Landfill and Natural disaster (Year 6)

Curriculum Links:

Geography

- Nil

Science

- Reversible and irreversible differences
- Generating electrical energy
- Natural disasters

Topics Discussed

Decomposition timeline of the rubbish inside a landfill cell. Reversible and irreversible changes in the landfill

- How long it takes items to breakdown in landfill. Impact of micro plastics on the environment.
- Creating mulch from green waste
- Generating electricity from methane gas – process from gas collection in landfill cell to generator and process of getting electricity into grid
- Where does all the rubbish from a natural disaster go? How our landfills have to be able to cope with influxes of rubbish and green waste after a natural disaster.

Before you start the lesson

- Make sure you have Red/ Green and yellow bins for demonstration purpose. Alternatively, use any two bins in the classroom and label it as Red/ Green and Yellow bins
- Gather some display items (example -empty plastic bottles, cans, glass bottles, paper/cardboard)

Lesson Outline/ Teacher Resource

Today let's talk about how our rubbish and recycling create reversible and irreversible differences; how managing a by-product from our landfill enables us to generate electricity and how Fraser Coast Regional Council is prepared to manage the waste resulting from a natural disaster.

Firstly Let us discuss the two types of bins. What goes into which bin?

We can recycle 5 types of items – paper & cardboard, plastic, glass, steel and aluminium

Let us discuss some recycling rules. No lids-lids go into rubbish, rinse it, no plastic bags, no bagging boxing.

Play the "**sorting game"** -Put a pile of items in a box – students to pick up an item and put into correct bin – make into a relay if enough space

Now, let us learn what a landfill is.

Use "**Landfill Cell**" poster

A landfill cell is a big hole in the ground used for burying out rubbish. We dig these cells at our landfill sites, also known as the dump or tip. We dig a hole about the length and width of a football field and go down two stories deep into the ground. We then layer the holes with clay (because it expands and contracts without cracking) plastic, geo-textile fabric, some rocks and gravel and then two piping systems. We then fill up the cell with rubbish. When it is full, we close it off with more clay, soil and grass. This creates an anaerobic atmosphere for our rubbish to break down – which means there is no oxygen to assist with the decomposing process, which slows the decomposing process down.

Plat the "**How a landfill works"** video

Use "**How long to decompose**" poster.

Not all items revert to their natural state. One example of this is plastic. When we put plastic into the environment – either landfill or litter that goes into our waterways and oceans - it just breaks down into small particles of plastic, which is called micro-plastics. These micro-plastics are too small to capture and recycle.

Play the "**Plastic Mockumentary"** Video

But if we recycle what we can – paper and cardboard, plastic, glass, steel and aluminium - we can enable a product to be reduced to its manufactured state and then it can get made into either a similar item (paper back into paper) or something entirely difference (plastic bags recycled to make plastic furniture).

Another form of irreversible differences can be seen with our mulch product.
Council mulches all of the green waste that is dropped to its green waste piles at the Maryborough and Hervey Bay waste facilities. First the raw green waste is chopped up very small and then it is put into what we call 'windrows' which are rows of the green waste. We then start the process of keeping the green waste moist (by rain or sprinkles), and at a set temperature (regulated by blowing oxygen through the piles from pipes). Every two weeks we turn the mulch over and continue to keep it moist and at the correct temperature. After 8 weeks, you have organically composted mulch that can be used on your gardens. This could also be viewed as a reversible difference because this mulch will help your plants and trees grow which will in turned be pruned or chopped down and then composted.

All of those items decomposing in the landfill cell, in particular organic waste (food scraps and green waste) create a toxic gas called methane. This presents a hazard because the methane can explode and/or burn. Therefore, the landfill gas must be removed. To do this, a series of

pipes are embedded within the landfill to collect the gas. In some landfills, this gas is vented or burned. More recently, it has been recognized that this landfill gas represents a usable energy source. This is called Waste to Energy. At our Maryborough Waste Facility, we pipe our methane gas to a generator to clean the toxins out of it by using a heating process. The burning of the methane heats water into steam that drives a turbine to create electricity that goes into the electricity grid.

Natural disasters can happen at any time. The most common natural disasters for the Fraser Coast are flooding and cyclones that can cause damage to buildings and gardens. As people clean up their homes and yards, of course they are going to need a place to take all of their rubbish - (timber, steel, plasterboard, tiles, and green waste. Where can they take it? To the dump (landfill site). So then, Council has to manage all of this extra rubbish. We do this by making sure that it is not all just thrown into the landfill cell. We have separate areas on our site for different materials that can be recycled and reused eg. Steel pile, concrete and bricks, timber, green waste. Any household items can be taken to the Reuse Collection area for assessment if they can be sold in the reuse market. Last resort is putting them in to landfill.

Questions for discussion

Q. What are the first three layers in the landfill cell?

Q. What are the two toxins created in the landfill cell?

Q. What is the main cause of methane gas in landfill?

Q. What can methane gas be used to produce?

Q. How long does it take for a glass bottle to break down?

Q. When plastic breaks down into really small particles of plastic, what are they called?