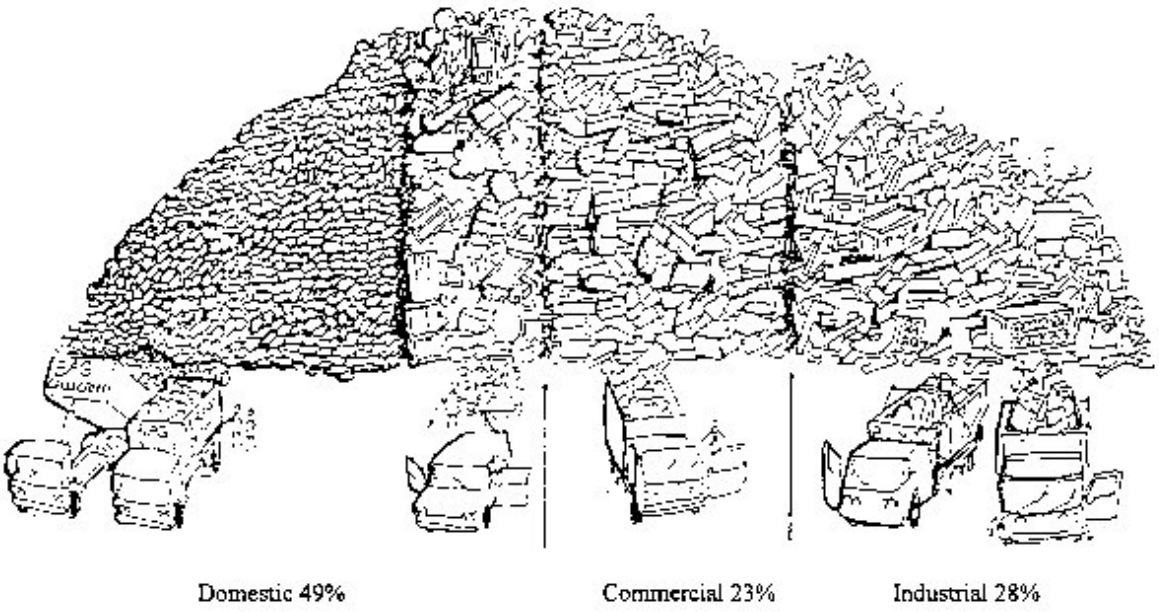
LANDFILLS

What is a Landfill?

New Zealand's Rubbish Heap……..



OBJECTIVES:
landfill is.

Students will understand what a

BACKGROUND INFORMATION:

New Zealanders produce an estimated 2.5kg of waste per day. Landfilling is the primary method of handling this waste.

As little as 20 years ago, landfills were dug wherever cheap unwanted land was available, in old quarries, abandoned mines, gravel pits and marshlands. Modern waste disposal facilities are known as sanitary landfills. A sanitary landfill is a designated piece of land where rubbish is tipped, compacted, and covered daily. Clay, soil or sawdust is often used to cover rubbish.

This cover reduces smell, vermin and litter and controls incoming water. As rain water falls onto the tip face, it breaks up waste products. The resulting residue material, known as leachate, trickles down to the bottom of the landfill where it is collected and pumped out for treatment.

As waste slowly decomposes under layers of dirt and clay, it emits methane gases. These gases are carefully monitored and extracted from the landfill. At some landfill sites in the major cities, methane gas is extracted and converted into electricity.

The household waste collected at the gate in Gisborne goes to the Resource Recovery Centre and is then transported to a landfill out of the Gisborne District.

From 1975 – 2002 Gisborne's waste went to Paokahu landfill. The landfill site covered an area of 20 hectares. In the early years 70,000 tonnes of waste are landfilled here annually, Towards the end of its life, following the introduction of both charging and recycling, this figure dropped to 18,000 tonnes.

There is a smaller landfill at Ruatoria. Townships such as Te Karaka, Matawai, Whatatutu, Te Araroa, Te Puia, Tikitiki, Tokomaru Bay and Tolaga Bay operate Transfer Stations.

Transfer Stations are not a disposal method in themselves, but rather a facility to assist in the disposal of refuse. Refuse is brought to the station and transferred to bulk haulage vehicles which take it to the Resource Recovery Centre or Landfill.

Landfills in New Zealand are filling up quickly. The process of siting a new landfill is long and difficult. Public opinion of landfills affects this process.

Few people want to have a landfill in their community. This feeling is commonly referred to as the NIMBY or "Not in my Backyard" syndrome.

Incineration is another waste disposal method. A number of incinerators are located in Europe, Asia and the USA. Currently, a handful of incinerators are used in New Zealand for quarantine and hospital wastes. In an incinerator, rubbish is burned in a furnace and reduced to ash.

Incinerators reduce waste volumes, but the residual ash still needs to be disposed of. Burning waste can also cause air pollution. Modern pollution control devices can help to minimise this.

Class Plan (Levels 1 and 2)

1. Show photo of a Landfill site.

2. Class discussion:
   - ❖ Who has been to a "tip" / "dump / landfill".
   - ❖ What does a trip to the "tip" / "dump / landfill" suggest to you?
   - ❖ How does it affect your senses? (Sight, sound, smell, touch.)
   - ❖ What sort of wildlife might you expect to find living there (seagulls, rats, mice, flies).
   - ❖ Would you like to have one next to you?

3. Write a story or poem "A Day in the Life of a Landfill Creature".

4. Write an acrostic using the word "Landfill" (vertically).

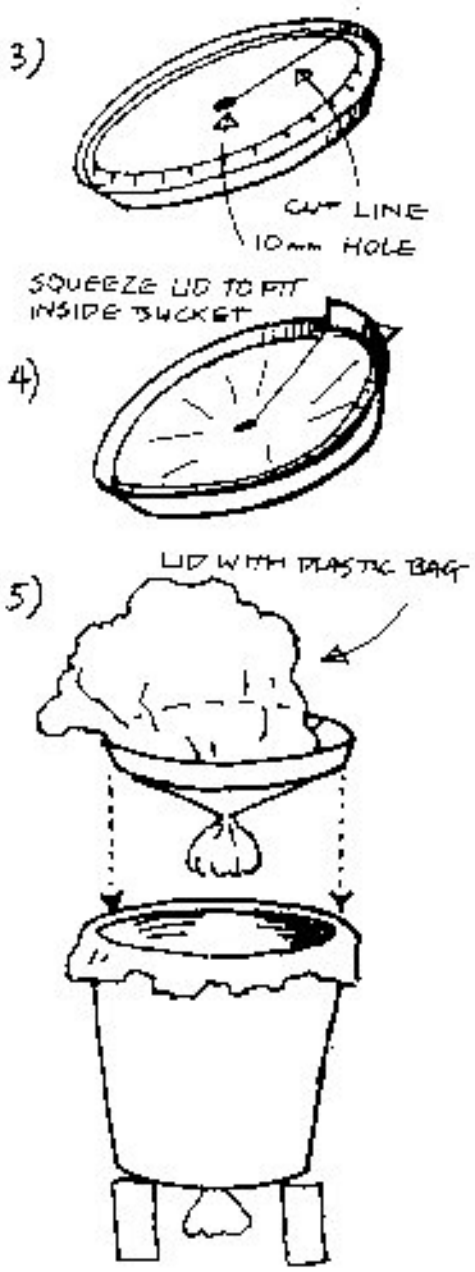
Materials:

⏭ Photos of a Landfill.

Class Plan (Levels 3 and 4)

1. Show photo of a Landfill site.
2. Class discussion:
   - ❖ What does a trip to the "tip" / "dump / landfill" suggest to you?
   - ❖ How would it affect your senses? (Sight, sound, smell, touch.)
3. Review the background information on landfills - explain how it works.
4. Discuss how the class could make their own "mini-landfill".

Suggested "Mini-Landfill"



1. Use a 10 litre plastic paint bucket and 2 lids.

2. Cut a hole in the centre bottom of the bucket (10mm).

3. Cut a hole in the centre of one lid (10mm) and a straight cut from the centre of the edge (this lid will sit in the bottom of the bucket and help the leachate drain.)

4. Overlap cut edges and push this lid into the bottom of the bucket.

5. Place a plastic bag out through the hole in the bottom of the bucket. This will act as a reservoir for the collection of leachate. Place the bucket on three bricks so there is space for the leachate to collect.

6. Put some soil (not potting mix as this is sterilised) in the base of your landfill.

   Fill the bucket daily with layers of scraps from your lunches, leaves from the school yard, paper and other rubbish such as glass, aluminium, metal, plastic and maybe some oil. this is a mini landfill so use only SMALL PIECES. Record what you add. After every 20mm of waste, cover with 5mm of soil and pack it down. Sprinkle each layer with a small amount of water.

7. When it is about three quarters full, cover with the second lid and let site for 1 – 2 months.

8. Water every now and again to simulate rain, look for sinking (subsidence).

9. At the end of the study, collect the leachate that ended up in the corner

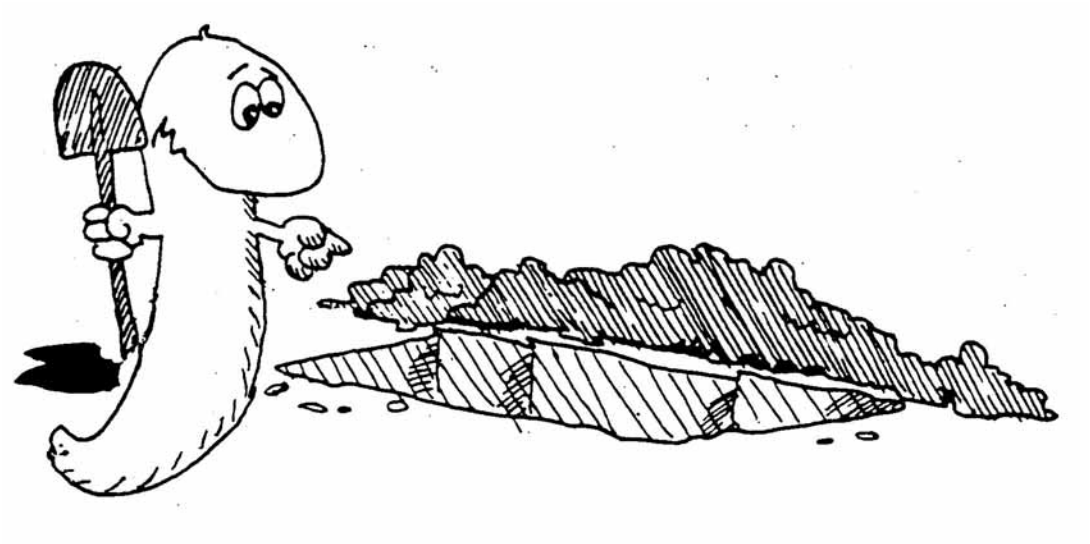
of the plastic bag. What do you think of it? What would happen to this in a large landfill?
Empty the content of the mini landfill to see which items decomposed and which didn't.

Materials:

- Photos of Landfill site.
- Bag of "bad smells" for class discussion.
- 10 litre plastic bucket and three lids.
- Large plastic bag.
- Sharp knife.
- Three bricks.
- Rubbish.
- Soil.

LANDFILLS

What are Their Problems?
What Happens when they Fill Up?
What can we do?



OBJECTIVES:

Students will understand some of the problems associated with landfills.

They will conclude that by producing less waste and recycling, we conserve landfill space.

BACKGROUND INFORMATION:

The average New Zealander produces 2.5kg of waste per day. LANDFILLING is the primary method of disposal for solid waste in New Zealand. While this country does not have a high population, landfill sites are increasingly difficult to secure. Public opposition to landfills and constraints on suitable land are among the factors that contribute to this difficulty. The Resource Management Act (1991) set up strict regulations on the evaluation of landfill monitoring and aftercare, making landfilling an expensive and non-sustainable option for managing our waste.

Landfills have existed since the early 1930's. Early landfills were only open pit dumps covered with dirt regularly to hide rubbish and cut down on pests and smells. Modern landfills are lined on the bottom with dense clay, limestone, or soil. Landfills have been sited in old quarries, mines, canyons and even former wetlands.

Each day rubbish is taken to landfills and dumped. Once in the landfill, rubbish is compacted into cells and covered with a layer of clay. Topsoil is then added as a final covering so plants can grow and prevent erosion.

As some waste slowly decomposes, it creates methane and sulphurous gases. These gases can pose a serious fire or explosive danger. They also contribute to global warming. New Zealand landfills give off around 300,000 tonnes of methane every year. This is one fifth of New Zealand's total methane emissions and the country's second largest source of methane.

Many other gases have also been found to escape from landfills. In modern systems the environmental impact of these gases is carefully managed by way of underground extraction systems. Gases are pumped out and either burned off safely or used to generate power.

Another result of the breakdown process is a liquid substance called leachate. Leachate is formed when water (either from rain or underground waterways) combines with decomposing rubbish. Leachate can be drained off into nearby water treatment systems. Otherwise, it can drain into groundwater, streams, rivers and the sea.

When leachate gets into the sea, it can be absorbed by fish and shellfish that we eat. When it gets into groundwater, it can find its way into our water supplies.

Toxic chemicals can combine in landfills to form new toxins which can be even more dangerous than the original chemicals.

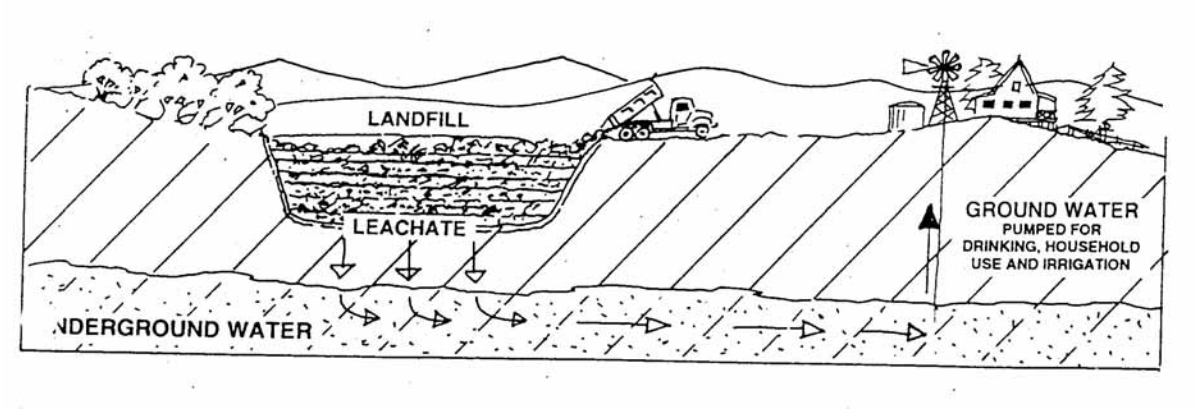
Food scraps, vegetation, paper and other organic wastes break down very slowly in landfills. They all need oxygen and moisture to break down and they do not get enough of either when they are buried in a landfill.

Scientists studying landfills in the United States once dug up a piece of steak that had been buried for 15 years. They could still see that it was a steak and even see the fat on it. They also found newspapers that could still be read after 12 years in a landfill.

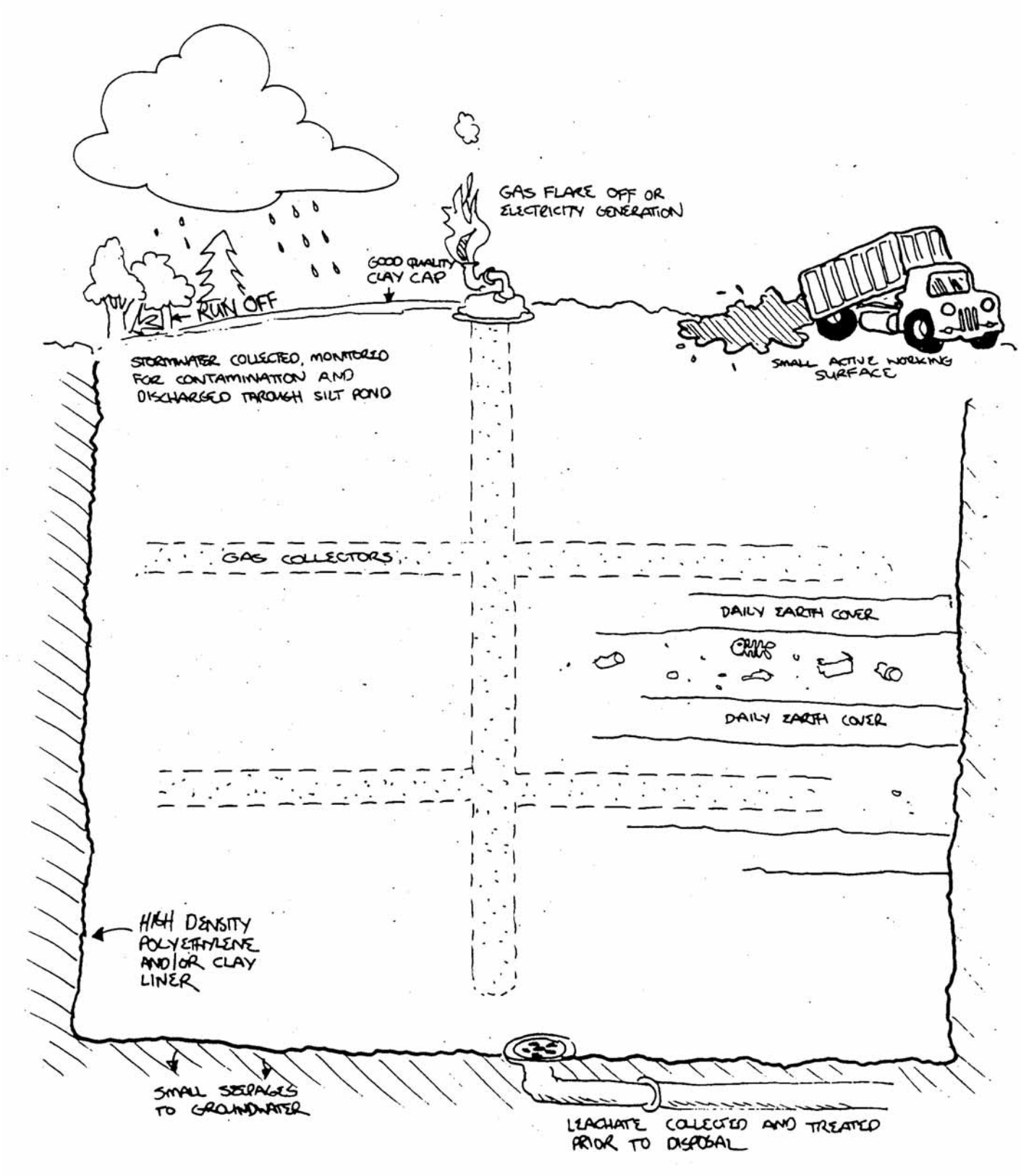
Incineration is another method of waste disposal. Incinerators are basically large furnaces that burn rubbish to reduce its volume and / or to produce energy.

Incineration only reduces waste by about 70%. The remaining 30% ends up in landfills as toxic ash. Currently, there are no incinerators operating in New Zealand which burn household waste.

OLD STYLE LANDFILL



MODERN LANDFILL



Class Plan (Levels 1 and 2)

1. **Class Discussion**

   What are the problems associated with landfills?

- Smells, rats, pests, diseases.
- Windblown litter.
- Usage of land.
- Contamination of land and water from leachates.
- Gas emission (some of which are "greenhouse" gases).
- Minimal decomposition due to poor aeration.

2. Bring a 2.5kg bag of pre-sorted rubbish to class. Based on the figure of 2.5kg per person per day, calculate how much rubbish the class produce as individuals and as a class each day, each week, each year. Compare this to something they can relate to (classroom, playground etc).

3. **Landfill Experiment**

Bury some food scraps side by side with other materials such as plastic, paper and aluminium (a mixed sample could also be interesting). Mark the sites with labels from a yoghurt cup or piece of plastic. Dig them up a month later.

Which materials are beginning to decompose and rot? Which are not? Explore and describe changes.

Materials:

- 2.5kg bag rubbish.
- Tape measure.
- Spade.
- Yoghurt pots for labels.
- Various categories of waste (plastic, paper, glass, organic).

Class Plan (Levels 3 and 4)

1. Show photos of a Landfill, Gisborne or visit your local landfill or transfer station.

2. Draw a picture (or complete photocopy) of a modern sanitary landfill. Refer worksheet. Discuss how old style landfills, such as Paokahu Landfill (Gisborne) differed from this and possible problems associated with this.

3. **Class Discussion**

   What are the problems associated with landfills?

   - ❖ Smells, rats, pests, diseases.
   - ❖ Windblown litter.
   - ❖ Usage of land.
   - ❖ Contamination of land and water from leachates.
   - ❖ Gas emission (some of which are "greenhouse" gases).
   - ❖ Minimal decomposition due to poor aeration.

4. Bring a 2.5kg bag of pre-sorted rubbish to class. Based on the figure of 2.5kg per person per day, calculate how much rubbish the class produce as individuals and as a class each day, each week, each year.

5. Brainstorm alternatives to landfilling or incinerating waste. Discuss waste reduction, recycling, reuse and composting as safer, more efficient methods of handling our waste. Emphasise that waste reduction is the best method for handling waste as it reduces it before it is actually a disposal problem.

Materials:

- ⏭ Photos
- ⏭ Worksheet : Landfill.
- ⏭ 2.5kg of pre-sorted rubbish.