

Teacher's Guide

Garbage In, Garbage Out

Period 1

Based on the NCERT curriculum for Standard VI



JANAAGRAHA CENTRE FOR CITIZENSHIP & DEMOCRACY

Janaagraha's initiative to improve citizen engagement in India's democracy through their civic learning program

Developed in collaboration with Young Leaders for Active Citizenship (YLAC)

Garbage In, Garbage Out | Teacher's Guide (1/3)

Period 1

Class VI
Board – CBSE
Subject – Science
Textbook – Science Textbook for Class VI (NCERT)
Chapter 16 – Garbage In, Garbage Out
Number of periods – 03
Length – 90 minutes

Section I: What are we going to learn and why is it important

Learning objectives

Students will:

- Learn how much garbage they produce every day and how much garbage is produced city-wise in India.
- Understand how landfills work.
- Distinguish between the different kinds of waste and their decomposition rates.

Learning outcomes

- Understanding the gravity of the problem of garbage and demonstrating a sense of responsibility to reduce the garbage produced.

Key terms

Garbage/waste	Landfill	Safai karamchari	Leachate
Decomposition	Organic waste	Inorganic waste	

Section II: How are we going to learn

The quantum of waste we produce

Time: 20 minutes

Note to the teacher:

This section will use activities, pictures and videos to help students understand the quantum of waste they produce in daily life and get them to appreciate the magnitude of the problem.

Facilitation notes:

- Did you all see garbage on the roads on your way to school today? Was there a lot of smell from the garbage pile? Where does all this garbage come from? Where does it go? We'll discuss this today and in the next few periods.
- But first, let's undertake a small exercise: Let's each spend 5 minutes thinking about the garbage we produce every day. Let's tabulate what we did yesterday!

Activity - How much waste do we generate



Note to the teacher:

Ask each student to make 3 columns in their notebook (as in the table below) and note down all items they consumed yesterday and the parts they threw into the garbage.

Item consumed	Quantity	Parts thrown

De-brief:

- Select 2 students at random and ask them to read out their list. Note down these items on the board.
- Highlight the number of items that each of us consume, and the amount we throw out!
- Nudge students to undertake this activity for a week and tabulate everything that was used and thrown at home. Ask them to submit their responses on a sheet of paper.
- Show them the following video as an interesting way to think about our waste generation.



Video: Trash Me with Rob Greenfield
An experiment in holding on to trash

The idea behind this video is to visually demonstrate the amount of trash that each person generates

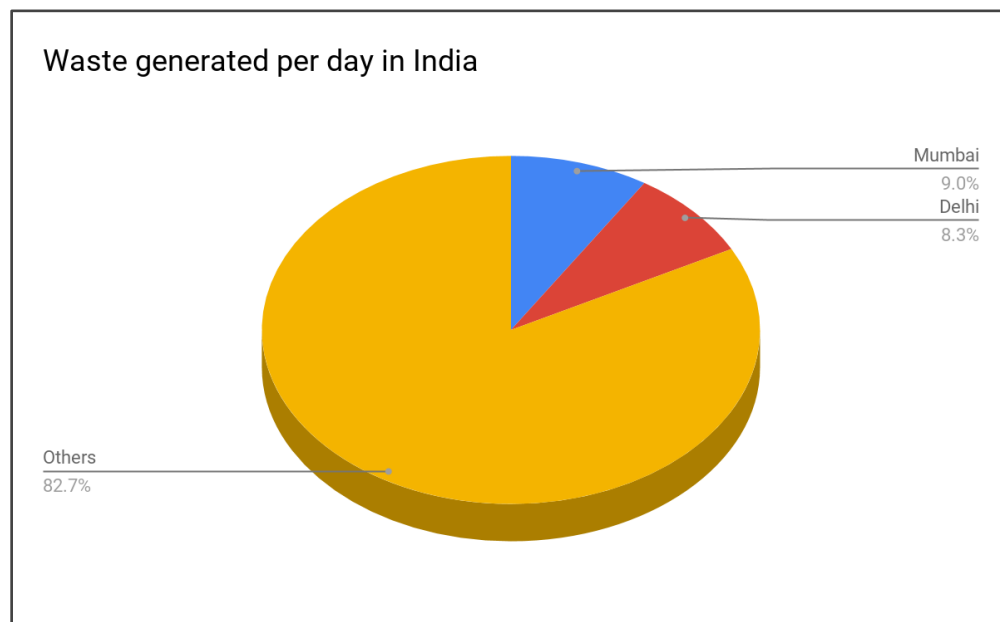
Link: [Youtube](#)

How much waste do our homes and cities generate?

Fact: Did you know that each person who lives in a city in India produces between 200 to 600 grams of garbage everyday? That amounts of 6-18 Kgs of garbage per person per month!

Facilitation Notes:

- Given how much waste each of us generate, can you estimate the amount of waste India generates in a day? Give me a number in kgs! *[Take 2-3 responses; jot these down on the board. Most likely these numbers will be far less than the actual]*
- *[Write the number on the board]:* **100,000,000 Kgs per day! (or 100,000 tonnes per day)**
- The bulk of this waste comes from our biggest cities. Mumbai alone produces 9000 tonnes (or 9,000,000 Kgs) every day and Delhi produces 8300 tonnes every day. *[Project the following charts on the screen]*



Source: [India generates 1,00,000 metric tonnes of waste per day.](#)
Times of India. March 30, 2017.

Where does this trash go?

Time: 15 minutes

Facilitation notes:

- We all throw our garbage into the bin at home or in school. Where does it go from there? Who takes it away? Any ideas? *[Take a couple of responses. Likely answers: safai karamcharis take it away and either burn it, or dump it at a garbage collection site, or reuse it]*
- Yes, burning, dumping and reusing are all correct answers. But, we dump and burn much more than we reuse. In fact, garbage is often not dumped properly; it is left to rot or thrown into the sea. And given the volume of garbage we have been generating, it is becoming a very big environmental problem.
- What do you think are some problems that garbage leads to? *[Take a couple of responses. Likely answers: wastage, foul smell, diseases, air pollution from burning, water and soil pollution, threat to animals etc.]*
- Let's look at some images from around the country and the world to see the kind of problems that garbage has created. *[Please play the following images in slideshow and explain, wherever needed]*



Source: [Blog, Professor Ian Boyd](#)
Seal caught in a net



Source: [Network for Animal Protection](#)
Cows eating plastic



Source: [Downtoearth](#)

Flooding in Guwahati due to dumping of garbage in Brahmaputra



Source: [Seaotters.com](#)

Otter Pup caught in single use plastic



Source: [Express](#)

A European white stork caught in a plastic bag



Source: [EPW](#)

Waste burning around Delhi

- We are producing so much garbage that we are actually running out of places to dump it and a lot of it has landed up in our rivers, seas and oceans. Let's see a video to understand the gravity of the problem.



Video: 'So much plastic!': British diver films deluge of waste off Bali, Indonesia

Link: [Youtube](#)

Landfills

Time: 20 minutes

Note to the teacher:

This section introduces students to the concept of landfills and talks about the design of landfills and how they function.

Facilitation Notes:

- In most cities, the garbage generated by the residents is dumped at sites that are called '*landfills*'. A landfill is like a giant open garbage bin, but for an entire city. Garbage is received from garbage trucks and safai karamcharis on a daily basis.
- Do you know of any landfills in the city? What do they look like? *[Take 2-3 responses]*
- What happens to the garbage that is left in the landfills? *[Likely response: It just stays there and slowly decomposes]*

- The garbage collected from the city is spread over the entire landfill and a layer of soil is put on top. Over time, the garbage breaks down in the landfill. However, while this sounds okay, the process is not as simple or straightforward *[Please draw a landfill on the board to explain]*:
 - a. Firstly, all garbage does not decompose rapidly. If not managed properly, the landfill can become an eyesore and a site for germs and infections.
 - b. During decomposition, often water seeps through the garbage in the landfill and become poisonous. This water is known as leachate, and should not be allowed to mix with groundwater.
 - c. In addition, a gas called methane is produced in the landfill, which too can be harmful and must be collected separately.
- When the landfill becomes full, it is often covered with a layer of soil and the area is converted into a park or a playground. Given the weak foundation, no building is allowed to be constructed on top of the landfill for the next 20 years or so.

Let's watch a video on how landfills work!



Video: How Landfills Work

Link: [Youtube](#)

This video introduces students to the working of the landfill by taking an example from Hawaii and then focusing attention on the landfill at Ghazipur in Delhi.

De-brief:

- What did you notice about the landfills in India? Is this the correct way to dispose garbage? What kind of problems do you think landfills can cause?
- What do you think about the people working in these landfills? Is it fair to subject them to such hazardous conditions?
- Did you notice that landfills we saw contained different kinds of garbage? What kinds of garbage did you see? [*Likely responses: plastic, glass, clothes and shoes, etc.*]
- Different kinds of garbage in the landfill break down at different speeds—some break down very fast while others don't break down at all. The process by which garbage breaks down is known as **decomposition**.
- Let's study this in more detail using an activity.

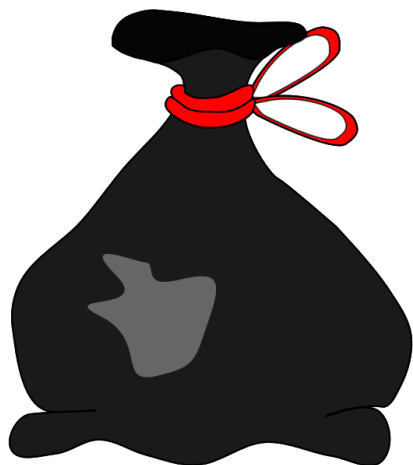
Activity – How fast do different kinds of garbage decompose?

Time: 25 minutes.

Note to the teacher:

This activity is based on the experiment given in the NCERT textbook. The idea is to demonstrate how different kinds of garbage decompose at different speeds. The activity can be conducted either during class hours or during the laboratory hour, and observations will have to be made over several days. The heaps created can either be buried in the school garden or placed in boxes in the laboratory.

Materials needed: Plastic bags, small shovel, garbage (fruit and vegetable peels, tissue paper, scraps of newspaper, dry leaves, small glass jar, aluminium foil, empty shampoo bottle, plastic wrapping material).



Approach:

Divide the garbage into two groups, Group 1 and Group 2.

- Group 1: fruit and vegetable peels, tissue paper, scraps of newspaper, dry leaves.
- Group 2: small glass jar, aluminum foil, empty shampoo bottle, plastic wrapping material.

Divide each group into two separate heaps. Label them as Heaps A, B, C and D.

Put one heap from Group 1 and one heap from Group 2 into two separate plastic bags. Tie the mouth of these two bags tightly. Leave the others heaps as is, i.e. without the plastic.

Ask the students to put all the four heaps in separate pits and cover them with soil.

Students must check in regular intervals (given below) to observe the process of decomposition.

Students should check if the heaps:

1. Decomposed completely and do not smell.
2. Decomposed almost completely but has a bad smell.
3. Decomposed only partially
4. Did not decompose at all.

They must record these observations in their notebook in the form of the following table:

Garbage Heaps	After 4 Days	After 7 Days	After 2 Weeks	After 4 Weeks
A				
B				
C				
D				

Discussion at the time of initiating the activity:

- What do you think will happen? *[Collect responses from students]*
- Which heap will decompose the fastest? *[Answer: Heap from Group 1 that is not in a plastic bag]*
- Which heap will decompose the slowest? *[Answer: Heap from Group 2 that is in the plastic bag]*
- Items in Group 1 will decompose faster than those in Group 2. Why?
 - Items in Group 1 are known as **organic matter**. These items are decomposed by small organisms found in the soil. These organisms need to be exposed to the air in order to decompose organic matter.
 - When organic matter is placed in plastic bags, these organisms no longer have access to air. Without air, the decomposition process generates methane gas and also causes a lot of smell.
- Items in Group 2 are known as **inorganic matter**. These items take a very, very long time to break down into smaller pieces.
- For example, while organic matter such as banana peels and tissue paper decompose in 2-4 weeks of time, plastic cups can take up to 50 years to decompose. The pepsi cans that you drink from take 80-200 years to decompose, while the decomposition of glass bottles takes a million years!
- Let's observe our pits carefully over the next couple of weeks to see if we are correct!

Conclusion

- Earlier we spoke about landfills and now we understood the different rates of decomposition of material. What does that suggest about dumping everything together in landfills?
- When both organic and inorganic garbage is dumped together, the process does not factor in the different decomposition rates of the two and can be counter-productive. Over time, water can seep through the garbage in the landfill and become poisonous. This can cause a lot of problems if it mixes with groundwater. In addition, the methane produced can also cause problems to our environment.

- Instead of just dumping everything together, organic and inorganic matter need to be disposed differently. Also, since inorganic matter take so long to decompose, it might be better to instead find alternative uses for these materials.
- In the next class, we will study how organic matter can be decomposed, and in the class after that, we will study how we can reuse inorganic matter.

Section III: Assessment

Time: 5 minutes

Give each student the following list of items and ask them to classify these as organic or inorganic.

Item	Organic/ Inorganic?
Pen	
Wooden pencil	
Batteries	
Cotton Clothes	
Stale food	
Leaves and twigs	
Broken glass	
Paper	
Metal rod	

Correct answers are as follows:

Item	Organic/ Inorganic?
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Pen	Inorganic
Wooden pencil	Organic
Batteries	Inorganic
Cotton Clothes	Organic
Stale food	Organic
Leaves and twigs	Organic
Broken glass	Inorganic
Paper	Organic
Metal rod	Inorganic

Homework

- 1) Ask students to maintain a record of all the garbage that is produced at home everyday. They should identify what kind of garbage each item belongs to - whether organic or inorganic, and whether different kinds of garbage are thrown into the same garbage bin or separate ones. If the latter, why? The following format may be used:

Item	Is the garbage organic or inorganic?

- 2) Ask students to conduct research online to find the amount of garbage their city or locality produces. They can look for newspaper articles or ask their parents for help.

Section IV: Closure

Summary by students

Note to the teacher: Select a student at random to summarize the key points of the session and why this particular session is important.

Recap by the teacher

Time: 5 minutes

In our daily lives, each of us generate a lot of garbage, much more than we realize. Everyday India generates 100,000 tonnes of garbage. This garbage is increasingly becoming hard to manage and is polluting our land, seas and oceans and threatening life. Landfills that are designed to manage this garbage are overflowing.

Landfills in India are also often mismanaged and different kinds of garbage - both organic and inorganic - are dumped in them together. While organic waste like food and wood can decompose fast, inorganic waste like plastic can take decades and centuries to decompose. Putting them all together, hampers the process of decomposition and can increase pollution.

Section V: Additional resources

Resources for students:

1. Video: Midway, a plastic island

This video talks about ocean currents leading to plastics travelling long distances in water and ending up on remote islands.

Link: [Youtube](#)

2. Video: Massive Indian landfills are mistaken for mountains

This video shows the aerial view of a landfill and the people working in it.

Link: [Youtube](#)

Resources for teachers:

1. Video: Drowning in garbage
This video talks about how world's landfills will never be enough.
Link: [Washington Post](#)
2. Video: The Aerial Expedition.
Between September 26 and October 7, 2016, the Ocean Cleanup team conducted a series of reconnaissance flights across the Great Pacific Garbage Patch.
Link: [Youtube](#)
3. Video: How a landfill works?
This animated video takes you on a tour of a modern landfill and how it's constructed and managed.
Link: [Youtube](#)
4. Reading: How long does it take garbage to decompose?
Link: [Pdf](#)

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