

A Sea of Plastic

Lesson Map: <http://esriaustralia.com.au/education/SpatialActivity43>

Engage

Plastic is not so fantastic

- Each year, more than 8 million tons of plastic ends up in the oceans, costing at least \$8 billion in damage to marine ecosystems. World production of plastic materials in 2016 was 280 million tonnes.
- These plastics degrade into tiny pieces of plastic, called microplastics, which can now be found in our soil, oceans, fish, food, even air!
- According to a recent report by the United Nations Environment Programme, the three biggest culprits include single use plastic bags, disposable single use plastic items and microbeads. Fill in the below table which explores these three pollutants.

Item	Description	Used In
Single Use Plastic Bags	<i>Plastic bags that are used once</i>	<i>Typically used in shopping, such as grocery shopping</i>
Disposable Single Use Plastic Items	<i>Disposable plastic items, such as cutlery, food packaging, straws, cups</i>	<i>Typically used in fast food and other services</i>
Microbeads	<i>Microbeads are synthetic plastic particles added for abrasive purposes</i>	<i>Typically used in personal products such as face scrub, soaps. They can also be used in medicinal and building industries</i>

Download student worksheet [here](#).

Time
45 minutes

Activity

Investigate the trillion tonnes of plastic floating in our oceans, and the processes behind it.

Learning Outcome

Students will be able to:

- Understand the state of plastic around the world
- Explore the many factors that shape our ocean
- Analyse the spatial distribution of polluted rivers and gyres
- Identify the key polluters in the Great Pacific Garbage Patch

ACARA Curriculum Link

Year 10 Geography – Unit 1: Environmental Change and Wellbeing
[ACHGK070 | ACHGK073](#)

Teacher Feedback:

To share your feedback on this, or any Spatial Activity, please contact education@esriaustralia.com.au

Explore

A plastic world

- Click on the Lesson Map URL above to open the map. In the 'details' pane, under 'content', tick the first checkbox to turn on the layer 'Plastic MSW'. This layer looks at waste per capita, which means waste per person.
- MSW stands for Municipal Solid Waste and is commonly known as rubbish.
- ? What countries have the highest rate of MSW? [Kuwait, Antigua and Barbuda, Guyana, Sri Lanka, Barbados, Soloman Islands, Tonga, New Zealand, Ireland, Vanuatu.](#)
- ? What is Australia's rate? Hint: Clicking on each country will display a pop up. [Australia's MSW rate is 2.23.](#)
- Turn off the layer 'Plastic MSW'. Turn on the next layer 'Mismanaged Waste predicted in 2025, percent of global total'. This layer shows those that are predicted to be **above** and **below** the world average of 0.6 percent.
- ? In terms of total waste, which countries have the highest rates? [China, Indonesia, Philippines, Vietnam and India.](#)
- ? The results between the two layers are very different. Between the two layers, which do you think is the truest representation of a country's neglect for the environment? Should we look at total waste, or should we look at waste per capita? [Student's own answer.](#)

Explain

One big wave pool

- To understand how plastic and waste become trapped in our oceans, we need to understand the ocean works.
- Turn on the layer 'Ocean Currents'. Ocean currents are movements of water, from a range of forces such as wind and the Coriolis effect.
- Warm ocean currents travel from the equator and cold ocean currents from the poles.
- The movement of these waters create ocean gyres, which is a large system of circulating ocean currents. These ocean currents circle between the continents on

The Coriolis effect causes objects in the Northern hemisphere to deflect to the right, whereas objects in the Southern hemisphere deflect to the left.

earth.

- ? Turn on both 'Plastic Patches' layers and turn off the 'Ocean Current' layers. What are the major ocean gyres called?
- North Atlantic Gyre
 - South Atlantic Gyre
 - Indian Ocean Gyre
 - East Pacific Gyre
 - West Pacific Gyre
 - South Pacific Gyre
- ? Turn on the layer 'Top 20 Plastics from Rivers, 2015'. Which river is responsible for sending the most plastic into the ocean? **The Yangtze River is responsible for sending 333,000 tonnes of plastic into the ocean.**
- ? What is the spatial distribution of the highest polluted rivers? **These most polluted rivers are in Asia, where the highest population is.**
- ? Turn on the layer 'Surface Plastic 2013'. This layer is in tonnes. Which ocean has the highest concentration of plastic? **The North Pacific Ocean, which has around 96000 tonnes floating.**

Extend

The Great Pacific Garbage Patch

- ? The Great Pacific Garbage Patch (GPGP) is located in the North Pacific Ocean. What two Gyres is it combined? **The East Pacific and West Pacific Garbage patch.**
- A [2018 study](#) into the GPGP, found that microplastics accounted for 94% of the trillion pieces floating in the area. However, these microplastics only accounted for 8% of the total mass.
- The biggest plastic pollution by total mass was actually fishing equipment, such as ropes, lines and nets. 46% of the floating debris in the GPGP was fishing nets.
- ? Explain the risk that both of these items pose to the oceans, as well as the flow in effect.

Microplastics	Fishing gear

Next Steps:

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