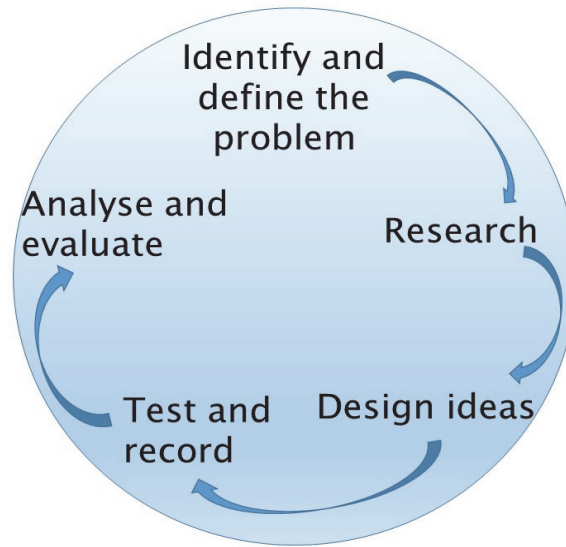


The Challenge

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 were trees and plants, there are now towns. Even hillsides are often flattened to make way for buildings and roads.

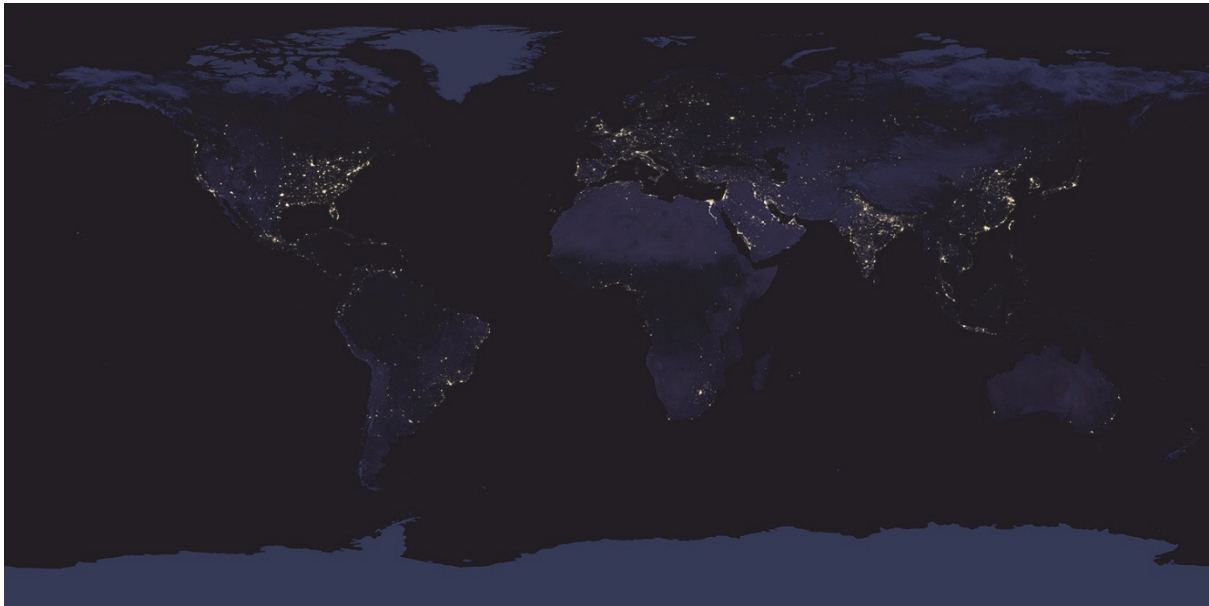
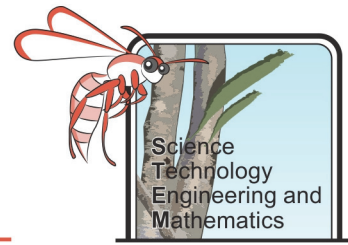
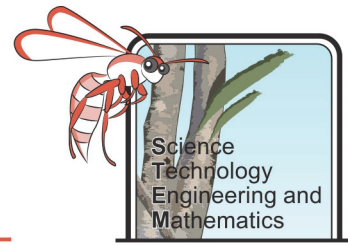


Figure 1. Satellite picture of Earth by night (NASA, 2016)



Background Research

1. What is the definition of erosion?

Suggested website: <https://kidskonnnect.com/science/erosion/>

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

Suggested website: <https://kidskonnnect.com/science/erosion/>

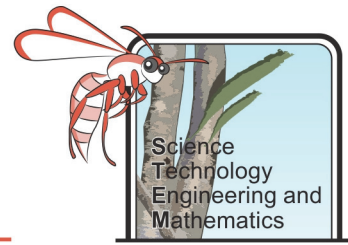
3. What are some ways to control erosion?

Suggested website: <https://kidskonnnect.com/science/erosion/>

4. How much fertile soil is lost to erosion each year? (Reference your source).

5. How long does it take for 1 cm of soil to form? (Reference your source).

6. Would you consider soil a renewable or non-renewable resource? Explain your answer.



Walking Away the Earth

Objective

To design and carry out an investigation to find out how much animals (humans) walking on the Earth's surface can cause erosion.

Equipment

Write an equipment list for your experiment.

Safety

Write any safety precautions that have to be taken.

Method

Write a list of steps and draw a diagram to show how you will do the experiment. Include instructions on how you will record and present your results. Make sure you make it clear how you will make it a fair test.

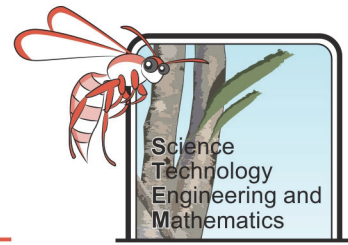
Prediction

What results do you think you will get from your experiment?

Results and Analysis

Present your results as a table and/or graph. If you have taken any photos or made videos of the experiment, make sure you add them.

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Evaluation

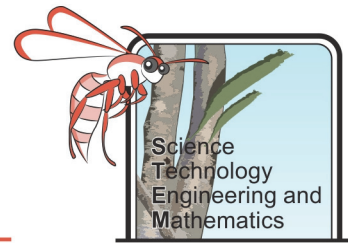
1. Was your prediction supported?

2. How well did the experiment show how animals (humans) can cause erosion on the Earth?

3. How could you improve the experiment?

4. How could you extend this experiment?

5. How does this experiment relate to farming livestock?



Adding to the Earth

Objective

To design and carry out an investigation to see how the materials we use, and dispose of, break down. Also, to discuss how this can change the Earth's surface.

Equipment

Write a list of equipment for your investigation.

Method

Write a list of steps and draw a diagram to show how you will do the experiment. Include instructions on how you will record and present your results. Make sure you make it clear how you will make it a fair test.

Safety

Write any safety precautions that have to be taken.

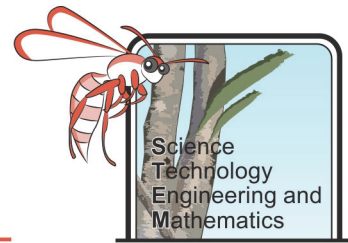
Prediction]

What do you think will happen to each piece of rubbish?

Results and Analysis

Present your results as a table and/or graph. If you have taken any photos or made videos of the experiment, make sure you add them.

1. Which piece of rubbish broke down the most?



2. Could any pieces of rubbish have been recycled?

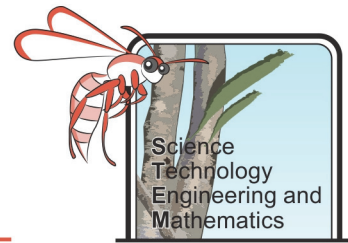
Evaluation

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?

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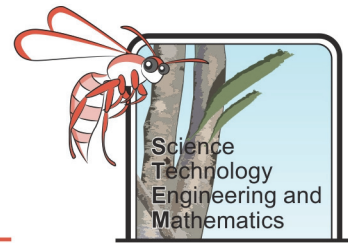


Discussion

1. 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?

2. In the last 20 years our population has grown by 28 per cent, but the amount of waste we produce has increased 170 per cent. Why do you think we are producing so much more waste and what do you think can be done about it?

3. In some places in the world waste is being used to create new land, in a process known as land reclamation. For example, on islands where the population has grown a lot and people need space to build, such as Singapore. Do you think this is a good use of waste? Explain your answer.



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 design and carry out an investigation to find out to what extent plant roots help hold soil together and prevent erosion.

Equipment

Write a list of equipment for your investigation.

Method

Write a list of steps and draw a diagram to show how you will do the experiment.

Include instructions on how you will record and present your results.

Make sure you make it clear how you will make it a fair test.

Think about what measurements you could make to try and look for relationships in your data.

Safety

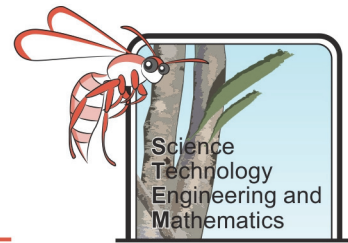
Write any safety precautions that have to be taken.

Prediction

What do you think will happen to each piece of rubbish?

Results and Analysis

Present your results as a table and/ or graph. If you have taken any photos or made videos of the experiment, make sure you add them.



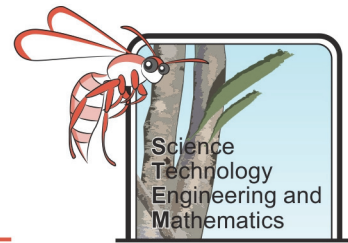
Evaluation

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

2. How could you improve the experiment?

3. Did you notice any relationships in your data?

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 civilisation on Earth?

Objective

To create a presentation comparing different human practices and their impact on Earth's surface.

Prediction

Which human practice do you think has the largest impact on the Earth's surface: mining, farming or building?

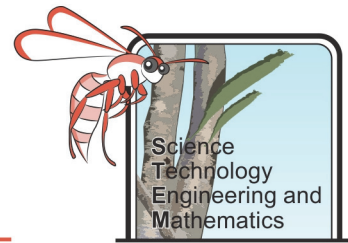
Equipment

- Computer with the internet, a spreadsheet and presentation (e.g Excel and PowerPoint) application.

Research

1. Create a spreadsheet with the following column headings:

	Super Pit	Tom Price Mine	North West Shelf Gas Plant	Wheatbelt	Average Wheatbelt Field	Perth Metro
Length (km)						
Width (km)						
Area (km²)						
How much bigger or smaller than Super Pit?	N/A					
Additional interesting information						



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

3. Go to [Google Maps](https://www.google.com/maps) and turn it onto satellite mode.

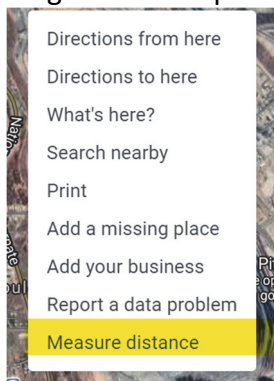
 Map

 **Satellite**

Labels on

 Terrain

- ➔ 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:



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

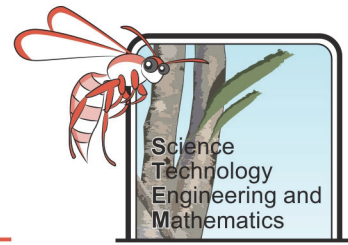
Add this data to your spreadsheet and calculate the area.

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?

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

4. Repeat Steps 1 – 3 for the other locations, taking screenshots and finding interesting information about each place for your presentation. Use the measure distance tool to enable you to compare the sizes of the different locations and areas.

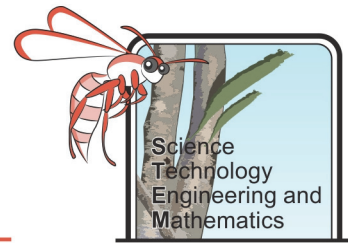
5. Put these in order of area, smallest to largest: Super Pit, Mount Tom Price mine, Karratha Gas Plant, Wheatbelt, Perth metropolitan area.

6. Size wise, what human practice/industry do you think makes the biggest impact on the Earth's surface?

7. Do you think that the size of the site is the only impact that each of these human activities has on the surface of the Earth?

8. What do you think Australia looked like from space 250 years ago?

9. Edit your presentation to contain interesting information you have gathered and decide if there is anything else you would like to research to add to it before showing it to your teacher.



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 design and carry out an investigation to find out if different ploughing methods have an affect on erosion.

Prediction

Do you think you ploughing along the contours will make any difference to the amount of erosion compared to comparing up and down the slope?

Equipment

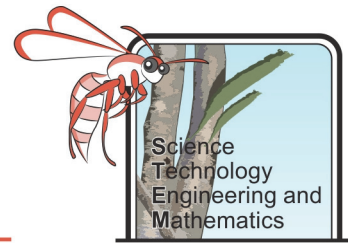
Write a list of equipment for your investigation.

Method

Write a list of steps and draw a diagram to show how you will do the experiment. Include instructions on how you will record and present your results. Make sure you make it clear how you will make it a fair test. Think about what measurements you could make to try and look for relationships in your data.

Safety

Write any safety precautions that have to be taken.



Results and Analysis

Present your results as a table and/or graph. If you have taken any photos or made videos of the experiment, make sure you add them.

Evaluation

1. Was your prediction supported?

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

3. How could you improve the experiment?

4. Did you find any relationships in your data?
