FITDigit

A Green Future in the Digital World - *FitDIGIT*

[2022-1-FR01-KA220-SCH-000084947]

Educational materials for teachers and exemplary lessons for pupils based on story telling (3)

How start-ups and companies reduce plastic in the ocean

Project Result 1
Digital stories for Environmental Education-Handbook
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Introduction

"A Green Future in the Digital World" is an Erasmus+ project designed especially to support the innovative digital educational curricula supporting environmental and digital education is schools all around the Europe. Implemented by six partners, it gives strong educational boost to support sustainable green environmental awareness.

One part of the project (WP3) was designed to create interdisciplinary pedagogical model and educational tools to help teachers and their pupils to gain cognitive skills in environmental change with "real life" application. As a result a huge bunch of educational materials has been created, which are divided into two Parts:

Part 1. Digital Stories for Environmental Education

Part 2. E-coding curriculum for Environmental Education.

This Handbook is the 3rd element of the first Part of the educational materials, and it provides insightful and innovative information about how starts-up and companies respond to ocean's pollution.

These educational materials are divided into the following parts:

- Theoretical part – presenting interesting materials on the relevance of oceans in earth symbiosis and negative consequences of its pollution- for teachers;
- Practical part – presenting the innovative initiatives of two companies supporting cleaning up activities of the Ocean, which can be used by teachers during their classes;
- The third part presents the lesson plan, and it is supported by Quizzes, and Exemplary video materials and games to be used during classes.
- The Handbook is supported by interactive presentations in Canva, supporting teachers in their daily activity.

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At the end of the lesson pupils should acquire the knowledge, skills, and competencies on the sustainable initiatives supporting ocean's up-cleaning activities, green skills related to plastic production reduction, and social responsibility skills.

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THEORETICAL PART

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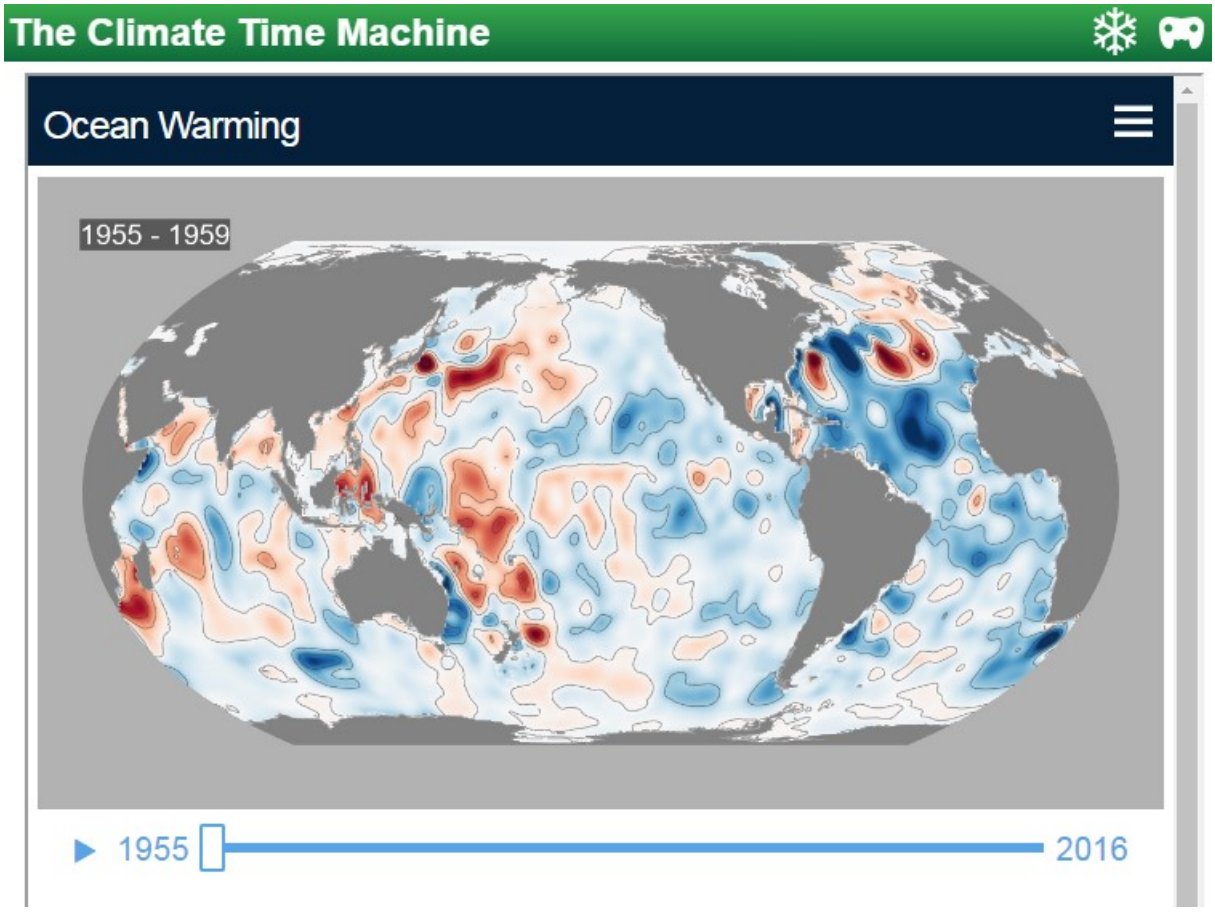
The ocean is a wonderful and important element of our planet. It is home to a wide variety of plants and animals and covers almost 70% of the Earth's surface.

What makes the ocean so crucial for life on Earth?

Firstly, the ocean acts as a large air conditioner for our globe. by absorbing the sun's heat and dispersing it across the planet, it helps to regulate the temperature. This contributes to the creation of different seasons and climates, which are essential for plant growth and animal life.



The Climate Time Machine | NASA Climate Kids

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How does the ocean soak up heat from the Sun?

Because water has a large heat capacity and can absorb a lot of heat before becoming heated, it is a good medium for storing heat. The top few meters of the ocean store as much heat as the whole atmosphere of Earth. Human activity is causing the Earth's temperature to warm. The temperature of the air gets hotter as Earth's climate warms. By effectively absorbing the excess heat from the atmosphere, the ocean helps to postpone all the consequences of global warming.

The ocean receives the majority of the additional energy when the world heats. Over 90% of the warmth caused by global warming ends up in the water.

However, the plants and animals that inhabit the water may become ill or maybe die if it becomes too warm.

NASA has noted that sea levels are rising as the Earth warms. When it becomes warmer, water expands. Sea levels rise as a result of heated water taking up more space in our seas.

Melting land ice is another factor contributing to ocean rise. Large ice masses that rest on the ground are known as glaciers and ice sheets. This ice melts and flows into the oceans as our world warms. Sea levels rise when there is more water in the oceans.

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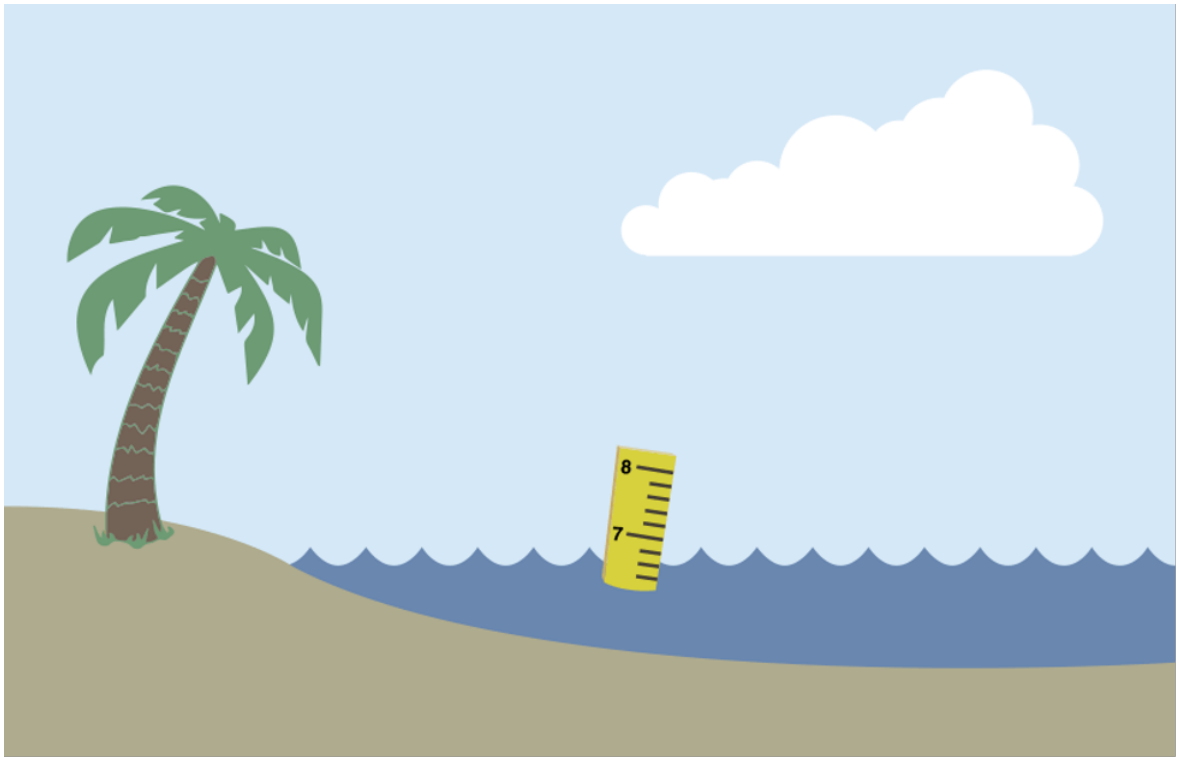

https://climatekids.nasa.gov/ocean/

Sea ice melts as a result of the warming of the Earth's temperature and the temperature of the ocean. The water may becoming less cold and less prone to sink. In certain areas, ocean currents could slow down or even stop in the absence of cold water sinking. This can impact the climate in regions like Europe, where warm ocean currents provide a milder environment. The ocean generates a large portion of the oxygen we breathe in addition to helping with temperature. Around half of the oxygen in our atmosphere is produced by microscopic plants called phytoplankton, which are found in the ocean. They provide us the oxygen we require to survive and grow.

Similar to land animals, fish and other marine life breathe oxygen and release carbon dioxide (CO2). Like land plants, ocean plants absorb carbon dioxide and release oxygen. CO2 from the atmosphere may be easily absorbed by the water.

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Still, a significant portion of CO2 is produced by human activity. For instance, more carbon dioxide enters our air due to production, airplane, and car emissions. The Earth absorbs more heat when there is an excessive amount of carbon dioxide in the atmosphere. Approximately 25% of the CO2 that people produce by burning fossil fuels–oil, coal, and natural gas–is absorbed by the ocean.

https://en.wikipedia.org/wiki/Coral_reef

Coral reefs are at danger because of the warming oceans . Very delicate colonies of organisms that surround themselves with skeletons form coral reefs. These undersea colonies are full with a wide variety of fascinating life forms. However, climate change creates serious issues for them. The Earth's

temperature is rising due to climate change, and this is also warming the oceans. The coral reefs are stressed when the water becomes very hot.

Coral bleaching is the term used to describe the pale, colorless state that results from stress on coral reefs. Coral bleaching is an example of a major illness for the reefs. The microscopic algae inside corals, known as zooxanthellae, have a unique connection with the corals. Through photosynthesis, these algae give the coral its vibrant colors and serve as a food source. However, the corals lose their color and vibrancy when the water becomes too warm because they get stressed and push out the algae.

(201) Ocean Acidification – YouTube

Since coral reefs serve as vital habitats for a large number of fish and other marine life, all these changes brought on by climate change are quite concerning. They offer thousands of species food, refuge, and safety. All of these animals suffer when the coral reefs deteriorate.

Both humans and animals love the wide range of delectable seafood found in the waters. We harvest seafood from the ocean, including fish, shrimp, crabs,

and many more species, which are vital sources of food for humans as well. We also like water activities like sailing, swimming and surfing.

It offers plenty of excitement and adventure. It is possible to sail, swim, surf, and take in the splendor of the water. But it's also important that we take care of the ocean. The sensitive balance of life in the ocean may be harmed by pollution, overfishing, and climate change. We need to take responsibility and make decisions that protect the ocean and its creatures.

Ocean pollutions

One serious hazard to the world's waters is pollution. Our seas suffer as a result of our continuous production and consumption of enormous volumes of products and energy. Wide-ranging effects of ocean pollution include harm to ecosystems, marine life, and eventually human health.

Let's take a closer look at the major types of ocean pollution.

Plastic pollution

One of the biggest causes of pollution in the ocean is plastic garbage. Millions of tons of plastic end up in our seas every year, harming ecosystems and marine life. Marine creatures can become entangled in plastic waste, which can suffocate them, interfere with their usual habits, or even kill them. Microplastics, which are absorbed by marine organisms and have the ability to enter the human food chain, is further evidence of the harmfulness of plastic.

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(200) How We Can Keep Plastics Out of Our Ocean | National Geographic - YouTube

Oil spills

Oil spills are a serious hazard to marine life. Large amounts of crude oil leak into the water as a result of spills during transportation or extraction operations. This oil covers the surface of the water, killing off marine life and destroying fragile coastal ecosystems. Damage to habitats, loss of biodiversity, and change of entire ecosystems are just a few of the catastrophic long-term consequences of oil spills.

Chemical pollution

Chemical contamination occurs when substances from industry, agriculture, and urban runoff end up in the ocean. The water is contaminated by toxic compounds including pesticides, fertilizers, and heavy metals, which endanger human health and marine life. The concentrations of these pollutants can rise as they migrate up the food web due to bioaccumulation and biomagnification, which occurs when these pollutants accumulate in the food chain.

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Marine debris

Our waters are full of a variety of different types of garbage in addition to plastic. Ghost nets what are abandoned fishing gear, are still killing and trapping marine animals. Through ingestion or entanglement, other types of marine garbage, including rubber, metal, and glass, can potentially endanger marine life. In addition to endangering marine ecosystems, this trash also washes up on shorelines, affecting coastal communities and tourism.

Noise pollution

Marine animal behavior is disturbed by underwater noise pollution, which is primarily caused by ship traffic, seismic studies, and military sonar. Sound is essential to marine animals' ability to navigate, communicate, and locate food. These animals may experience physical harm, stress, or confusion as a result of excessive noise, which may result in population decreases and ecological imbalances.

Sewage and wastewater

Hazardous bacteria, viruses, and other diseases can enter the ocean as a result of improperly handled sewage and wastewater handling. Diseases may spread as a result, and marine life may suffer.

It is crucial that we prevent ocean pollution by working together and implementing sustainable practices. Governments, businesses, and people all need to collaborate to decrease chemical use, enforce regulations related to oil spills, eliminate plastic waste, and create quieter marine technology. We can assure the health of marine ecosystems, maintain the amazing biodiversity, and ensure a sustainable future for the world and ourselves by taking action to protect our oceans.

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PRACTICAL PART

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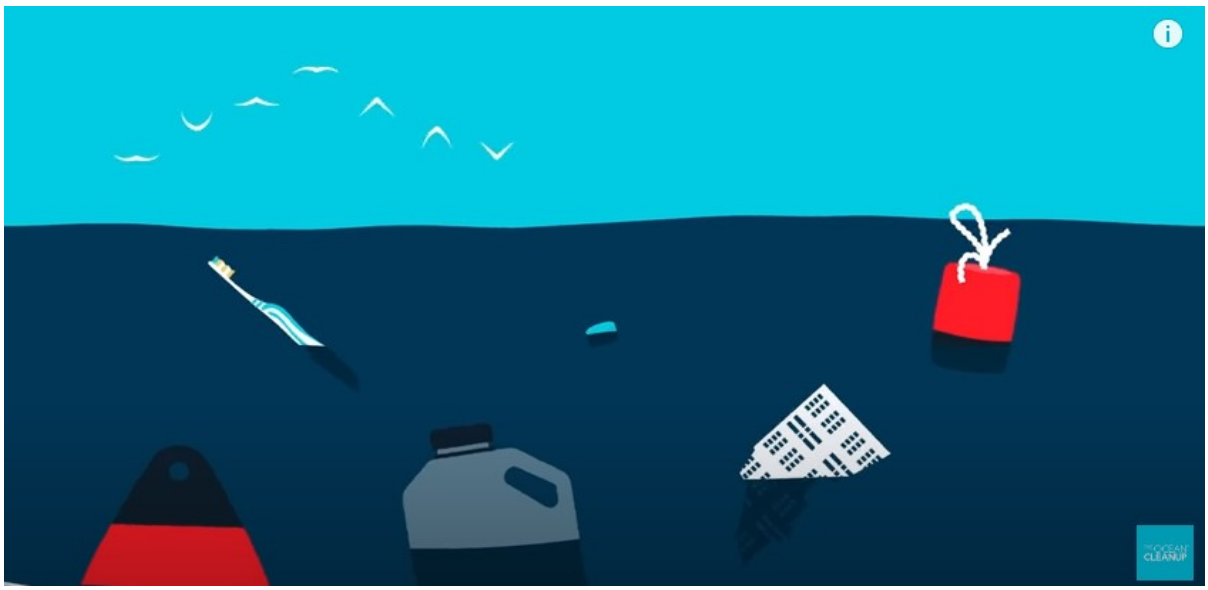
THE OCEAN CLEANUP

A well-known group called The Ocean Cleanup is committed to creating cutting-edge tools and techniques to eliminate plastic debris from the world's oceans. They have gained attention for their creative approach to addressing the problem, with an aim to clean up the Great Pacific Garbage Patch and other significant oceanic accumulation zones.



(200) Everything We Know About Ocean Plastic Pollution So Far | The Ocean Cleanup - YouTube

The scale of the problem

The seriousness of plastic waste in the water is acknowledged by The Ocean Cleanup. Data from scientific research and organizations such as the Ellen MacArthur Foundation indicate that the amount of plastic in the ocean is estimated to be 150 million metric tons, and that the amount is increasing by around 8 million metric tons year.

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Innovative cleanup technology

"System 001" or "Wilson" is a special system that The Ocean Cleanup has created. With this device, plastic garbage is collected and concentrated by deploying a long, floating barrier with a skirt beneath the surface. After that, the plastic is retrieved, cleaned, and made ready for recycling.

Real-world deployments

Wilson, The Ocean Cleanup's first system, was successfully deployed in the Great Pacific Garbage Patch in September 2018. This deployment served as a critical turning point in the battle against ocean plastic pollution and offered insightful information on potential improvements.

(200) Transition to System 03: Our Blueprint for Scale-Up | Cleaning Oceans | The Ocean Cleanup - YouTube

Continuous evolution and learning

The Ocean Cleanup has improved its technology and design after the initial deployment. They have addressed issues including durability, effectiveness, and ocean condition adaptability.

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Collaboration and partnerships

The Ocean Cleanup understands that working together is essential to achieving their objectives. To speed up research, development, and the deployment of practical solutions, they actively seek collaborations with corporations, governments, and academic institutions.

Environmental impact assessments

They carry out extensive environmental impact assessments and work with experts to make sure their operations are sustainable.

Long-term vision

Beyond simple cleanup efforts, The Ocean Cleanup promises more. By creating and marketing sustainable goods, promoting policy reforms, and increasing public awareness of the importance of decreasing plastic waste at its source, they want to put preventative measures into action.

We must shut the tap and stop new plastic from entering the oceans in addition to cleaning up the existing plastic in order to totally eliminate plastic from the oceans. One of The Ocean Cleanup's main objectives is to clean up the 1,000 most polluted rivers worldwide.

The economy suffers billion-dollar losses due to marine plastic every year, which have an impact on tourism, aquaculture, fisheries, and cleanup. The effects on human health and the marine ecology are not considered in this. Dealing with the consequences later on is much more expensive than intercepting plastic in rivers.

In October 2019, they presented The Interceptor Original, their first river cleanup solutions. Its automatic plastic extraction and 100% solar powered allowed for faster roll-out. Because the Interceptor Original is intended for serial manufacturing, roll-out may happen more quickly. Konecranes and The Ocean Cleanup partnered in December 2020, with Konecranes handling the manufacturing and serial production.

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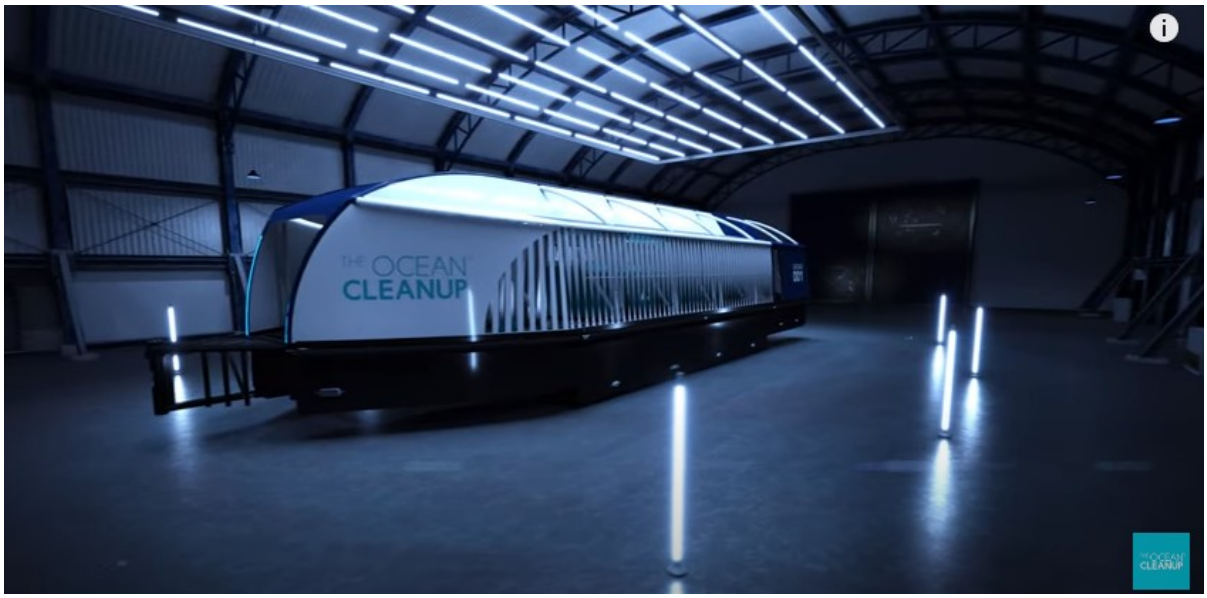

(200) Introducing the Interceptor | Cleaning Rivers | The Ocean Cleanup - YouTube

In the struggle against ocean plastic waste, the Ocean Cleanup is an example of action. They are significantly improving ocean cleanliness and spurring international action thanks to their creative cleanup technologies, ongoing learning, partnerships, and long-term vision.

They say:

"Protecting the natural environment is at the core of our work. It's the main driver behind the development of our technology. Our Environmental team consists of scientists and professionals in fields such as marine biology, oceanography, and marine biogeochemistry; some of whom are experts in protected species, environmental assessments, and anthropogenic impacts. We continually seek to have a greater understanding of the relationship between our technology and the environment with the goal of maximizing the net positive effect of our impact."

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PLASTIC BANK

A social venture called Plastic Bank has used a novel strategy to address the problem of plastic pollution in the ocean. Their goal is to minimize the amount of plastic trash produced by constructing a global system that pays people in developing countries for collecting and reusing plastic.

(200) We are the Humans of Social Recycling | Plastic Bank - YouTube

Social impact model

Using a social impact concept, Plastic Bank enables people living in impoverished regions to start collecting plastic. By providing a fair and transparent payment system and an opportunity of income for individuals who participate, they encourage the collecting of plastic waste.

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(200) Ocean Bottle Dip Dive x Plastic Bank | Plastic Bank Brazil - YouTube

Collection centers

In regions where plastic pollution is a problem, Plastic Bank sets up collecting points. These centers serve as gathering places for local waste collectors to bring their collected plastic garbage to be weighed, sorted, and exchanged in for cash or valuables like food, clean water, or vouchers for education.

Partnerships with corporations

In order to maintain their operations, Plastic Bank collaborates with businesses who share their commitment to minimizing their plastic waste. Through such partnerships, companies ensure a steady market for recycled materials and foster the development of a circular economy by paying a premium price for the collected plastic.

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(200) Henkel and Plastic Bank open first collection centers in Egypt - YouTube

Environmental stewardship

By ensuring that the plastic that is collected is appropriately recycled and used again, Plastic Bank puts a high priority on environmental responsibility. They reduce the requirement for the manufacturing of virgin plastic and minimize environmental impact by processing the plastic waste into useful products in collaboration with local recycling facilities.

Community development

The programs of Plastic Bank go beyond managing plastic trash. They actively fund community development initiatives, offer learning opportunities, assist regional business owners, and create a feeling of pride and ownership in the places they operate.

Technology and innovation

Plastic Bank uses blockchain technology to increase transparency and simplify operations. With the use of this technology, the collecting and recycling process can be traced and held accountable, guaranteeing that the plastic is recycled correctly and that the collectors are fairly compensated.

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Scaling impact

Plastic Bank wants to take its business concept global by setting up a network of collecting centers in several nations. They want to significantly improve the lives of collectors, cut down on plastic trash, and keep plastic pollution out of our oceans by growing their business.

According to Plastic Bank, as of 2020, more than 21,000 collectors in their four countries have gathered about 14,147,000 kg (13,924 long tons; 15,594 short tons) of plastic. According to the company, this amount of plastic is the same as more than 500 million plastic straws, 1.5 million coffee cup lids, and 707,367,900 plastic water bottles.

In order to encourage recycling among kids at a young age, Plastic Bank has placed collecting bins in school environments. Additionally, they work with "Plastic Bank Ambassadors" to promote environmental education in Haiti. The potency of encouraging plastic collecting and recycling in order to reduce ocean plastic pollution is demonstrated by Plastic Bank's creative social impact model. They are developing a sustainable solution that helps people and the environment through their collaborations, environmental stewardship efforts, and community development programs.

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(200) Stories of Becoming | Shaun Frankson | Plastic Bank - YouTube

Awards for Plastic Bank:

2019 Prix Voltaire International Award

2019 Green Tech - Game Changer of the Year

2019 SDG Action Award - Connector

2018 Nature Inspiration Award

2017 UN Momentum for Change Award (COP23)

2015 Sustania Community Award (COP21)

2014 EO Global Citizen Award

2014 RCBC Environmental Award for Innovation

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EXEMPLARY LESSON PLAN

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LESSON: OCEAN POLLUTION AND ITS IMPACT ON ENVIRONMENTAL

Objective: To educate children about ocean pollution, its causes, effects, and ways to prevent it.

1. Introduction

1. Begin the lesson by asking the children if they have heard about ocean pollution and if they know what it means.
2. Explain that ocean pollution refers to the contamination of the ocean with harmful substances, which can have detrimental effects on marine life and ecosystems.

How Does Climate Change Affect the Ocean? | NASA Climate Kids

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https://www.youtube.com/watch?v=a35ffqcF_ZA

2. Causes of ocean pollution

1. Discuss the main causes of ocean pollution:

a) Plastic pollution - Explain that plastic waste, such as bottles, bags, and microplastics, is a significant contributor to ocean pollution.

b) Chemical pollution - Discuss how chemicals from industries, agriculture, and households can find their way into the ocean through runoff or improper disposal.

c) Oil spills - Explain the devastating impact of oil spills on marine life and habitats.

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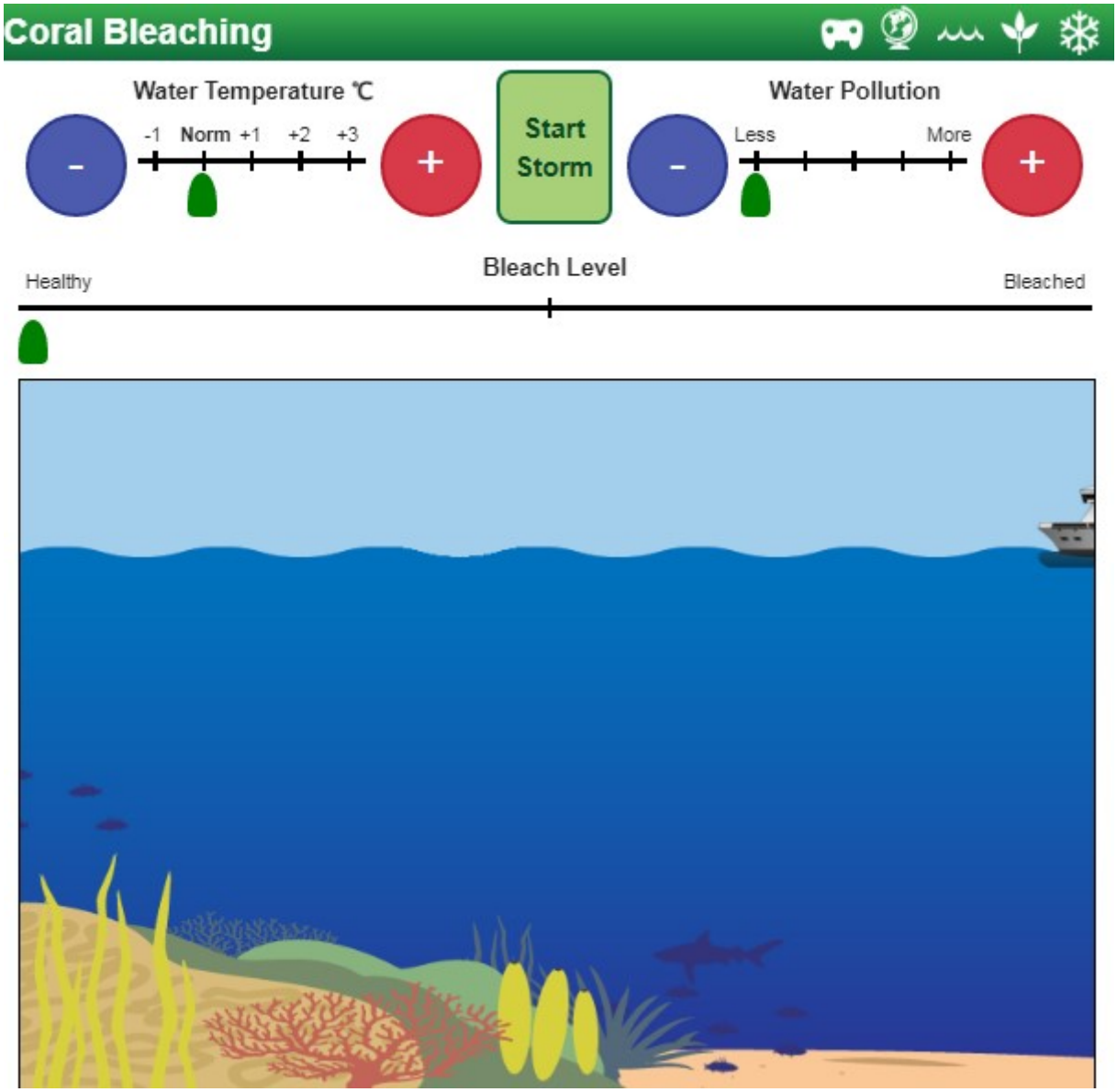

Coral Bleaching | NASA Climate Kids

3. Effects of ocean pollution

Discuss the effects of ocean pollution:

a) Harm to marine life: Explain that marine animals can mistake plastic for food, leading to ingestion and entanglement, which can be fatal.

b) Disruption of ecosystems: Discuss how pollution can harm coral reefs, seagrass beds, and other vital habitats, leading to a loss of biodiversity.

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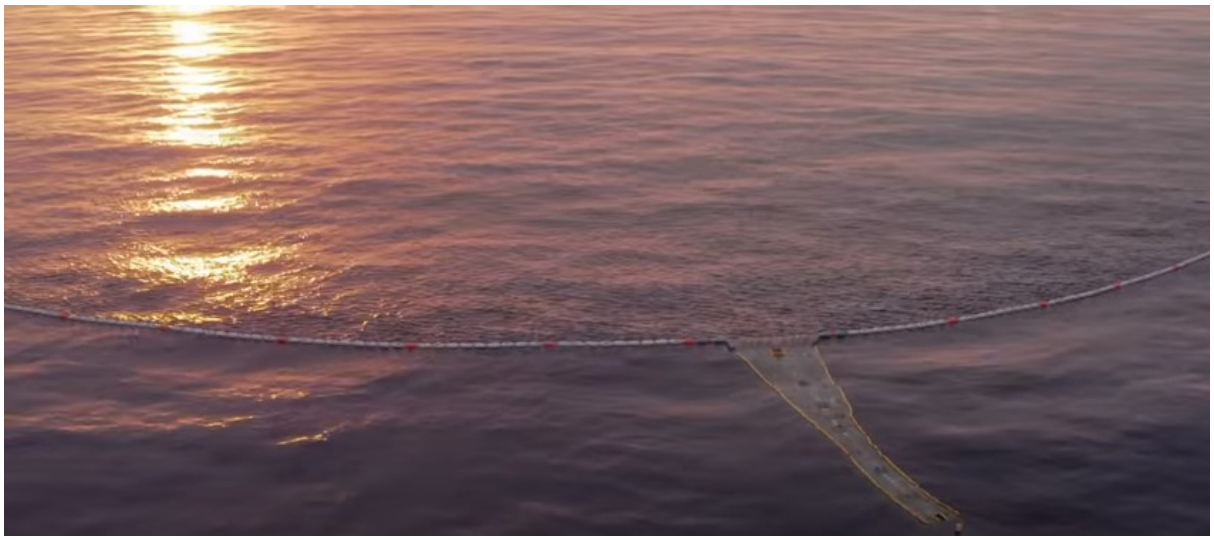
c) Contamination of seafood: Explain that pollutants can accumulate in the tissues of fish and other seafood, posing health risks to humans who consume them.



(200) 2 Minutes of Ocean Cleaning Operations Footage - YouTube

4. Ways to prevent ocean pollution:

Introduce various methods to prevent ocean pollution:

a) Reduce plastic use - Discuss the importance of reducing single-use plastics and using reusable alternatives, such as bags, bottles, and straws.

b) Proper waste disposal - Explain the significance of recycling, composting, and disposing of waste in designated bins to prevent it from entering waterways.

c) Beach and coastal cleanups - Encourage children to participate in or organize cleanups to remove litter from beaches and coastal areas.

d) Responsible chemical use - Discuss the importance of using environmentally friendly and non-toxic products, as well as proper disposal of chemicals.

e) Education and awareness - Emphasize the value of spreading knowledge about ocean pollution to friends, family, and the community to

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inspire collective action.

Six Ocean-Friendly Habits to Help Protect Marine Life - Clearwater Marine Aquarium (cmaquarium.org)

5. Activity - "Protect our ocean poster"

5.1. Divide the children into small groups and provide each group with a large poster board and art supplies.

5.2. Instruct them to create a poster that raises awareness about ocean pollution and promotes actions to protect the ocean.

5.3. Encourage them to use colors, images, and slogans to convey their

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message effectively.

5.4. After the posters are complete, ask each group to present their poster to the class, explaining the key points and actions depicted.

Children can use a variety of materials to create their activity poster on how to protect oceans. Here are some suggested materials:

1. Poster board or large paper, as the base for the poster. Choose a size that is suitable for the space where the poster will be displayed.

2. Markers, colored pencils, or crayons: These can be used to draw illustrations, write text, and color the poster. Encourage children to use vibrant colors to make their poster visually appealing.

3. Construction paper: Children can cut out shapes and letters from construction paper to add dimension and create eye-catching elements on their poster. For example, they can cut out waves, fish, or other marine creatures.

4. Glue or tape: Children can use glue sticks or tape to attach cut-out shapes, photographs, or other materials to the poster board.

5. Magazines or newspapers: Provide old magazines or newspapers for children to cut out relevant images related to ocean conservation. They can use these images to create collages or add visual elements to their poster.

6. Stencils or templates: If children struggle with drawing certain shapes or letters, provide stencils or templates that they can trace to ensure neat and accurate designs.

7. Scissors: Children will need scissors to cut out shapes, letters, and images from paper or magazines.

8. Decorative materials: Encourage children to use decorative materials such as glitter, sequins, or stickers to add extra flair to their poster. However, remind them to use these materials responsibly and avoid any that may harm the environment.

9. Rulers or straight edges

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6. Conclusion

6.1. Summarize the main points discussed in the lesson about ocean pollution and its impact on marine life and ecosystems.

6.2. Encourage the children to share what they have learned and to actively participate in efforts to protect the ocean, such as beach cleanups and promoting sustainable practices.

6.3. Remind them that every small action can make a significant difference in preserving the health and beauty of our oceans.

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QUIZ: OCEAN POLLUTION

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1.What is ocean pollution?

a) When the ocean water turns blue

b) When the ocean water becomes dirty and harmful to marine life

c) When the ocean water tastes salty

2. Which of the following is a common source of ocean pollution?

a) Trees

b) Plastic waste

c) Clouds

3. What is the biggest problem caused by plastic pollution in the ocean?

a) It makes the water look dirty

b) It harms marine animals that mistake it for food or get tangled in it

c) It causes the ocean to become too cold

4. How can we help reduce ocean pollution?

a) Throw garbage into the ocean

b) Recycle and properly dispose of waste

c) Pour chemicals into the ocean

5. What is one thing you can do to prevent ocean pollution?

a) Use reusable water bottles instead of single-use plastic bottles

b) Throw trash in the ocean because it will eventually dissolve

c) Use as much plastic as possible

6. True or False: Oil spills can cause severe damage to marine ecosystems.

a) True

b) False

7. Which of the following is an example of chemical pollution in the ocean?

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a) Freshwater from a river flowing into the ocean
b) Oil spills from ships or offshore drilling
c) Rainwater falling into the ocean

8. True or False: Noise pollution can disrupt marine life, such as whales and dolphins.
a) True
b) False

9. What can happen to marine animals if they ingest plastic waste?
a) They become stronger and healthier
b) They can get sick or die
c) They can grow bigger

10. What is one way we can conserve and protect our oceans?
a) Use as much plastic as possible
b) Support organizations that clean up ocean pollution
c) Dump waste into the ocean

Answers:
1. b) When the ocean water becomes dirty and harmful to marine life
2. b) Plastic waste
3. b) It harms marine animals that mistake it for food or get tangled in it
4. b) Recycle and properly dispose of waste
5. a) Use reusable water bottles instead of single-use plastic bottles
6. a) True
7. b) Oil spills from ships or offshore drilling
8. a) True
9. b) They can get sick or die
10. b) Support organizations that clean up ocean pollution

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ADDITIONAL VIDEOS AND GAMES

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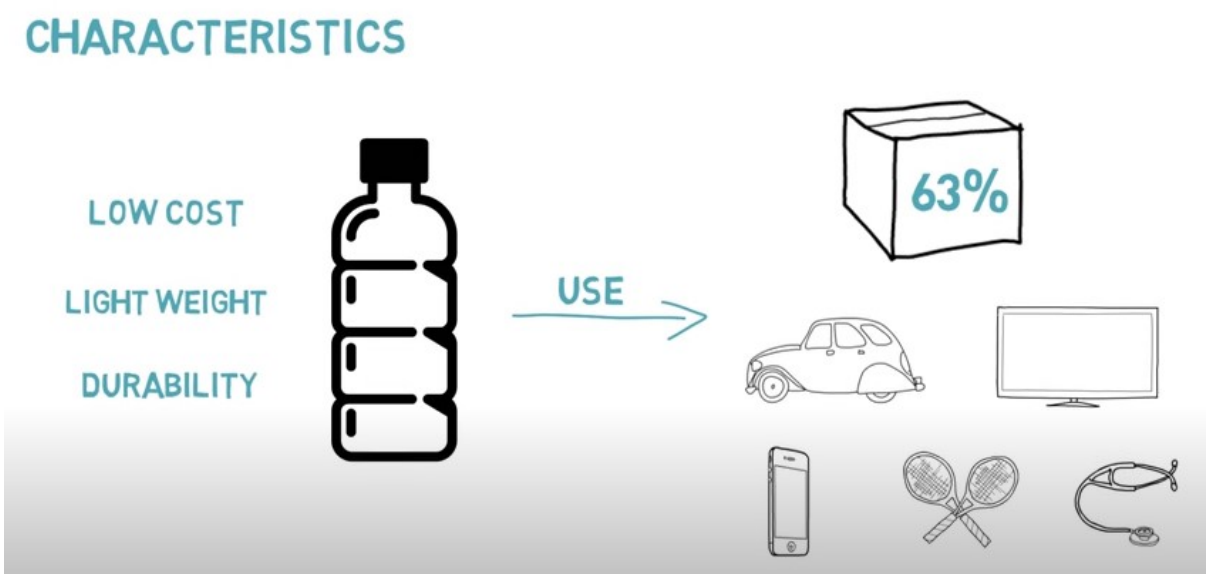
(200) Why should we reduce our use of plastic? | News2Me - YouTube



(200) Plastic pollution in the ocean - YouTube

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(200) How does plastic end up in our oceans? - YouTube

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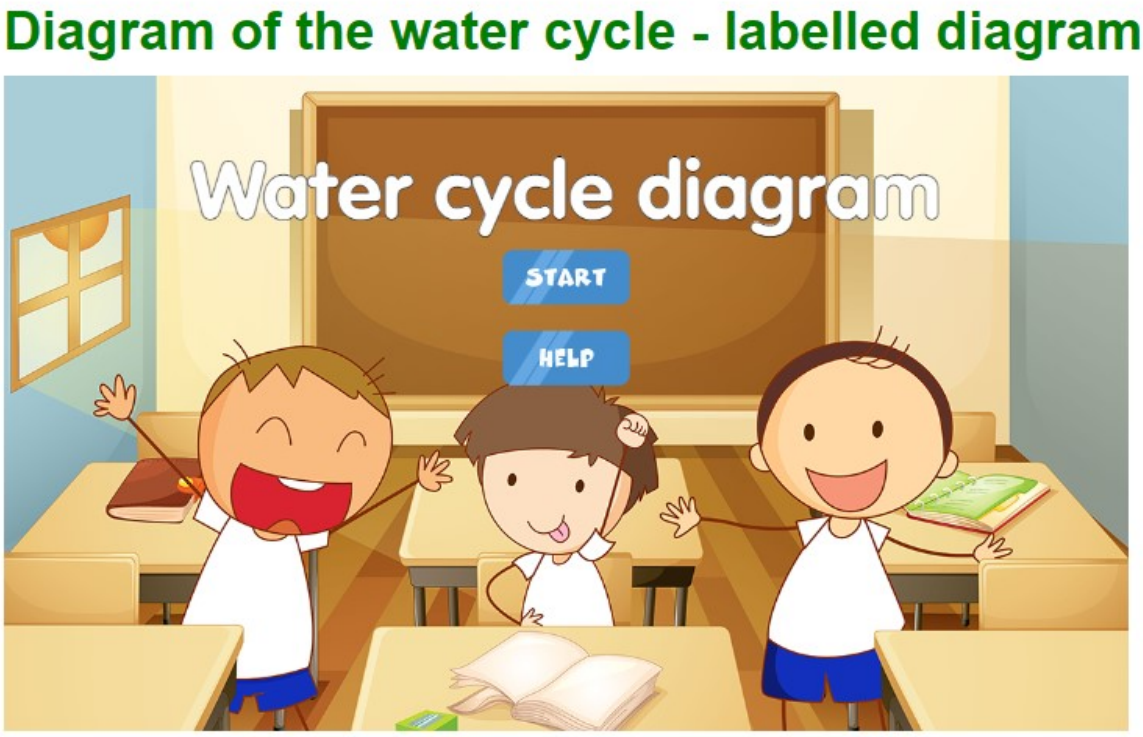

Diagram of the water cycle - labelled diagram (ecosystemforkids.com)

(200) The Water Cycle Video Lesson - How the Hydrologic Cycle Works - YouTube

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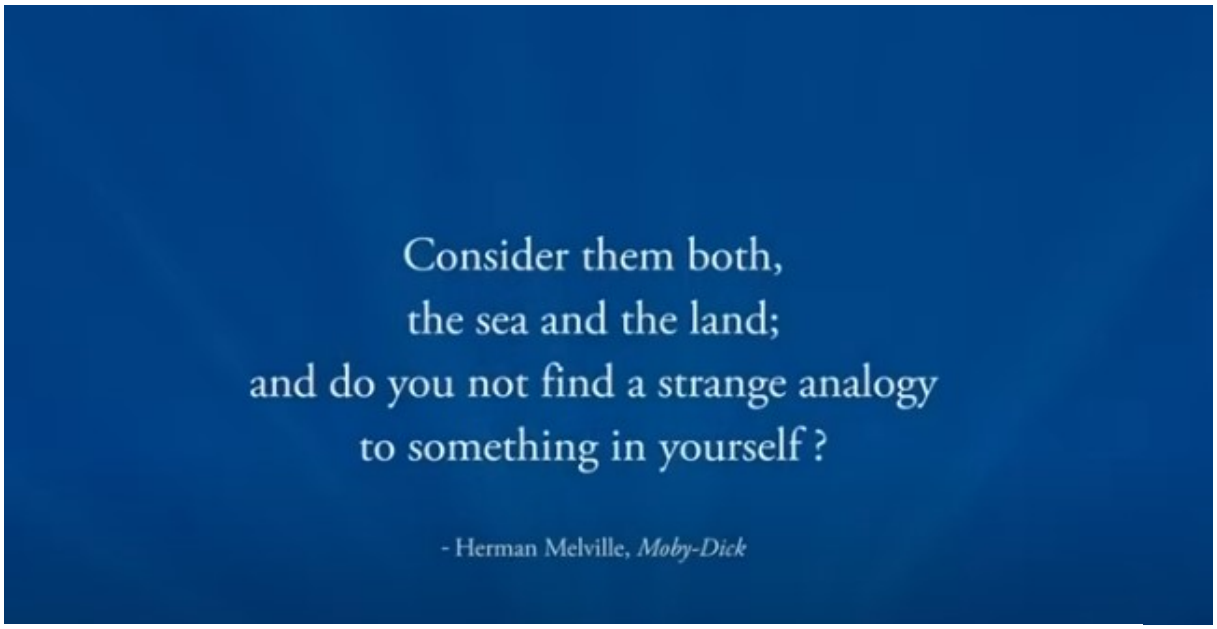
(201) Increasing Coral Bleaching with Global Warming - YouTube



(201) A Plastic Ocean - YouTube

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(201) What is Ocean Acidification? - YouTube

https://youtu.be/6zrn4-FfbXw

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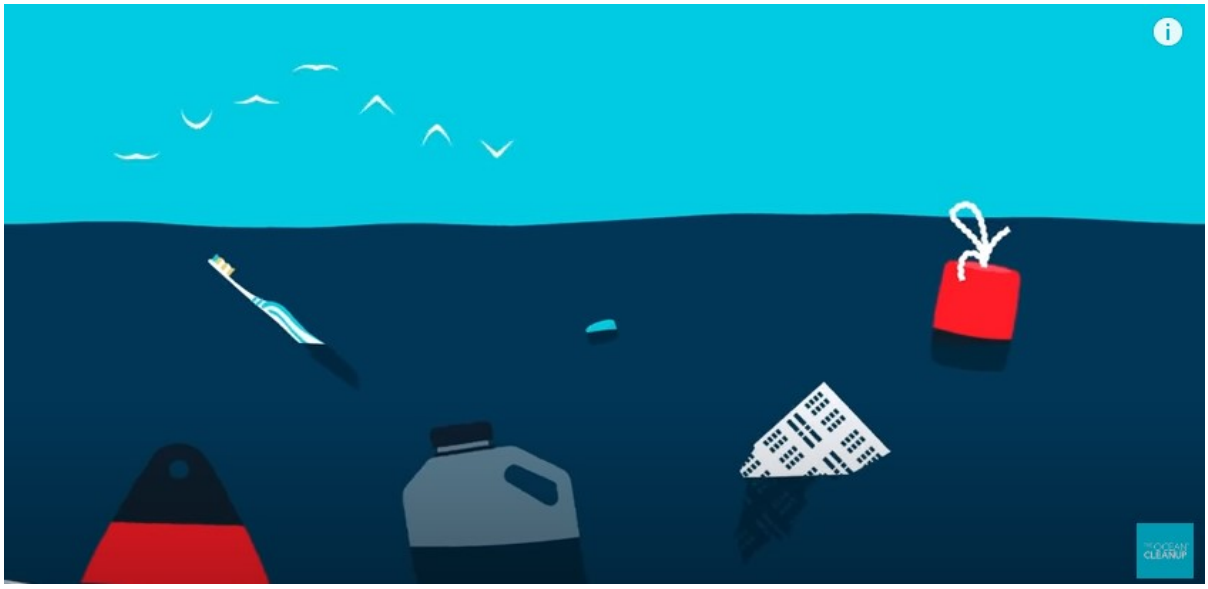

(200) Everything We Know About Ocean Plastic Pollution So Far | The Ocean Cleanup - YouTube

(200) The End of the Great Pacific Garbage Patch | The Ocean Cleanup - YouTube

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