

Ocean acidification

3

“Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels”

Target 3 of the UN Sustainable Development Goal Life below Water

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Fact Sheet
for school
students and
proactive
citizens.



BACKGROUND

Acidification refers to a reduction in the pH of the oceans caused primarily by the uptake of CO₂ from the atmosphere, although it may be caused by other chemical additions or subtractions from the ocean.

Ocean acidification is expected to have an impact on ocean species to varying degrees:

- Photosynthetic algae and seagrasses may benefit from higher CO₂ levels in the ocean.
- Studies have shown that a more acidic environment has a dramatic effect on some calcifying species. Calcium carbonate minerals are the building blocks for the skeletons and shells of many marine organisms. The acidification of seawater leads to a reduction in the concentration of carbonate ions, which makes building and maintaining shells and other calcium carbonate structures difficult for calcifying organisms such as oysters, clams, sea urchins, shallow water corals, deep sea corals, and calcareous plankton.
- These changes in ocean chemistry can also affect the behaviour of non-calcifying organisms. The ability of certain fish to detect predators decreases in more acidic waters. When these organisms are at risk, the entire food web may also be at risk.
- Ocean acidification affects all the world's oceans, including coastal estuaries and waterways. Many economies are dependent on fish and shellfish, and people worldwide rely on food from the ocean as their primary source of protein.

Ocean acidification is thus an emerging global problem. Over the last decade, many studies have focused on its potential impacts. Predictions suggest that, in the future, the oceans will continue to absorb CO₂ and become even more acidic. Estimates of future CO₂ levels indicate that, by the end of this century, the surface waters of the ocean could be nearly 150 percent more acidic, resulting in a pH level that the oceans have not experienced for more than 20 million years.

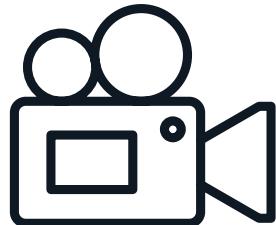
With the pace of ocean acidification accelerating, scientists, resource managers and policy makers recognise the urgent need to strengthen the scientific basis of decision making and action.

VIDEO

Chemistry Lesson at the Beach

<https://www.youtube.com/watch?v=krC9gsLMw3U> (3:35 min)

This **video** is appropriate for elder students.



Activities: Form three groups to trace and explain in more detail the three components (A,B and C) presented in the video: A/ acidification, B/ bioavailability, and C/ calcifiers

The effect of ocean acidification on marine sounds

<https://www.youtube.com/watch?v=xy6ogOyO-5E> (1:39 min)

This video is appropriate for younger students. After the video presentation discuss using the following questions:

- Is the ocean a silent place?
- Which sea animals emit sounds?
- Why different sounds below water are important for small fish?
- Which are the sources of CO₂ emissions?
- What did the scientific investigations show?
- What are the consequences of acidifying seawater for sound-emitting animals?

Ocean acidification and biodiversity impacts

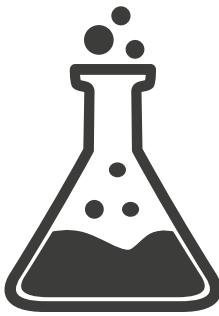
<https://www.youtube.com/watch?v=GL7qJYKzcsk> (12 :12 min)

This **video** is suitable for teachers and more curious students who show a strong interest in the process of acidification of the oceans. The availability of automatic translation into different languages facilitates the perception of this part of the information, which is of a more expert nature.



ROLE-PLAYING

Based on the “Ocean acidification and biodiversity impacts” video as well as additional research on Internet, volunteers could take on the roles of different scientists: chemists, biologists, ichthyologists, oceanographers, etc. with the task to organize an impromptu conference where they have to present in more detail different impacts of acidification on the marine life.



EXPERIMENT

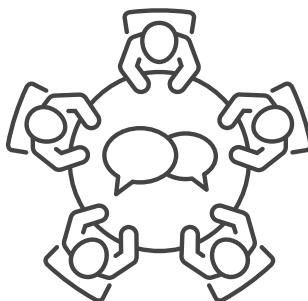
The experts say that oceans absorb around 40–50 percent of the carbon dioxide from the atmosphere. That is the reason to often call oceans “the planet’s biggest carbon sink”. Step by step the oceans are becoming increasingly acid due to the increase of greenhouse gases and in particular – the carbon dioxide.

Try to simulate ocean acidification on calcareous skeleton by placing a raw chicken egg into a glass with vinegar (eggshell contains calcium carbonate) and leave it for 2–3 days.

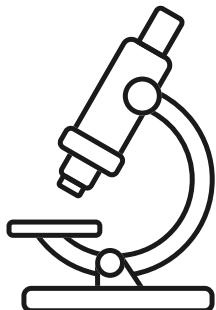
BRAINSTORMING

Discuss the following questions:

- Acidification is no longer regional, but global issue. Which one of your daily habits increases concentration of carbon dioxide and thus the ocean acidification?
- What activities need to be implemented on local and global level in order to reduce further ocean acidification?



How would you explain the message of the scientist Carol Turley from Plymouth Marine Laboratory: “Ocean acidification – it is the silent storm. It can’t be heard, it can’t be felt, it can’t be seen, but scientists are measuring it.”



RESEARCH

Coral reefs and ocean acidification
Corals are colonies of tiny individual animals called polyps, which have soft bodies and stinging tentacles. In tropical corals, the polyps are protected by a hard, external skeleton made of calcium carbonate. Coral reefs cover less than one percent of the sea floor but are home to 25 percent of marine species. Due to the increased acidification of the ocean all coral reefs are in jeopardy. Find in the available literature and internet the impact on wildlife of this “rainforest of the sea” if corals get extinct due to the increased acidification of the ocean water.

Some of the website addresses can serve as a starting point when searching for more information:

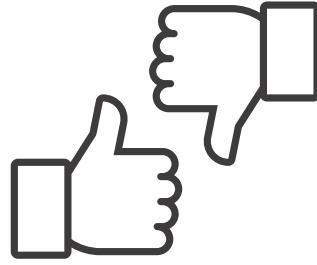
<https://climateinterpreter.org/content/effects-ocean-acidification-coral-reefs>
<https://usa.oceana.org/effects-ocean-acidification-corals>
<https://www.nationalgeographic.org/media/acidification-reefs/>

FOLLOW UP

Share the ocean acidification problems with other members of your family.

Discuss:

- How can an individual impact in order to preserve seas and oceans?
- Can this problem be overcome by developing industry which does not pollute the environment, or we should not prevent the development?



What can you change in your lifestyle in order to reduce your impact on increase of ocean acidification?

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