Case Study: Plastics in our water ways

Activity Sheet 12. “Plastic solutions”

Introduction

In this activity sheet students explore measures to prevent and reduce the impacts of plastics in our waterways. These approaches have been placed into two broad categories; strategies to clean up the existing plastics in our waterways and methods to reduce the amount of plastic waste available to enter our waterways. In this activity sheet strategies at a global and national scale are investigated. Activity Sheet 13 will focus on the strategies implemented at a local scale.

The content of this activity sheet relates to the following Geographical Concepts and Skills and Geographical Knowledge.

Geographical Concepts and Skills

Place, Space and interconnection

- Identify, analyse and explain interconnections within places and between places and identify and explain changes resulting from these interconnections

Geographical knowledge

- Causes of an atmospheric or hydrological hazard and its impacts on places, and human responses to it to minimise harmful effects on places in the future.

Cleaning up existing plastics in our oceans

Prior to commencing the tasks below, as a class discuss why it may be difficult to clean up existing areas plastics in our waterways, such as the ocean garbage patches. Notes could be taken on the following:

- Due to their size, microplastics are difficult to collect and trap
- It is difficult to collect plastics that are submerged
- Whilst plastic litter is concentrated in the ocean garbage patches, plastic litter is distributed across the globe. Such a large area is difficult to manage and due to the nature of water is constantly moving.
- There are already large quantities of plastics in our waterways causing significant damage

- The oceans garbage patches are in international waters and are not the legal responsibility of one particular country. It is a global problem that needs to be addressed at a global, national and local level.
- What funding is available?
- Given the above a range of solutions need to be implemented and co-ordinated.

The programs that have been implemented to clean up the existing plastics in our waterways tend to be those implemented by non-government organisations. The strategies adopted by such organisations are occurring at a range of scales and locations. There is a large amount of information available – below are just some of these resources to get you started.

1. One of the more recognised efforts to clean up the Great Pacific Garbage Patch is the prototype developed by a foundation called The Ocean Clean Up. Information about the foundation and their project can be obtained via their website.

Watch the clip
Boyan Slat unveils The Ocean Cleanup Prototype

An update of the prototype can be found on The Ocean Clean Up website and via clips such as
The Ocean Cleanup's Most Advanced Scale Model Test to Date

Using the information from the Ocean Clean Up website and the above clips answer the following questions:

a) What conventional methods are available to clean up the oceans? According to Boyan what are the limitations of these methods?
b) Describe the design of the prototype and explain how it will collect rubbish from our oceans.
c) When is it expected that this project will be fully operational?
d) When the prototype is fully operational what are the expected outcomes?
e) Will the prototype be able to collect all of the different plastics in the ocean garbage patches?
f) There are articles, such as those listed below, which provide an insight into some of the factors/issues that the prototype could face.

    - 'Great Pacific garbage patch' sprawling with far more debris than ...
    - Great Pacific Garbage Patch plastic removal system could become ...

    As a class discuss and take notes on the pros and cons of the implementation of the prototype.

    Using the above points as a guide, ask students to write an evaluation of the prototype and their recommendations about its use.

2. On a smaller scale other projects such as Seabins have been implemented. Watch the following clip
Will Seabins save our oceans? The Seabin Project - YouTube

Articles such as Seabins to catch rubbish in Aussie waters provide useful information to help evaluate the effectiveness of this project.

With reference to the above information answer the following questions:

a) What are seabins and how do they operate?
b) What type of plastics/litter are collected by seabins?
c) Describe the general locations of seabins.
d) When is it planned that seabins will go offshore?
e) As a class summarise the pros and cons of seabins. In this discussion ask students to comment on the locations where they would consider seabins to be most effective.

3. Across the globe there are numerous non-profit organisations that clean up litter, including plastics, that have washed onto beaches. Apart from improving the health of the environment, removing litter found on the beaches simply means it will not re-enter the water. Within Australia some of the organisations that undertake litter clean ups include:

- Tangaroa Blue
- Beach Patrol
- Sea Shepherd
- Ocean Watch
- Clean Up Australia
- Port Phillip Baykeeper

As an example of one of these organisations go to Tangaroa Blue website. Using the information contained under “Home” and “About Us” answer the following questions.

a) What are the broad aims and objectives of Tangaroa Blue?
b) How has Tangaroa Blue assisted in the removal of debris from beaches?
c) How much litter has been collected from beaches via Tangaroa Blue’s programs?
d) Explain the purpose of the Australian Marine Debris Data Base. How does this data base operate?
e) As a result of the data collected what are some changes re use of plastics that have occurred?
f) What other projects has Tangaroa Blue initiated?

To provide a real life experience of the Australian Marine Debris Base you could go on to the site and organise a clean-up.

Alternatively, you could choose to research a similar organisation that you have or would like to develop community ties with. If one of these organisations is close by you could

consider inviting them to your class to provide an overview of their operations. You could also consider asking volunteers from your class to participate in one of their clean up days.

Strategies to reduce the amount of plastic items used

Introductory Activity

The purpose of this activity is to get students considering the options that are available to every day plastic items and the reasons why these alternatives are not being used on a larger scale.

Begin by undertaking research to complete the table below.

Plastic item	Alternative non-plastic item	Cost comparison	Are you or would you use the alternative non – plastic item (briefly explain)
Water Bottles			
Retail Bags (eg. Myer)			
Straws			
Cotton Buds			
iPhone Cover			
Garbage Bags			
Tooth Brush			
Cooking Utensils			
Take Away Coffee Cups			
Sandwich Wrap			
Food Storage			
Facial Scrubs			
Lunch Box			
Plastic wrapping used in supermarkets			

Bags from baker, butcher, fruit & vegetables			
Plastic Cutlery (used at parties/picnics)			

Use the results from the table to initiate class discussion. Some points that could be raised include

- Which of the alternative non-plastic items would class members be happy to use? Why?
- Which of the alternative non-plastic items would class members not want to use? Why? What would need to change for you to use these items?
- During your research what other items did you come across that could reduce the amount of plastics being used?
- Given the availability of these non-plastic items suggest factors that could explain why they are not common place in households.
- What could Governments do to make non-plastic alternatives more common in households? (Use this as an introduction to the next topic)

Government policies aiming to reduce the use of plastic items

As an introduction read the following article "9 Brilliant Ways the UK Is Cracking Down on Plastic Pollution"

a) List the ways that the Government in England has begun to reduce the amount of plastics being used.
b) As a class research which of these strategies has been introduced by Governments in Australia.
c) Which of the strategies introduced in England do you think could also be implemented in Australia?

If you wish to extend this activity, government approaches from other countries could be researched. For a guide to such an approach see Activity Sheet 7 in Unit 1 Hazards and Disasters.

How are businesses reducing the use of plastic items?

As an example of the efforts of businesses to reduce the amount of plastics read over the following article

Companies take major step towards a New Plastics Economy

Complete the following tasks:

a) For the companies discussed in the article list the ways in which they are/ plan to reduce their use of plastics.
b) What are the timelines for the above strategies? Comment on whether you consider these timelines to be suitable.
c) For one of these companies go to their website to find more specific details about the programs discussed in the article. Other companies such as Starbucks, Coles and Woolworths can also be included. When researching these companies it is also worthwhile looking at the websites of their Australian branches as they can contain information about programs that are specific to Australia.

As an alternative to the above, you could divide the class into pairs and allocate each pair a specific company to research.

A table similar to that below could be used to record the information.

Company : _____

Description of strategy to reduce the use of plastics	Date of implementation	Comments about the effectiveness of this strategy

Recycling Plastics

According to a range of sources only 9% of plastics are recycled in Australia. The majority of plastics are produced by virgin fossil fuels. It is estimated producing plastics from recycling saves 88% of the energy required to produce plastics from fossil fuels. (Source: Suez). So given the overall benefits to the environment and the fact that recycling would create less plastic waste it seems logical to invest into reusing plastics.

1. Explain to the class why such a low level of recycled plastic is being used in Australia. Articles such as the following are useful reference points.

   Recycling in Australia is in crisis. Can it be fixed? - Science News ...

   Australia needs to start recycling and reusing its own waste, says ...

   The above articles also contain some suggestions to improve the amount of plastics being recycled that could also be discussed in class.

2. As an example of alternative strategies of how plastics can be used watch some of the following clips. After each clip discuss the feasibility of the project.

No, Sweden does not recycle 99 percent of its waste

How to Make Diesel from Plastic

Turning Plastic Waste into a Resource

Break the class up into small groups. Allow each group time to research inventive ways that recycled plastics could be used on a mass scale. For example, there are trials of laying bitumen that contains plastics. From their research students are required to present a proposal containing what they consider to be the best package of methods to reuse plastics on a large scale.

In their presentation the following points need to be raised

- An outline of how the method uses recycled plastics

- The technology and infrastructure require for this method
- The amount of plastic that could be used
- An estimation of the costs involved
- An outline of the pros and cons of this approach
- A summary of why they chose this particular approach