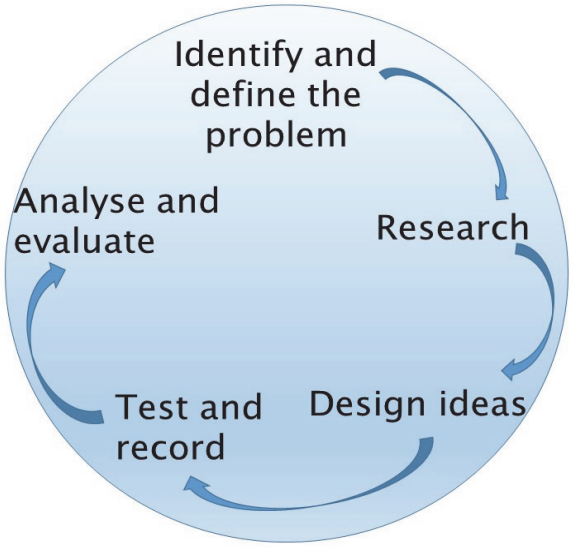
The Challenge

Humans have evolved over time. Humans have learnt to make tools, farm and produce goods in ways that other animals haven't. Your challenge is to investigate how human activities change the surface of the Earth.



Background Information

Humans need food to survive. As our global population grows more quickly than ever before, so too does the demand for food. Most of our food comes from large farms with crops or livestock, such as sheep and cows. This has led to large scale removal of vegetation to clear areas for farmland, such as jungles, woodlands and bushland which changes much of the surface of the Earth.

Many of us also live in a 'consumer culture' in which we are told that we need lots of things. In this modern world we use a lot of technology, such as phones, computers and tablets. To build these devices we first need the raw materials, such as minerals, metals and oil, which are extracted from the Earth by mining. This involves removing rocks and materials from the Earth. Mining can greatly impact the surface features of the Earth. With that said, mining companies are now more environmentally aware and will rehabilitate an area once they have finished, by replanting vegetation.

If we look at satellite pictures of the Earth by night, like the one below, we can see where there are cities as they are lit up. Buildings and infrastructure (roads, railways etc) have stamped their mark on the Earth's surface. Where once there where trees and plants, there are now towns. Even hillsides are often flattened to make way for buildings and roads.

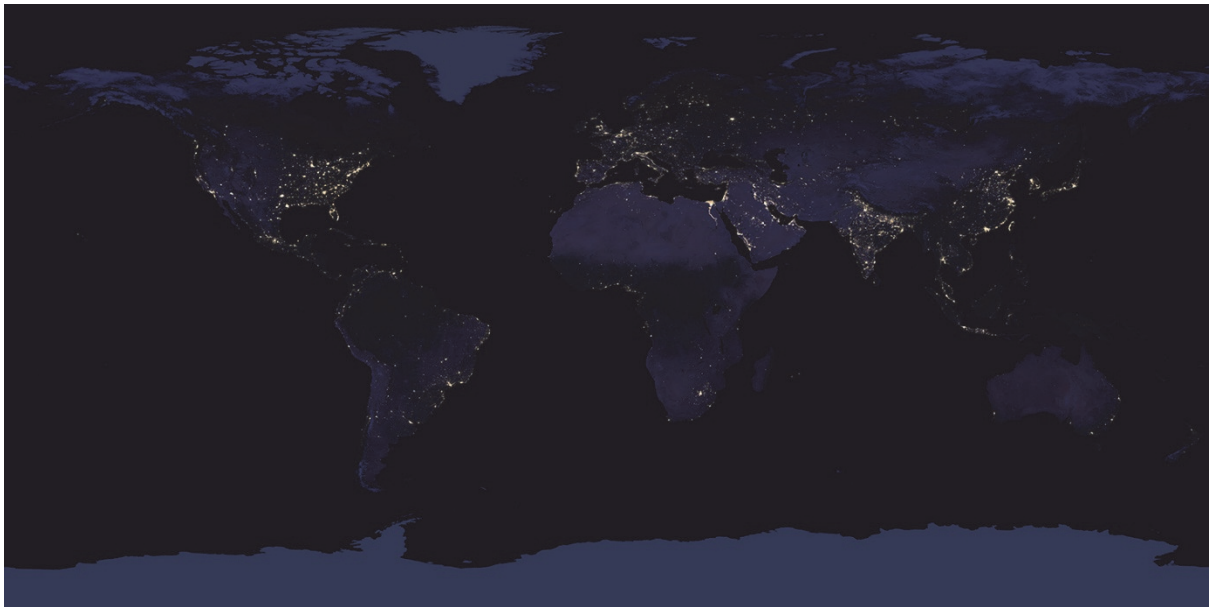


Figure 1. Satellite picture of Earth by night (NASA, 2016)*)*

Background Research

1. What is the definition of erosion?

Suggested website: https://kidskonnect.com/science/erosion/

2. What are some human activities that can cause erosion?

Suggested website: https://kidskonnect.com/science/erosion/

3. What are some ways to control erosion?

Suggested website: https://kidskonnect.com/science/erosion/

Walking Away the Earth

Objective

To investigate the impact of walking on the Earth's surface.

Equipment

- Tray with sand in it
- Tray with water in it
- Weighing scales

Method

1. Weigh the tray with sand in it using the scales. Record the weight in the table below.
2. Everyone in the class should take a turn of first standing in the tray with water in it and then standing in the tray with sand in it.
3. Weigh the tray with sand in it again and record the new weight in the table.

Results and Analysis

Initial weight of tray with sand (kg)	Final weight of tray with sand (kg)

1. What was the change in weight of the tray with sand? Show your calculations below.

Evaluation

1. How well did the experiment show how humans can cause erosion on the Earth?

2. Why did each student step in water before the experiment, and do you think the results would have been different if they hadn't – if so how?

3. How could you improve the experiment?

4. How does this experiment relate to farming livestock?

Adding to the Earth

Objective

To investigate how the materials we use, and dispose of, can change the Earth's surface.

Equipment

- 3 x large plastic cups
- An apple core
- A piece of plastic rubbish (like a chocolate wrapper)
- A small piece of metal rubbish (like part of an empty drink can with the edges smoothed off)
- A bag of soil
- Cling wrap or three clear plastic bags
- 3 x elastic bands

Method

1. Carefully scoop some soil into the bottom of the plastic cups.
2. Add to 1 cup the apple core, another cup the piece of plastic rubbish and the third cup the piece of metal rubbish.
3. Hold the piece of rubbish against the side of the cup, while carefully filling the rest of the cup with soil – so that you are still able to see the piece of rubbish, but it becomes covered in soil.
4. Moisten the soil with some water.
5. Seal the cup with cling wrap and put an elastic band over the top to ensure it is airtight.
6. Make observations of the contents of the cups over the next few weeks and record them in the table (add some photos if you can).

Results and Analysis

	Observations		
	Apple core	**Plastic rubbish**	**Metal rubbish**
Start			
Week 1			
Week 2			
Week 3			
Week 4			
Week 5			

1. Which piece of rubbish changed the most?

2. Which piece of rubbish could have been recycled?

Evaluation

1. How well did the experiment show how different rubbish breaks down?

2. How could you improve the experiment?

3. Is there anything else you would like to investigate?

4. Every year, around 70 million tons of waste is produced in Australia. Waste that can't be recycled or turned into compost goes into landfill. What do you think this will do to the Earth's surface?

Keeping it Together

Have you ever tried to push over a tree or pull one out the ground? Chances are you didn't manage. Why do you think that is?

Objective

To investigate how plant roots help to hold soil together and prevent erosion.

Equipment

- Gardening gloves
- Ruler
- Trowel
- Camera (optional)

Method

1. Find a weed in the garden and try to pull it out. If you can't manage, use the trowel to dig it out. Make a note in the table of how easy it was to pull out of the soil.
2. Use the ruler to measure the length of the roots. Make observations of the roots and add this to the table (e.g. Is there only one root or lots of them? Are they spread out or narrow?).
3. Write in the table how much soil was held together in the roots.
4. If you have a camera take a photo of the weed, with the ruler next to it for scale.
5. Repeat the investigation pulling up different types of weeds, recording your findings and observations in the table.

Results and Analysis

Weed (photo or description)	How easy it was to get out (did you need to use the trowel?)	How long are the roots, and any other observations	How much soil was held together in the roots

1. Was there any relationship between the length of the roots and how easy it was to pull the weed up?

2. Was there any relationship between the length of the roots and how much soil was held in the roots?

3. Was there any relationship between the amount of soil held in the roots and how easy it was to pull the weed up?

Evaluation

1. How well did the experiment show how plants can help hold soil in place?

2. How could you improve the experiment?

3. Trees have much larger and deeper roots than weeds. How do you think planting trees can help prevent erosion?

4. What impact do you think deforestation (cutting down trees) for farming, mining and cities has on the Earth's surface?

Earth from Above

Imagine aliens were studying our solar system to look for evidence of intelligent life forms. What would they see that could prove to them there was life on Earth?

Objective

To create a presentation showing evidence of human impact on Earth's surface.

Equipment

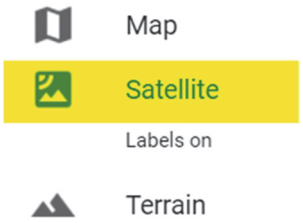
- Computer with the internet and PowerPoint application.

Research

1. Where is the Super Pit and what is mined there?

   _____

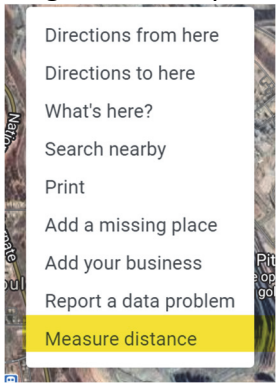
2. Go to Google Maps and turn it onto satellite mode.



➔ Search for Super Pit, Fimaston WA

➔ Take a screenshot of it and add it to your PowerPoint presentation. Don't forget to add a title to the slide.

➔ In Google Maps use the distance tool, by right clicking on the mouse, to find the length of the Super Pit in kilometres:



Length of the Super Pit = km

➔ Use the distance tool to find the width of the Super Pit, at its widest point, in kilometres

Width of the Super Pit= km

An Olympic swimming pool is 50 m long and 25 m wide.

a) How many pools would fit in to the Super Pit length ways?

_____

b) How many pools would fit in to the Super Pit width ways?

_____

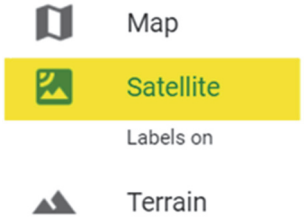
c) How many pools would fit into the Super Pit in total (answer a x answer b)?

_____

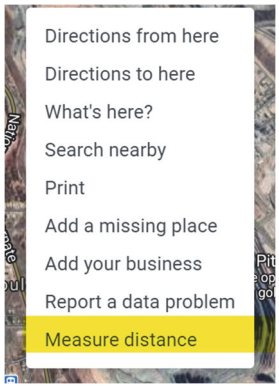
3. Where is Mount Tom Price Mine and what is mined there?

_____

4. Go to Google Maps and turn it onto satellite



➔ Search for Mount Tom Price mine
➔ Take a screenshot of the mine and add it to your presentation. Don't forget to add a title
➔ In Google Maps, use the distance tool to find the length of the mine in kilometres.



Length of the Mount Tom Price mine = km

➔ Use the distance tool to find the width of the mine, at its widest point.

Width of the Mount Tom Price mine= km

a) How does the Mount Tom Price mine compare in size to the Super Pit?

_____

5. In Google Maps and on your web browser, search for the North West Shelf Visitors Centre

a) What infrastructure surrounds it?

_____

b) What is gas used for?

_____

c) Using the distance tool in Google Maps, work out the length of the gas plant.

_____

d) Using the distance tool in Google Maps, work out the width of the gas plant.

_____

e) How does the size of the gas plant compare to the size of the Super Pit?

_____

6. Where is the Wheatbelt in Western Australia (you may like to add a map of it to your presentation)?

_____

a) What is the area of the Wheatbelt? (square kilometres)

_____

b) How does that compare to the area of England?

_____

c) Name three Wheatbelt towns.

d) Look up one of the towns on Google Maps

➔ Use satellite view to find evidence of farming in the area and add this to your presentation.
➔ Measure the length of three fields (instructions above).

e) How does the length of a field compare to the length of i) the Super Pit and ii) the gas plant?

7. Look at Perth in Google Maps satellite view

a) What evidence is there of humans changing the surface of the Earth?

b) Where do you think marks the northern end of Perth?

c) Where do you think marks the southern end of Perth?

d) Measure from the northern end to the southern end of Perth using the distance tool. How long is Perth? (kilometres)

8. Put these in order of area, smallest to largest: Super Pit, Mount Tom Price mine, Karratha Gas Plant, Wheatbelt, Perth.

9. What human practice/industry do you think makes the biggest impact on the Earth's surface?

Contour Ploughing

Traditionally, farmers have ploughed their fields on hillsides by starting at the top of the hill, then going to the bottom, before making their way back up again in a series of lines. However, it has been argued that if farmers were to follow the contours of the land there would be less erosion.

What is meant by the word contour? (add a diagram)

Objective

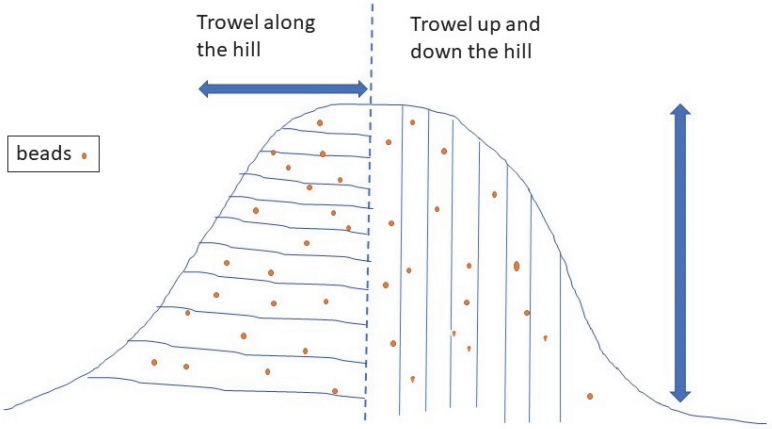
To investigate different ploughing methods to reduce erosion.

Equipment

- Tray with sand
- Toy rake
- Beads
- Camera (optional)

Method

1. Build a basic sandcastle/hill with the sand, trying to make sure it is symmetrical (both sides sloping at the same angle). Scatter some beads on the sides of the hill.
2. Mark a line, splitting the hill in half from top to bottom.
3. On one half of the hill, trowel up and down – from the bottom of the hill to the top
4. On the other half of the hill, trowel along the ways following the contours



5. Record your observations of what happened to the sand and the beads in the table. Take a photo, if you have a camera
6. Repeat steps 3 and 4 three more times, ensuring you continue to trowel one side up and down and the other side following the contours, recording your observations after each trial.

Results and Analysis

	Observations and photos	
	Trowelling up and down	**Trowelling along contours**
Start		
Trial 1		
Trial 2		
Trial 3		
Trial 4		

1. Which method made the most beads and sand 'erode'/slide down to the bottom of the tray?

   _____

Evaluation

1. How well did the experiment show how different methods of ploughing can reduce erosion?

2. How could you improve the experiment?