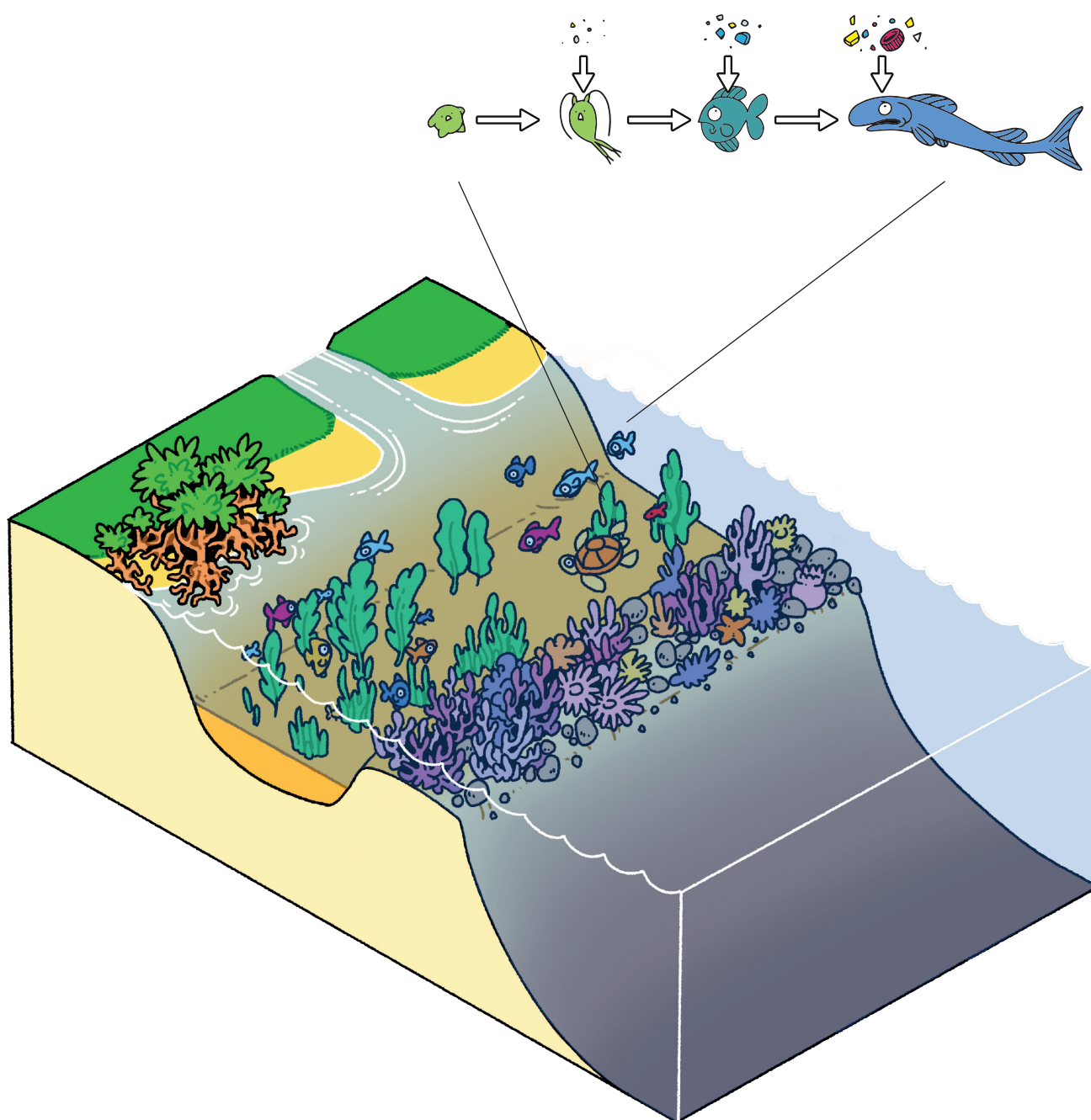
Can you draw a bar graph to identify the most common categories? On the x-axis would be your type of litter, on the y-axis the number of items you found.

ACTIVITY 3

How does Litter affect the Food-Chain?

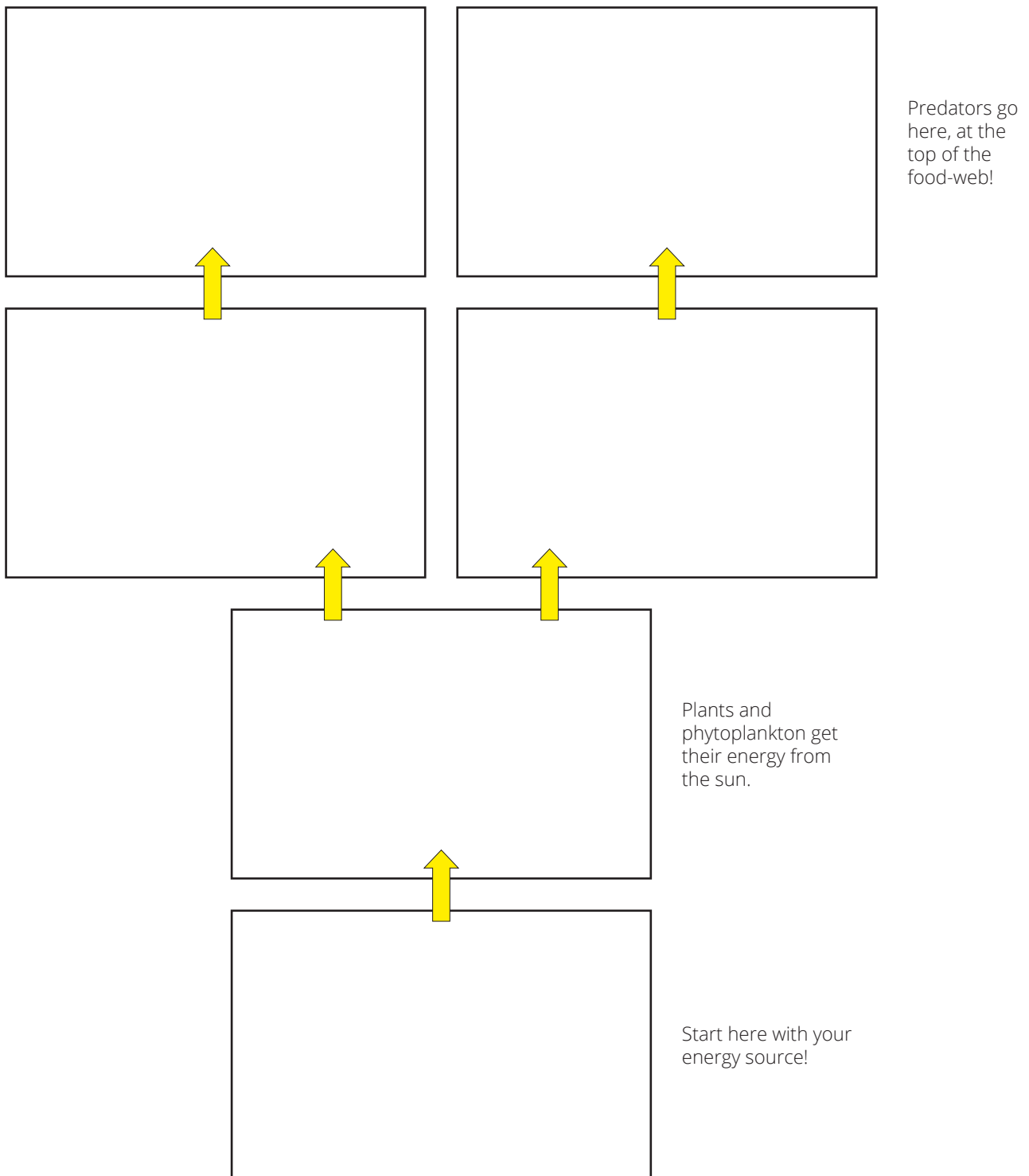
Pick a few animals and write a few sentences about for each animal about the ways that you think they are affected by marine litter.

If you get stuck, don't forget to use the marine litter factsheet included in this pack as well as the resources listed on the previous page.



ACTIVITY 3 • HOW DOES LITTER AFFECT THE FOOD-CHAIN?

Draw some marine animals you know that live in your country in the boxes below.
Do any of them eat the other animals? For example, sharks eat fish.
Do you know any animals who only eat plants?



ACTIVITY 4

Make your own Marine Litter solutions

The aim of this activity is to become aware of the five ways that you can make sustainable everyday choices to help combat marine litter by implementing the five R's- Refuse, Re-use, Reduce, Recycle and Repair.

You will need:

A variety of cleaned marine litter items collected from previous lessons or examples of clean litter from the home or community center.

Instructions:

Locate five spots in your classroom that represent the 5 R's and mark them.

In turn, select an item from the litter that you have collected from the beach and consider whether you can **re-use, recycle, repair** it, or if could have **refused** it and **reduce** its use. Then, place it in the correct pile.

After the activity, you will need:

- Worksheet
- Pencils

Can you answer these questions?

Do you know where can you take the recycling?

Can you re-use anything in these piles?

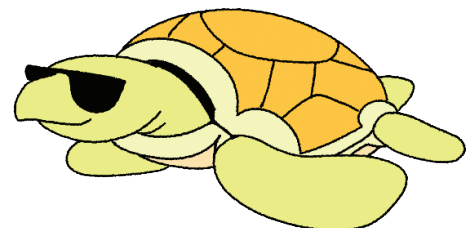
Is there anything in this pile that did not need to be used and/or thrown away?

Can you make art out of the marine litter for your classroom? Or a piece of jewellery?

What can we do as individuals?

What can we do in our communities?

What can the government do in our country?



Advanced learners:

Use the list you came up with to action some of the suggestions. Write a letter to a business or the government highlighting ways they could carry out your suggestions.

Write a 250–500 word answer to this question.



Photo of beach and mangroves before a beach clean. Can you spot the marine litter?

ACTIVITY 5

What are the issues around the Globe?

Key words

- Global issues
- Innovation
- Solutions

This activity will raise awareness of the global issue of marine litter, and of the innovative solutions that have been adopted.

You will need:

- Creativity

Instructions:

Around the world, there are some great examples of innovative solutions to solve the global marine litter crisis. If you have internet access, research, and present your findings to your class. Try to gather this information about initiatives happening in Sri Lanka or around the world:

1. Where has the initiative been started? Where is it currently active?
2. Who made it? Who is in charge of it? Who is the initiative aimed at?
3. What is the invention?
4. Can you replicate this at home, at school or in your community?



Artists: Jordan Borland & Kaeson Muschamp

School: Forest Home Methodist School & St. Peter Claver Primary School

Description This poster was created using cardboard as the base. The background was painted and the letters were outlined before painting. We decided to use cardboard as the base as a means to show how this material can be recycled instead of ending up in the dump.

The message directly addresses how turtles are affected by the increase of plastics in the water bodies. This turtle is very sad because plastic threatens its existence. Therefore the plea to humans is urgent. People need to understand how their irresponsible disposal of plastic harms marine life. People need to reuse and re-cycle in order to reduce the negative impacts of plastics.

Some examples of marine litter initiatives include making artwork to spread the word around your community.



Artist: Aliyah Gutierrez

School: St. Peter Claver Primary School

Description: I created a jelly fish. I was glad I got that animal because I love the way it looks. To make the jelly fish, I used plastics, fan cover, bottle caps and used them because there are too many plastics in our environment. When I created the jelly fish, I used mostly plastic to tell that I care about our environment and everyone should. The marine ecosystems needs to be kept clean so we don't kill our aquatic animals that we depend on. The marine litter affects our community because when the garbage comes to the shore, it smells and looks bad. You can imagine what it does to our turtles, dolphins, and fish that we eat. People need to know about this problem because it affects everyone. I encourage everyone to volunteer with the town council, talk to the mayor and help with clean up campaigns. Most of all, I advise that we avoid using plastics to avoid it going into the ocean. We can do it.

ACTIVITY 6

Spread the word!

Time to be creative and spread the word to help combat marine litter. Use the examples you have learnt about and plan or draw your initiative or invention.

You will need:

- Creativity

Instructions:

Can you think of an effective way to communicate what you have learnt in recent lessons and to educate your wider community? You could produce a poster, a song, a dance, or artwork. Be creative! You could even use some of the litter you saved in lesson 2 and use social media to reach as many people as possible.

