



## Protect Life Below Water

### Subject:

Science, Geography

### Learning Outcome:

- To develop knowledge of threats to the ocean
- To explore ideas of how to use the ocean sustainably

### Preparation:

- Print out or project the images for the introductory activity (appendix 1).
- Print out information sheets describing threats to the ocean (appendix 2).
- Print out suggestions for protecting the ocean (appendix 3).

Total Time:



Age Range:



Image Lovingly Provided By Getty Images

World's Largest Lesson is a collaborative education project to support the announcement of the United Nations Global Goals for Sustainable Development. The project is living proof of the importance of Global Goal 17 "Partnerships for the Goals" and would not have been possible without the help of all of our partners working with us and with each other.

Thanks to our Founding Team:



Powered By:



Distributed By:



Translated By:



And special thanks to those who have worked with us across the world:



Lesson plans created in collaboration with Think Global [www.think-global.org.uk](http://www.think-global.org.uk). Promoting learning for a just and sustainable world.



## Learning Activity

5  
mins

Show students a series of images of damaged seas or oceans, e.g. plastic waste, acidification or over-fishing (appendix 1).

Ask students to write or discuss with a partner what they think happened before the photo and what will happen after.

Ask students to feedback to the class.

## Learning Activity

10  
mins

Display copies of the short information sheets around the room (appendix 2).

Give students five minutes to move around the room and read the information sheets describing a selection of threats to oceans and ask them to sort into a hierarchy from most to least serious.

Tell students that they need to be ready to explain and justify their choices to the class.

Lead a class discussion and call on students to briefly describe the issue they thought was most serious and justify their selection.

## Differentiation and Alternatives

Please simplify the text if need be.

## Learning Activity

15  
mins

- Students are given some solutions and suggestions for sustainable ocean use. (either as a handout or displayed at the front).
- Encourage students to match these to the threats, e.g. small-scale fishing to match to large hauler fishing.
- Students choose to focus on one of the issues and write a paragraph explaining what the threat is, why it damages the ocean and beyond (e.g. effect on the wider environment and on people) and how the solution can help. They can use textbooks, the internet (see links in appendix 4) or pre-prepared materials to add detail to their writing. They should make sure they include real-world examples in their answer.

## Differentiation and Alternatives

For younger or lower ability students you could provide some sentence starters and/or key points they should cover in each paragraph.

Older or higher ability students could also describe the impact on people of damaged oceans, e.g. reduced fish stocks. They could also discuss the competing needs of people compared with marine mammals, birds, fish and the natural environment, who has more rights to use the oceans?

## Learning Activity

15  
mins

In pairs or small groups (depending on the number of students and how many students have focussed on a particular issue) ask the students to come up with actions to combat their chosen threat to the ocean. List them under the following headings: 1, personal, 2, those that could be taken up by organisations and 3, those that could be implemented by government. Refer back to the information sheets.

## Differentiation and Alternatives

This could also be developed into a further class activity to engage the whole school in action on protecting the ocean. This could involve producing information for the school, reducing waste or eating fish from sustainable sources.

## Learning Activity

15  
mins

Write a tweet (140 characters – and tweet @theglobalgoals #largestlesson), a headline to explain why we should protect the ocean.

### Take Action For for the Global Goals

As an educator you have the power to channel students' positive energies and help them believe that they are not helpless, that change is possible, and that they can drive it.

The Design for Change "I Can" School Challenge invites children to take action, make change for themselves and share it with children across the world.

Visit [www.dfcworld.com](http://www.dfcworld.com) to get started.

To download a Design for Change lesson pack or a simple advice pack for young people to take action themselves visit [www.globalgoals.org/worldslargestlesson](http://www.globalgoals.org/worldslargestlesson)

DESIGN for  
CHANGE



Images Lovingly Provided By Getty Images



Images Lovingly Provided By Getty Images

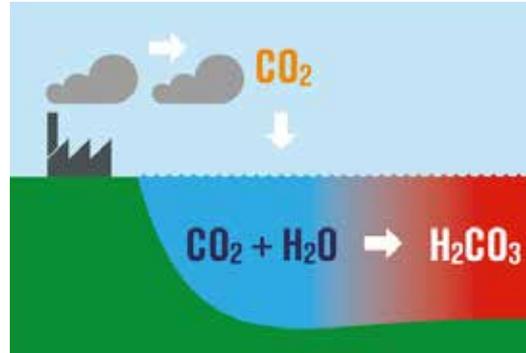
# Threats to the Ocean: Acidification

## What is it?

Ocean acidification means that the chemical composition of the water in the ocean is changing over time. The PH of the water is decreasing and the water is becoming more acidic.

## How is it caused?

Ocean acidification is caused mainly by the uptake of carbon dioxide (CO<sub>2</sub>) from the atmosphere, the ocean absorbs about 30% of the CO<sub>2</sub> in the atmosphere, this happens wherever air meets the water. CO<sub>2</sub> emissions above water are increasing from human activity, such as burning fossil fuels, resulting in an increased amount of CO<sub>2</sub> getting into the ocean. Once in the ocean the CO<sub>2</sub> changes the chemical make-up of the water (H<sub>2</sub>O). This results in the water becoming more acidic, this is carbonic acid.



Source: <http://oceans.digitalexplorer.com/resources/?controller=search>

## What is the effect on the ocean?

The increased acidity of the seas and ocean can cause major problems for marine organisms and ecosystems. Many sea creatures are affected by acidification, for example it can prevent the building of shells or the formation of corals. It can even alter the feeding patterns of some fish. It can have a dramatic effect on the whole marine eco-system.

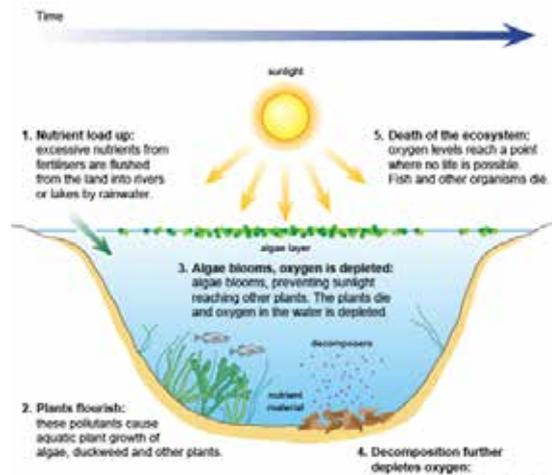
# Threats to the Ocean: Dead Zones

## What is it?

A Dead Zone is an area of the sea that has very little marine life. They can occur naturally, but the real issue is when they occur as a result of human activity. Dead Zones are areas with low-oxygen, sometimes called hypoxic, it is difficult for plants or animals to survive in these conditions.

## How is it caused?

There are many factors that can cause a Dead Zone, but nutrient pollution has been identified as one of the main human activities causing the problem. In order to increase their crop production, farmers often use fertilizer. Excess fertilizer can run off the land and into the ocean. The ocean can end up with excess nutrients leading to a process called eutrophication. This can encourage the growth of algae that can block sunlight from reaching the water. When the algae in the ocean dies it decomposes. As part of this process the oxygen in the water is used up. Without oxygen in the water, the animals and plant will not survive.



Source:

<http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel>

## What is the effect on the ocean?

In these Dead Zones it is usually hard for any marine life to survive. This can have a wide effect as it can disrupt food chains leaving some marine mammals without food. They can also result in the introduction of harmful chemicals into the food chain.

# Threats to the Ocean: Overfishing

## What is it?

Overfishing occurs when we remove fish too quickly or in too large quantities from oceans (or rivers). When we are catching more fish than can naturally replenish (keep fish numbers at the same levels), overfishing happens. It is an unsustainable use of the ocean for fishing.

## How is it caused?

A number of factors contribute to the overfishing of the ocean, including the development of fishing technology and the growing appetite for certain types of fish.

**Growing demand:** As populations increase, the need for food increases. People are also increasing their demand for varieties and amount of fish. Fisheries are meeting this growing demand and are able to increase their profits from using methods that result in a bigger and faster catch.



**Unsustainable practices:** A number of widely used practices have negative effects on marine life: blast fishing (the practice of using dynamite to kill schools of fish to maximise a catch), bottom trawling (using a heavy net to trawl along the ocean floor, damaging habitats) and bycatch (modern fishing nets can bring up unwanted fish or mammals with the catch, which then die and are discarded overboard).

**Capacity:** There are too many fishing fleets for the amount of fish available. It is estimated that there are four times the amount of fishing boats needed for our planet.

Source: <http://thecaudallure.blogspot.co.uk/2011/07/genetic-diversity-losing-out-to.html>

## What is the effect on the ocean?

**Extinction:** Some species will become extinct if we continue to catch them in such high quantities, e.g. Bluefin tuna.

**Destruction of ecosystems:** Some of the less targeted fishing methods, such as blast fishing, can result in the destruction of whole areas of marine habitats. Additionally, reducing the numbers of specific species can change food chains, which can have destructive results across the ecosystem.

# Threats to the ocean: Waste in the ocean

## What is it?

It is estimated that 8 million tonnes of plastic waste end up in the ocean every year. Jenna Jambeck, at the University of Georgia, says it is like having five shopping bags of trash on every foot of coastline around the globe\*. Plastic is one of the main waste products that end up in the sea, although marine waste can include anything from glass to cans to abandoned sailing boats. Many of the objects in the ocean end up in giant 'garbage patches.' These are massive areas where waste gathers, that are formed by ocean currents. There are five known garbage patches, two in the Pacific Ocean, two in the Atlantic Ocean and one in the Indian Ocean. The Great Pacific Garbage Patch is estimated to be larger than the state of Texas, but currently no-one has a really accurate way of measuring it.

## How is it caused?

Waste ends up in the ocean for a number of reasons. Sometimes it is intentionally dumped into the sea. Sometimes it is carelessly dropped on land and ends up in the sea. Natural disasters, such as a hurricane or tsunami, can also result in waste ending up in the sea.

\*Source National Geographic



## What is the effect on the ocean?

Marine life is often affected, by ocean waste. This can happen in a number of ways:

- Birds, fish and other sea creatures can become trapped in plastic bags, netting or packaging and may get injured or die.
- Marine mammals and birds can end up swallowing waste in the water. It has been well documented that turtles, for example, mistake plastic bags for jellyfish. Eating waste can lead to illness or starvation.
- Some of the marine debris is made up of material that contains chemicals that are harmful to fish and other species. Whilst this may not directly harm the sea life that swallows the waste, it can result in harmful toxins entering the food chain.

# What Can Be Done to Protect Our Oceans?

## 1. Reduce Energy Consumption:

Reduce the effects of climate change on the ocean by consuming less energy and limiting the burning of fossil fuels.

## 2. Use Fewer Plastic Products:

Plastics that end up as ocean debris contribute to habitat destruction and entangle and kill tens of thousands of marine animals each year. To limit your impact don't drop litter, carry a reusable water bottle, store food in non-disposable containers, bring your own cloth or other reusable bag when shopping, and recycle whenever possible.

## 3. Maintenance of River Floodplains:

Maintaining flat areas of land next to rivers can help to reduce leaves and mud from entering the river and from there the oceans. This is important as when rivers flood these sediments are deposited on the plains either side of the river instead of into the oceans. Managing farm waste and sewage effectively are also important, to stop sediments from entering rivers and then oceans.

## 4. Make Safe, Sustainable Seafood Choices:

Global fish populations are rapidly being depleted due to demand, loss of habitat, and unsustainable fishing practices. When shopping or dining out, help reduce the demand for over-exploited species by choosing seafood that is both healthy and sustainable.

Source: adapted from National Geographic

# Links for Student Research

## Ocean acidification:

- Video from the Alliance for Climate Education (3:01)  
<https://www.youtube.com/watch?v=Wo-bHt1bOsw>
- National Geographic  
<http://ocean.nationalgeographic.com/ocean/critical-issues-ocean-acidification/>
- Smithsonian Museum  
<http://ocean.si.edu/ocean-acidification>

## Ocean waste:

- Greenpeace  
<http://www.greenpeace.org/international/en/campaigns/oceans/fit-for-the-future/pollution/trash-vortex/>
- National Geographic  
<http://education.nationalgeographic.co.uk/encyclopedia/great-pacific-garbage-patch/>
- Eco Kids  
[http://www.ecokids.ca/pub/eco\\_info/topics/oceans/risks\\_to\\_oceans.cfm](http://www.ecokids.ca/pub/eco_info/topics/oceans/risks_to_oceans.cfm)

## Dead zones:

- National Ocean Service  
<http://oceanservice.noaa.gov/facts/deadzone.html>
- National Geographic  
<http://education.nationalgeographic.com/encyclopedia/dead-zone/>
- Teach ocean science  
[http://www.teachoceanscience.net/teaching\\_resources/education\\_modules/dead\\_zones/learn\\_about/](http://www.teachoceanscience.net/teaching_resources/education_modules/dead_zones/learn_about/)

## Overfishing:

- World Wildlife Fund  
<https://www.worldwildlife.org/threats/overfishing>
- National Geographic  
<http://ocean.nationalgeographic.com/ocean/critical-issues-overfishing/>
- UN  
<http://www.un.org/events/tenstories/06/story.asp?storyID=800>