

Sustainability and Waste

An activity-based learning
program for schools.



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This Booklet contains:

- All information and instructions required to carry out the proposed activities.
- Worksheets that can be photocopied and used for data collection in the field. These worksheets are provided as an example and you are welcome to use other formats of your choice for the same. But be sure to collect all relevant information as required for each activity.

The accompanying resource material contains:

- Printed sheets to make playing cards.
- The layout of the game board that can be glued to cardboard to make the game board.

Please Note:

The waste in this booklet refers to 'solid waste'. Waste can also be found in the liquid and gaseous forms but in this booklet, all mentions of 'waste' are in regards to solid waste.

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Source: Pixabay

INTRODUCTION

Wipro earthian is Wipro's Sustainability Education Program for schools and colleges. The program helps students develop an interdisciplinary understanding of the topic at hand and provides multiple perspectives to help make sustainability education more meaningful. By meeting these objectives, educational institutions, their educators and students will be better equipped to make sustainable choices.

We invite you to form student teams and participate in our program 'Sustainability & Waste'. The **Wipro earthian** Award will be given to the best school, based on your submissions.

We intend to engage with the winners of the **Wipro earthian** Award over a sustained period to make sustainability education more holistic, involving both teachers and students.

WHY DOES WASTE MATTER?

We consume natural resources and produce waste every day of our lives. In fact, each year, nations generate over 2 billion tonnes of waste worldwide. This number is expected to soar to 3.4 billion tonnes by 2050¹. In India, over 62 million tonnes of waste is generated every year and by 2047, it is expected that 1,400 sq km of landfill area would be required for dumping India's increasing volumes of municipal solid waste; this space is roughly equal to the combined area of three out of the top five most populous cities in India: Hyderabad, Mumbai and Chennai².

¹ World Bank, 2016: <http://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management>

² <https://www.epw.in/engage/article/institutional-framework-implementing-solid-waste-management-india-macro-analysis>

Our overall lack of understanding of how to use and manage resources has us regarding waste as something to be thrown away and not as a resource. Perhaps we have never asked “Where do all the materials that make up our waste come from?”, “What happens to waste when we throw it away?” or “Where is this ‘away’, anyway?”

This lack of understanding of waste has had disastrous effects on the environment. Answering these questions will help us realise that learning about waste is more than just understanding how to manage it. Rather, it is essential that we tackle the waste problem at its source and reduce the amount we produce in the first place.

WHEN DID INDIA START WASTING SO MUCH?

India has always been a densely populated nation, but it didn't always produce the amount of waste it does now. Take, for example, the production of toothpaste in India: India produced an estimated 1200 tonnes of toothpaste in the 1970s. However, just 45 years later, we started consuming 67 times that amount – 80,000 tonnes or 800 million tubes. These tubes are non-biodegradable, and hard to recycle, and this is just one of many examples of how our consumer practices have changed the waste output of India's households.



Source: www.georganics.co.uk



THE FRONTIERS OF WASTE

Every year we consume 1.7 times the amount of natural resources that the Earth is capable of replacing³, and we dispose of 99% of these products in 6 months or less, leading to enormous amounts of waste⁴. We see waste on our roads, in our fields and water bodies everyday but the problem is even bigger than we know.

We have managed to leave no place untouched, not even the Moon, or Mount Everest or even the Mariana Trench – that's outer space, our highest peak and the deepest point in the ocean! Waste is fast becoming the legacy of human existence and it's absolutely everywhere!

Waste has become a part of our lives – it's everywhere, on our streets, in fields, in our forests, rivers and seas but it seems like we no longer notice it. Everywhere we go, human waste follows – have we become so used to this that we've stopped seeing it as a problem?



Source: Pixabay

³ <https://www.newsweek.com/earth-overshoot-day-2017-climate-change-645296>

⁴ <https://www.getrichslowly.org/the-story-of-stuff/>

THE MOON & OUTER SPACE



We've left rubbish on the Moon – over 18,000 kg of it – and manmade objects that no longer serve a purpose are simply abandoned on Venus and Mars. According to NASA a thick band of space junk — composed primarily of broken satellite pieces and discarded rocket boosters – orbits the Earth. It is made up of over 500,000 pieces of rubbish that are each larger than a marble and tens of millions of pieces that measure smaller than a centimetre.

Source:

http://www.nasa.gov/mission_pages/station/news/orbital_debris.html#backtoTop_rn

THE HIGHEST POINT ON EARTH



Jamling Tenzing Norgay – one of the first people to climb Mount Everest, alongside Sir Edmund Hillary – has called Mount Everest and the surrounding region “the world’s highest garbage dump”.

In 2017, 25,000 kg of garbage and 15,000 kg of human waste had to be carried down the mountain.

Source:

<https://phys.org/news/2018-06-mount-everest-high-altitude-rubbish-dump.html>

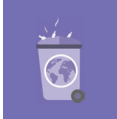
THE DEEPEST TRENCH



The deepest known piece of waste is a plastic bag that sits at 36,000 feet below sea level, inside the Mariana Trench, the deepest point in the ocean. Waste shares the Mariana Trench with a vibrant ecosystem that includes jellyfish, coral, octopi and other marine animals. The world's oceans are also home to the largest garbage dump of all – the “Great Pacific Garbage Patch”. It is a concentration of plastic and chemical waste and other debris that is found in the Pacific Ocean. It is estimated to have over 1.8 trillion pieces of waste.

Source:

<https://www.theoceancleanup.com/great-pacific-garbage-patch/>



WASTE: A GLOBAL CRISIS

Even though we've stopped noticing it, waste is a huge problem for us and the environment. As we continue to waste more and more, we use more natural resources and increase pollution in our world. When waste is not collected and managed properly it can cause illnesses such as diarrhoea from polluted water bodies and respiratory infections from burning waste. Waste from our streets can clog our storm water drainage systems and cause flooding. Additionally, millions of fish, birds and other animals often die from ingesting plastic waste by mistake. In fact, micro-plastics, which are tiny, microscopic pieces of plastic, have entered the food chain of most animals including humans and thereafter, into their bodies.⁵



We are desperately in need of effective resource and waste management and reduction techniques. Many innovative people and organisations have come up with ideas and solutions in response to this need. Just like them, you can work as an individual or as a community to address the issues posed by this global crisis. Remember to never doubt that you can make a difference.

Through the course of this program, students will be exposed to a lot of information about waste, its impacts and potential solutions. In the next section we cover the structure of this booklet so that you can use this resource to its full potential.

⁵ https://uneplive.unep.org/media/docs/early_warning/microplastics.pdf



HOW TO USE THIS BOOKLET

This booklet is divided into two parts – ‘Part A’ and ‘Part B’.

‘Part A’ focuses on teaching the students new concepts and exposing them to a variety of case studies and ideas. It has a total of 5 compulsory activities and 4 elective activities from which students have to select and undertake 2 elective activities.

Part B contains a single, compulsory final project - writing an essay, on ‘Moving Communities towards Sustainable Waste Management’. While going through this booklet, students will be researching, planning, collecting data and documenting their work. They will be learning many concepts pertaining to waste as they undertake the suggested activities in their pursuit to making waste management sustainable. Once they have learnt that, it would be easier to take their learning to the larger community and try to incorporate those learnings into improving the way waste is managed by their Housing Societies, Local Gram Panchayat or Municipality.

PART A (COMPULSORY)

- » Waste Scavenger Hunt
- » Categorising Waste: Is All Waste the Same?
- » Where does Waste go and Why is it a Problem?
- » Segregating Waste and Composting
- » The ‘R’s of Waste for a Zero Waste School

PART A (ELECTIVES)

- » Then and Now
- » The Packaging Problem
- » Agriculture and Waste
- » A Day in the Life of a Waste Worker

PART B (COMPULSORY)

- » Writing an essay on ‘Moving Communities Towards Sustainable Waste Management’

Each of the activities is explained using the following structure:

- 1) Objectives that state what we hope to achieve by the end of the section.
- 2) A set of instructions to guide you for each activity.
- 3) Formatted worksheets that may be included as required.
- 4) Card games and board games are included in the booklet.
- 5) Brainstorming activities, if present, are suggested as class discussions that will help students in future activities.
- 6) Information boxes provide case studies that will encourage students to think outside the box.
- 7) There will be reflections at the end of every section. These are classroom discussions that explore important questions that will help students share their experiences and take their learning a step further by analysing a situation or applying principles to their daily lives.

Note: *Brainstorming activities and Reflections will help you in later sections, and may be documented and submitted.*

SCORING PARAMETERS





HOW WILL YOUR SUBMISSION BE EVALUATED?

The submissions to **Wipro earthian** will be judged based on a broader approach as deemed appropriate by the jury. This will be based on how genuinely the activity was done, the comprehensiveness and creativity in documenting the activities, and on the ability to see and draw broader connections and conclusions. To give you a sense of direction and clarity we are listing a few key evaluation criteria. Do not blindly go by these criteria alone, make sure to pay attention to the broader approach as mentioned above.

Genuineness: Can be demonstrated through details in the documentation: the recorded observations, the data provided and other evidence of having done the activity.

Creativity in documentation: Usage of multiple formats and ways and methods of reporting that are woven together well into a whole. See below (Specific pointers for Part A), where some ideas for documentation are given.

Drawing Broader Connections: Beyond just the data presented, a sense of having understood the problems and their inter-connectedness well, as displayed in the documentation, is important. Here are some important questions to consider while putting together your submissions:

- Have you demonstrated how the completed activities might be connected to each other?
- Have you demonstrated how these connections have helped you expand your understanding of Sustainability?
- Have you clearly presented how the different perspectives to the issues raised in Part B have been understood and thought through?

Originality: While the internet may be used for research, downloaded text and diagrams should not be included word for word in the submissions. Such material should be presented in your own words and sketches redrawn to reflect your voice and interpretation. It is the quality of the learning and not quantity that is important.

Specific pointers for 'Part A'

'Part A' can be made attractive, fun and engaging by using different tools or presentation formats:



Story Telling: Your observations, data and in general experiences during the activity can be a narrative that need not be a formal report but presented as a story.

Poems: Observations can be presented as short poems – couplets, haikus, or short poems.



Drawings/Illustration: Use sketches, drawings or paintings to highlight something visually interesting. You can also create cartoons and comics.

Photograph/Video: Take photographs or video screenshots and paste them into your report at appropriate points. Remember to label and caption them appropriately.



Data Charts/Graphs: Use these means to present the data in attractive and interesting ways. State conclusions or trends based on the data you display.

You may use any other creative/innovative method of presenting the report as you choose.

You are required to complete only two of the four electives provided under the 'Part A' elective section, whereas all five activities of the compulsory section of 'Part A' should be completed.

Specific pointers for 'Part B'

'Part B' requires a different approach from 'Part A'. The purpose of 'Part B' is to connect what you learnt about waste in 'Part A' to local and broader contexts. It is to take the learning of 'Part A' to the wider community. It is to assist the entire community to move towards sustainable waste management practices. Since in 'Part A' you have undertaken many of the activities at your own school and home and have understood the problems and solutions associated with waste you would be best able to guide the community in this mission since you would have much more practical knowledge and expertise on waste management.

In 'Part B', a list of topics that you will need to cover have been specified. Each topic in turn, has a list of guiding questions that will help you to write it comprehensively. Though the topics and questions have been listed, you can go beyond those and add more material that would assist the community and local body to manage its waste more efficiently.

The teacher will play a key role in facilitating this exercise and making sure that the students cover a wide range of ideas and provide sufficient photographs, pictures and sketches in writing 'Part B'. The teacher can even decide to divide the class into groups and give each group a different topic to work on. The teacher has to remember that a lot of the material, like photographs and data etc., will already exist since the students would have documented their activities. These can easily be incorporated into the final essay.

ROLE OF THE TEACHER

- Provide general guidance on how to execute and document the activities.
- Help students connect the activities with what they study in class and also foster skills of collaboration, enquiry and empathy.
- Moderate discussions and group reflection sessions so that everyone can share what they have understood, raise questions and think through together what needs to be done. Each Activity has leading questions to start off the reflections. Apart from adding your own points for students to reflect on, encourage them to come up with their own views and questions. Holding debates on waste related topics like 'Plastic Bags vs Paper Bags' would help students understand the complexities of waste.
- Encourage students to talk to their friends, teachers, school administrators, organisations in the waste management field and friends and family to get as many perspectives as possible.
- Build connections to subjects/topics learnt in class, as this will not only help with building a stronger understanding of the subject, but will provide more insight during the process of reflection. This will come in handy when doing the activities and writing the essay in 'Part B'.

Teachers as mentors and guides should help students create their materials but must resist from writing or drawing for them.



GATHERING DATA

Data can be collected in two ways:

Data that has been collected from first-hand-experience is known as primary data. For example, collecting waste from bins and measuring it.

Data collected from a source that has already been published in any form is called secondary data. For example, figures on plastic waste found in the city municipal landfill as published by the Municipal Corporation.

SOURCES OF INFORMATION



Resource books:

Try to visit your local library or school library to find books written on the subject of waste.



Resource persons:

Safai karmacharis, ragpickers, panchayat samitis, farmers, municipal corporators, teachers, organizations working in the field of waste. Resource persons have more practical knowledge of local issues.



The Internet:

The internet has several important sources of information about waste. UN, government and NGO websites are useful resources. Remember, unless they are written by experts, blogs and Facebook are not legitimate resources.



Newspapers and magazines:

Newspapers and magazines regularly carry local stories about waste. These can be a great resource, especially if you check the published facts with other sources.



POINTS TO REMEMBER

- While trying to make the documentation creative, please do not forget the core tasks/requirements outlined in 'Part A' and 'B'.
- You need to attempt at least two of the four elective activities given in 'Part A'.
- Remember to capture as much data as possible in the 'Reflections'.

FREQUENTLY ASKED QUESTIONS

How much time will this require?

Ideally, 'Part A' activities and documentation will take each student team around 6-8 weeks, requiring approximately 2-3 hours a week. Teachers can assist teams in getting free time from classes to do these activities. The 'Part B' essay requires time for research and discussions and will take approximately 2 weeks. Research work can be done in free periods, SUPW/Social Work periods or Scout and Guides periods by taking the help of parents and resource persons.

How is this useful?

This program is designed as a project-based learning activity and has topics that can be connected with the regular school syllabus. Hence the work done here can be considered for CCE (Continuous and Comprehensive Evaluation) within the school curriculum. Along with learning about the various aspects of Waste, this program integrates topics and concepts from the sciences, social sciences and helps with development of language and mathematics. Learning about waste is actually about learning the 4th 'R' of literacy or 'Resource' Literacy which is critical in today's world and will soon become a part of the school curriculum. **Wipro earthian** also provides teachers and students with opportunities to develop important skills like team work, observation, recording, documentation, research, analysis, synthesis, reflection, writing, creative writing and design.



PART A: COMPULSORY

UNDERSTANDING OUR RELATIONSHIP WITH WASTE

OBJECTIVES

To try and answer the following pressing and urgent questions about waste: What is waste? Why is it such a problem? Is all waste the same? How much waste do we produce? How am I contributing to the waste problem? How are we managing our waste? Can waste be a resource? How can our waste management practices be more sustainable?

OVERVIEW

Part A is made up of 5 compulsory tasks, which must all be completed. There are also 4 elective tasks, of which students must complete at least two.

Compulsory Activities

Activity 1: Waste Scavenger Hunt

Activity 2: Categorising Waste: Is All Waste the Same?

Activity 3: Where Does Waste Go And Why Is It A Problem?

Activity 4: Segregating Waste and Composting

Activity 5: The 'R's' Of Waste for a Zero Waste School

Elective Activities

Activity 1: Then and Now

Activity 2: The Packaging Problem

Activity 3: Agriculture and Waste

Activity 4: A Day in the Life of a Waste Worker



ACTIVITY 1: WASTE SCAVENGER HUNT

OBJECTIVES

To take a look around you, while at school, and conduct a 'Waste Audit' based on your observations. Try and answer the following questions based on the results of your audit. Think of any additional questions that may need answering.

- Can we define waste as things that are thrown away because they've been used, damaged or are unwanted?
- What are the different types of waste you saw?
- What are some of the natural resources that have been used to make the items in your audit?
- Just because you've used an item, does it need to be thrown away?
- Is it possible that you might find something useful that someone else has thrown away?

To undertake a waste audit on campus is to calculate how much waste is generated on your campus every day. This data allows you to calculate the waste output for a month and a year.

INSTRUCTIONS

STEP 1: Take a copy of the 'Waste Scavenger Hunt' worksheet, given on the next page. This is to be filled by each student. Students can do this activity in pairs.

STEP 2: Identify 10 different waste items that you can find across your school or college campus, either in waste bins or as litter. Surveyed areas can include your classrooms, canteens, kitchens, on-campus shops, teachers' rooms, activity rooms or even playgrounds.

STEP 3: If you feel comfortable doing so, you can collect information from the science lab, sick room and toilets as well. Be sure to get your teacher's permission first.

STEP 4: Think about what waste was thrown away and why it is considered waste in the first place. You can also conduct a similar audit at home. How would your home waste differ from the waste you find in school?

WASTE SCAVENGER HUNT WORKSHEET

	ITEM OF WASTE	LOCATION OF WASTE	WAS THE WASTE IN A BIN?	IF NO, THEN WHERE WAS IT?	WHAT IS THE ITEM MADE OF? WHAT NATURAL RESOURCES WERE USED?	WHO MIGHT HAVE DISPOSED OF THIS WASTE?
Eg 1	Tissue	Classroom	No	Under a desk	Paper (wood pulp, trees)	Students Teachers
Eg 2	Bottle cap	Kitchen	Yes	Yes	Plastic (petroleum)	Cook
Eg 3	Broken test tube	Lab	Yes	Yes	Glass (silica)	Teachers
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

EVERYTHING WE DO CREATES WASTE

A pencil being sharpened, the use of a disposable ball point pen, vegetable peels from the kitchen, paper plates from the canteen, plastic wrappers from a bar of chocolate or sheets of old chart paper that were once used to decorate your bulletin boards – these are all different types of waste we might find in a school.

Be observant – Think about an activity you do at school. What are you using to do this? What waste does it create?



REFLECTION

1. What is waste? How would you define waste in one sentence?
2. Where does waste come from? How does everything we do create waste?
3. What are natural resources?
4. When does something become waste? Is it when you no longer need it? Or is it when a product is broken or somehow spoilt?
5. Who decides when an object becomes waste?
6. Who collects the waste from your school/college bins?
7. Where does this waste go?
8. Do you think everything you listed was actually waste? Why or why not?
9. Do you think that some of the things that you might throw away could be of value to someone else? For example, old jeans that don't fit you anymore can be given to your younger brother.
10. Define littering. Hint: was all the trash you found in the bin?
11. If you did the Waste Scavenger Hunt at home, were the results the same as those you got at school/college?



We brush our teeth twice a day – it's a habit that's been ingrained in us from childhood. Toothbrushes were invented in 1938. These everyday items are made of plastic, and so every toothbrush you've ever used, in fact, every single toothbrush ever produced till date, still exists somewhere on the planet polluting our soil and our waterbodies.

DID YOU KNOW?



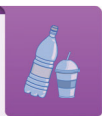
ACTIVITY 2: CATEGORISING WASTE - IS ALL WASTE THE SAME?

OBJECTIVES

To understand the ways in which we divide waste and why these categories are useful and to begin to consider appropriate approaches to waste segregation. To be able to segregate waste. To understand what is 'biodegradability'.

TYPES OF WASTE FOR BEGINNERS

While there are many different kinds of waste we can generally divide waste into 6 different categories. Recognising the different types of waste can help us decide how to treat or manage it.



DRY / RECYCLABLE WASTE

Consists mostly of man-made products or materials that cannot be broken down or decomposed by natural organisms but can be recycled.
Eg: glass, plastic, metal



BIOMEDICAL WASTE

Is any kind of waste that is medical, comes from a lab or contains infectious materials.

Eg: used syringes, used bandages



ELECTRONIC WASTE OR E-WASTE

Describes discarded electrical products or electronic devices.
Eg: SIM cards, old TVs, batteries, light bulbs



CONSTRUCTION/DEMOLITION WASTE

Consists of waste produced during construction or demolition.
Eg: old tiles, cement, rubble



HAZARDOUS (CHEMICAL) WASTE

is waste that is a threat to public health or the environment.
Eg. Pesticide, acids, cleaning liquids like bleach



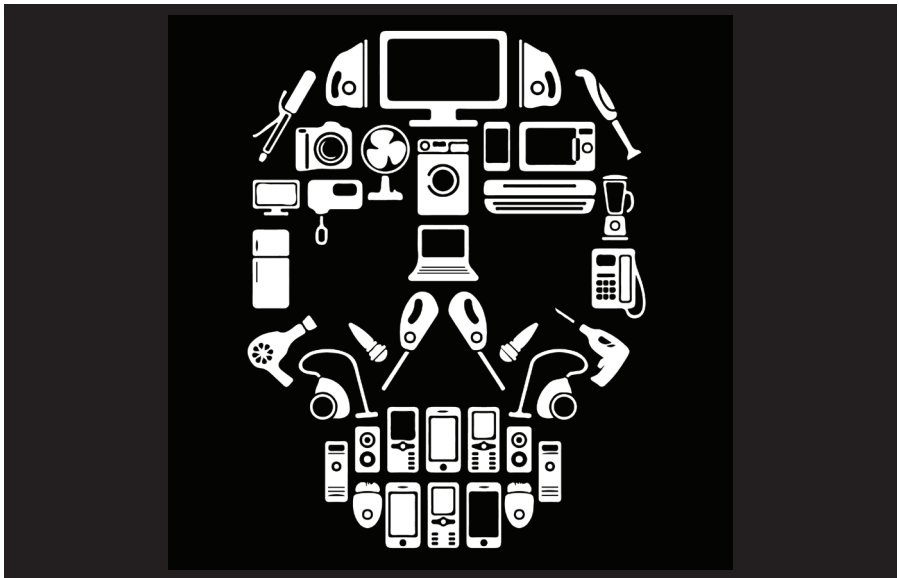
WET/BIODEGRADABLE WASTE

Refers to organic matter or waste from natural materials that can be broken down into CO₂, water, methane or simple organic molecules by microorganisms and fungi.
Eg: vegetable peels, leaves, cooked food, cut flowers

DID YOU KNOW?

In today's technological age, electronic items are used for almost everything. However, this has led to a lot of e-waste generation as technology is constantly improving, making most products redundant. For example, India has over 1 billion mobile subscribers, and considering that most mobiles do not last more than a few years, millions of mobiles are thrown away each year.⁶

E-waste contains a lot of toxic components such as mercury, lead, cadmium, barium and lithium, which have adverse effects on the environment and on human health, and therefore needs scientific treatment. However, 80% of India's e-waste is being treated by the informal sector, with disastrous consequences. Despite the E-Waste (Management) Rules of 2016 putting the responsibility of e-waste collection on electronics goods manufacturing companies, there has hardly been any change.



Source: Gianni Rossi

⁶ <https://in.reuters.com/article/india-telecoms-users/table-indias-mobile-phone-users-rise-4-97-mln-to-1-17-bl-in-dec-idINL4N1Q61KZ>

PART 1 : WASTE MATCHING EXERCISE: INSTRUCTIONS

STEP 1: Complete the waste matching exercise given in the worksheet below by matching the waste in column A with the waste categories given in column B.

STEP 2: Once you have finished the matching exercise think of one more waste item that fits in each category. For example pesticides are a type of hazardous waste while a cardboard box is a form of recyclable dry waste.

WASTE MATCHING EXERCISE: WORKSHEET



COLUMN A (WASTE ITEMS)	COLUMN B (TYPE OF WASTE)
Plastic Bags	Electronic Waste or E-Waste
Broken Tiles	Dry / Recyclable Waste
Used Mobile Chargers	Wet / Biodegradable Waste
Used Tea Leaves	Biomedical Waste
Cleaning Fluid (Phenyl)	Construction / Demolition Waste
Used Bandage	Hazardous (Chemical) Waste

PART 2 : THE WASTE SEGREGATION GAME: INSTRUCTIONS

- STEP 1:** Collect 6 empty containers (cardboard boxes for example) and label them according to the six waste categories shown to you above.
- STEP 2:** Divide your class into 2 teams. Each team should choose 10 items from their school Waste Scavenger Hunt sheet completed as part of Activity 1.
- STEP 3:** Write down the names of the 10 items on pieces of card paper, with only one item per card. Put both team's cards into a common bowl. You should have a total of 20 paper cards with one item of waste written on each of them.
- STEP 4:** A member from each team will then have a turn to pick a card from the bowl and place it into the right waste container. For every correct action the team scores a point (this is to be moderated by the teacher). The teams can alternate the picking of cards and the game ends when there are no more cards in the bowl. The group with the most points at the end of the game wins.



PART 3 : THE BIODEGRADABILITY EXPERIMENT: INSTRUCTIONS

So, what makes a product 'biodegradable'? In this activity we will try to answer this and other questions about biodegradability by setting up an experiment to determine the biodegradability of different substances or waste items.

UNDERSTANDING BIODEGRADABILITY

Earlier we saw the term 'biodegradable', but what does it actually mean? The '**degradable**' part of the word simply means that a product is able to break down into smaller, simpler compounds such as nutrients, carbon dioxide, water and oxygen. The '**bio**' part of the word means that this process is helped along by biological organisms, such as fungi and bacteria, which digest the material. Therefore, a '**biodegradable**' object is one that will break down quickly and safely into harmless compounds by using the action of living things like fungi and microorganisms and small animals like earthworms.



This experiment can be done in groups, with each group using the same or different waste items from the list below, or each group could be assigned materials to compare, for example, a plastic bag versus a piece of cardboard.

MATERIALS YOU WILL NEED:

- Pots or any other container that holds soil and water
- Soil (enough to fill the containers)
- Waste items: (i) potato peels or any other vegetable/fruit peel, (ii) a plastic bag, and (iii) a piece of used cardboard or paper
- A spade (you can also just use your hands)

STEP 1: Fill 4 pots/containers with soil up to the half way mark.

STEP 2:

Place an item of waste in each pot as follows and then cover it with more soil, making sure to cover it completely.

Pot Number 1 – place the plastic bag

Pot Number 2 – place the piece of used cardboard/paper

Pot Number 3 – place the piece of vegetable/fruit peel

Pot Number 4 – place the piece of vegetable/fruit peel. Dampen the soil with water, marking the pot as 'watered'. Keep it damp.

Keep the pots aside for a period of 2 weeks.

STEP 3:

After 2 weeks, remove the layer of soil and observe the piece of waste material you buried. Record these observations and use them to answer the following questions:

STEP 4:

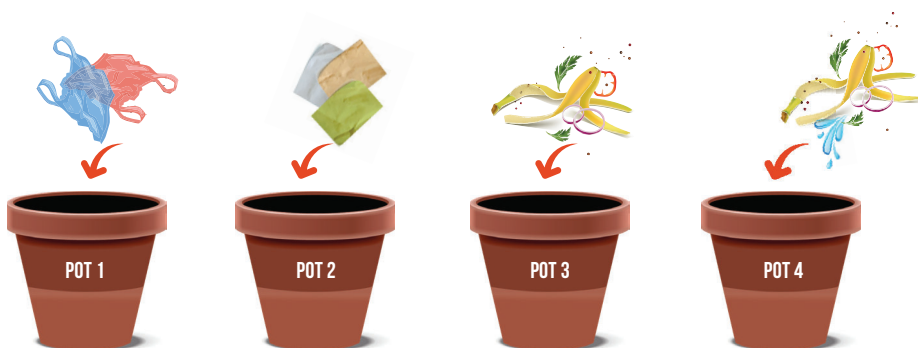
Have the items changed at all? How do these changes compare among the different types of waste?

Did adding water make any difference? If so, why?

What other variables might affect how fast something biodegrades (examples of variables are temperature, length of time, type of soil)?

STEP 5:

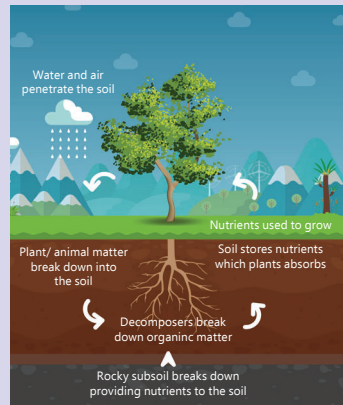
Try and repeat the experiment with other kinds of waste. See how your results change. Document your results and conclusions.



DID YOU KNOW?

HOW NATURE DEALS WITH WASTE

Nature has had her own set of 'waste disposal' solutions in place for millions of years. Consider the tree outside your school: it 'disposes' of its leaves by letting them fall to the ground. In the human world these leaves would be considered 'waste' and people would burn them or put them in a garbage dump. Not so with Nature – the microorganisms in the soil break down the fallen leaves, letting the nutrients they contain enter the soil. This in turn provides nourishment for the tree from which the leaves fell.



REFLECTION

1. What is the most common type of waste found on your school/college campus?
2. Is it the same at home?
3. If not, what kind of waste is most common in your home?
4. Why do we categorize waste?
5. What happens when you mix different types of waste like biomedical and hazardous wastes? Would it have an effect on human health?
6. Why is it important to segregate our waste? Do you segregate your waste into WET and DRY at your school or at home?
7. What is biodegradable waste? How can it be used to improve plant growth?



Different waste takes different amounts of time to degrade:

Vegetables and fruits: 2-3 weeks

Paper bag: 1 month

Thread: 2-4 months

Cigarette: 10-12 years

Wood: 10-15 years

Leather shoes: 25-40 years

Rubber Tyres: 50-80 years

Plastic bags: 300-400 years

Children's diapers and sanitary napkins: 500-800 years

Thermocol: Never

DID YOU KNOW?



ACTIVITY 3: WHERE DOES WASTE GO AND WHY IS IT A PROBLEM?

OBJECTIVES

To think about what happens to our waste after our bins are emptied and investigate current waste management practices in our schools and colleges and in our communities. To think about alternative waste management practices that are better for us and better for the planet.

To understand that every product that we use requires materials and other natural resources like water and energy and produces waste, whether it is food that has been grown in a field, like wheat, or manufactured in a factory, like a bag or pen.

PART 1 : WHERE DOES MY WASTE GO: INSTRUCTIONS

STEP 1: You can do this activity in pairs or groups. Investigate what happens to waste in your school after it's been put in a bin, by talking to your teachers, the administration staff and cleaners.

STEP 2: Your investigation should answer the following questions and include any other information you feel is important or interesting:

1. What happens to waste after it is removed from the school or college premises?
2. Where does it go?
3. How is it removed and who removes it? (Is it segregated before it is picked up and is it collected separately or in a common vehicle by the local body.)
4. Could you find out similar aspects about where the waste from your homes and buildings is disposed?

STEP 3: Record your findings and compare what you found out with the other students in your class. Discuss about what happens to the waste and where it finally lands up.

SCHOOL BIN



WHO COLLECTS
MY WASTE?



WHERE DOES
MY WASTE GO?

PART 2: HOW DOES INDIA MANAGE ITS WASTE: INSTRUCTIONS

STEP 1: Divide the class into four groups. Each group should choose one of the Case Studies given below and on the following pages. The following case studies describe how waste is being managed in different parts of India today. Use them to conduct the activity given at STEP 2.

CASE STUDY 1: DELHI'S BURNING WASTE

Breathing in Delhi, especially in the winter months, is like smoking 50 cigarettes a day. The city is so polluted! It was thought that majority of the pollution was caused by farmers burning stubble but that actually only contributes to 4% of the air pollution.¹ It is estimated that emissions from biomass and open burning of waste contribute to almost 20-30% of the total air pollution. Delhi burns 190 to 246 tonnes of municipal solid waste everyday.² Moreover, people burn plastic waste in the city which releases toxins such as dioxins into the air. Waste dumpsites near the city also release methane which is a powerful greenhouse gas that causes global warming. This gas catches fire easily and the fires on the landfills pump tonnes of cancer causing smoke into the air caused by burning plastic, leather etc. Even the ash, that remains after the waste gets burned, is full of poisonous heavy metals like lead and cadmium which in turn cause cancer.



Burning waste can seem easier and less expensive than sorting and recycling it. But once it's burned, we lose a precious resource that has been mined from the planet. Once a resource is burned it can never be used for anything else—it's gone forever!

Some cities like Delhi have been burning or incinerating waste to make energy but in other parts of India this has not been a success since it has led to air and water pollution and a loss of precious resources which could have been recycled to make other products.

Sources

¹ <https://chssachetan.wordpress.com/2018/12/15/air-pollution-crop-burning-and-the-alternatives/>

² <https://www.epw.in/engage/article/delhis-air-pollution-crisis-demands-rethinking-waste-management-practices>

DID YOU KNOW?

Burning garbage is classified as the third biggest cause of greenhouse emissions in India—apart from the impact on human health, the effect on land, water and food pollution is a matter of grave concern. Burning releases carbon monoxide, nitrogen oxide, sulphur dioxide, and carcinogenic hydrocarbons, apart from particulate matter into the air, resulting in India releasing 6% of methane emissions only from garbage (compared to a 3% global average) (Planning Commission 2014).⁷

CASE STUDY 2: MUMBAI'S OCEANS ARE FILLING WITH PLASTIC

If you ever take a walk along Mumbai's beaches, especially Juhu and Versova beaches, you will find it littered with trash and plastic waste.

This waste has come from the city's drains, rivers and creeks and has ended up in the sea. Globally, of the 260 million tons of plastic produced each year, about 10% lands up in the ocean. About 70% of this sinks to the bottom of the ocean but the rest floats and ends up being tossed onto the beaches by the waves. The problem is so bad that the Mumbai municipality has hired private contractors to clean the city's beaches and many organisations have regular beach clean-ups, yet, every day the waves toss back more plastic waste onto the shore.

Plastic waste kills up to 1 million sea birds, 10,000 sea mammals, marine turtles and countless fish each year. As much as 80% of the litter in our oceans is made of plastic. It is said that today there is more plastic in the oceans than fish. What's worse is that the plastic breaks down into millions of pieces of micro-plastic and scientists are very worried about this because all kinds of smaller animals – from zooplanktons to fish – eat them and get ill and die. Micro-plastics also enter our bodies through the food and water we eat and drink.



⁷ <https://www.epw.in/engage/article/institutional-framework-implementing-solid-waste-management-india-macro-analysis>

CASE STUDY 3: KOLKATA'S DUMPSITES ARE LEACHING TOXIC CHEMICALS

On the edge of the city of Kolkata, at Dhapa, lies a mountain. As you get closer you see flocks of crows circling the area and thick smoke rising from fires dotted across the mountain. Then you realise that you are looking at a mountain of garbage – a place where most of Kolkata's solid waste is dumped.



Unfortunately, this dumpsite at Dhapa is near the wetlands of Kolkata which support a lot of wildlife. Studies have shown that these wetlands now show traces of heavy metal pollution that are originating from the Dhapa dumpsite. It is a known fact that when waste on dumpsites degrades, and there is rainfall, dirty black liquid called leachate seeps into the ground from the waste. Leachate contains chemicals, heavy metals, as well as disease causing germs which seep into the groundwater and wetlands, causing health problems for humans as well as for the wildlife.

Walking along the edges of Kolkata's garbage mountain at Dhapa shows how this city is slowly getting choked by smoke from the fires of the burning garbage and leachate that is poisoning local waterbodies. It is no wonder then, that seven out of ten people in Kolkata suffer from respiratory illnesses and that pollution affects all living things from humans to plants and animals living in the wetlands.

CASE STUDY 4: BENGALURU — FROM GARDEN CITY TO GARBAGE CITY

Overflowing waste bins that emit foul smells are a common sight in most of our cities, including Bengaluru. They are an ideal breeding ground for bacteria and other germs and the flies that visit the garbage are also the same flies that roam around your food and leave germs that cause diseases like diarrhoea, gastroenteritis and other major illnesses.



Besides flies, the bins attract crows which lift the rotting food and drop it in the streets and gardens. Cows scatter the rotting food and chew on the plastic bags. Rats and stray dogs add to the problem. Rats cause many diseases like leptospirosis and plague, both of which can kill people.

In order to get rid of the waste in the overflowing bins some people burn the waste in the bins and this releases all kinds of toxins which pollutes the air and causes respiratory illnesses like asthma and bronchitis. Overflowing garbage bins are a nuisance and a risk to human health.



STEP 2:

Read your case study and discuss it with your team mates. Try to find out more about the given topic. The following questions will help you to cover your case study well:

1. What are some of the problems that are associated with the kind of waste management that has been mentioned in your case study?
2. Why do these problems occur?
3. What are some of the other waste related problems that occur in the city that is mentioned in your case study?
4. Are the problems in your case study similar or different to any waste-related problems that you have seen in your locality?
5. Can you mention some of the additional problems that occur in your locality or town or city?
6. Can you think of some of the solutions to such problems?
7. Can you find out about some organizations or practices in your community or in any other place in India that is making waste management more sustainable. In order to answer this question your group may need to undertake some research.
8. Think of additional questions you feel may address these issues.

STEP 3:

Take turns to present your case study to the entire class. You can present the case study to your class using a power point presentation or using a short video film or by using any other technique. Make sure you have covered the topics mentioned at Step 2 above.

LINEAR VS CIRCULAR

As the world's population continues to grow we use more and more resources and create more and more waste. This process is 'unsustainable' because Earth, our home, is a finite planet with finite resources. To ensure there's enough food, water and prosperity for future generations we need to find a new way to manufacture and use all the products we use in our daily lives, and find a way to become **zero waste**. To become zero waste we need to move from a **linear economy** to a **circular economy**.

The Linear Economy: For a long time, our economy has been 'linear'. This means that we use raw materials from the Earth to make new products, and after their use we throw them away into a landfill or incinerate them.

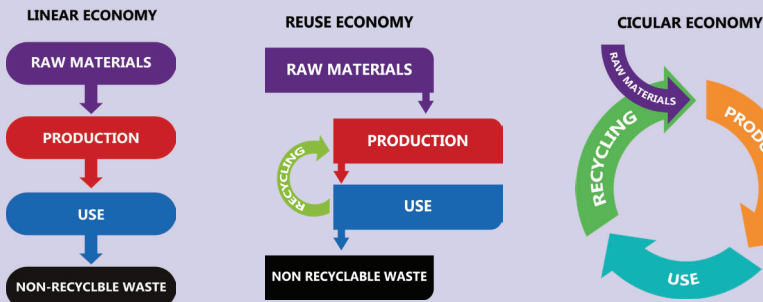


The Circular Economy: In a circular economy, manufacturers design products to be reusable. For example, electrical devices are designed in such a way that they are easier to repair. Products and raw materials are also reused as much as possible. For example, by recycling plastic into pellets for making new plastic products. In a circular economy we also treat our surroundings responsibly, by preventing litter on streets or in the natural environment.



WHICH ECONOMY DO YOU THINK IS BETTER?

From Linear Economy to Circular Economy



BRAINSTORMING

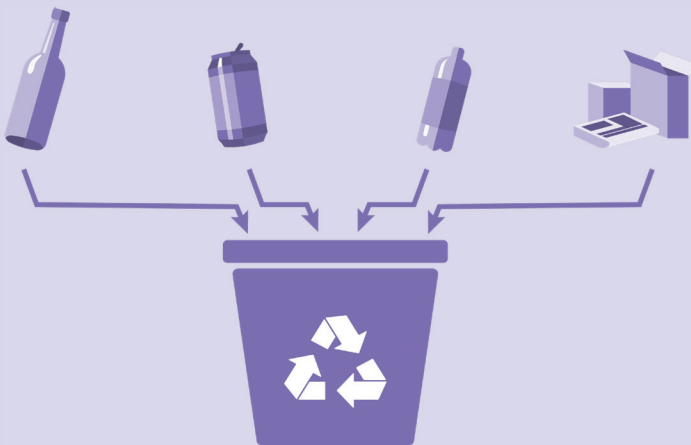
Did you know that up-cycling and down-cycling are two ways of recycling? Up-cycling of electronic devices is the best way forward for e-waste as the discarded products are upgraded to make them viable for newer technology instead of completely breaking them down, or down-cycling, them. Down-cycling should be used as the last resort because the entire product is dismantled and all the heavy metals and other components are completely reduced to the raw materials.

DID YOU KNOW?

Recycling is better than dumping waste on landfills. However, everything cannot be recycled forever.

For example:

- i. In general, most plastics can be recycled 7-9 times, though the number might change depending on the type of plastic.
- ii. Recycling causes the fibres in paper to shorten. Thus, it can only be recycled 4-6 times.
- iii. Glass, steel and aluminium lose no quality during recycling and can be recycled endlessly.



REFLECTION

1. Do you think the current waste management in your school is effective?
2. Where does the waste go finally from your school bin?
3. Why do we have waste dumps in cities?
4. Where are the waste dumps usually located?
5. What happens when the dumps or landfills fill up? What if your house was near a dumpsite – how would you feel?
6. What are the problems that are associated with the ways in which cities manage their waste?
7. Is our current waste management system linear or circular?
8. Why do you think waste is managed in those ways currently?
9. How does our current waste management affect our health and the environment?
10. Do you think the problems in the case studies occur in other parts of the country as well?

DID YOU KNOW?

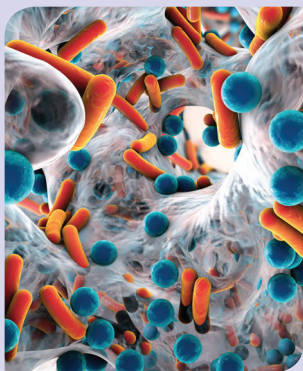
HelpUsGreen is an Indian private project that collects flowers from temples and mosques across cities in Uttar Pradesh and recycles them to produce natural incense, organic fertiliser and biodegradable packaging material. Their main aims are to clean up the Ganga river and empower women. The project employs 1,260 women and prevents pesticides and other harmful chemicals used to grow flowers from entering the river. It is one of 15 projects from around the world to win the UN Climate Action Award in 2018.



ACTIVITY 4: SEGREGATING WASTE AND COMPOSTING

OBJECTIVES

To understand the benefits of sustainable waste management practices by learning about segregation and the process of composting.



DID YOU KNOW?

Nearly 50% of the total waste in India is organic waste or wet, biodegradable, compostable waste that is lying unused and filling our dumpsites.⁸

Mixing biodegradable waste with recyclable waste (paper, plastic, metal) makes our recyclable waste less recoverable. Due to poor source segregation, Municipalities in India are currently able to compost only 0.21 % of the wet waste we throw away.⁹

WHAT IS COMPOSTING?

Composting is simply the process of breaking down the organic matter in the presence of air and water, using microorganisms and other small animals. The end product is called compost which is rich in readily usable plant nutrients, forming a part of healthy soil.

Composting organisms require 4 conditions to create compost:

1. Carbon-rich ingredients or '**the browns**' that come from organic matter like dried leaves, sawdust, straw etc.
2. Nitrogen-rich matter or '**the greens**' that comes from fruit and vegetable waste, fresh leaves, grass clippings, flower garlands etc.
3. Oxygen which comes from air.
4. Water in the right amounts.

⁸ <https://www.epw.in/engage/article/institutional-framework-implementing-solid-waste-management-india-macro-analysis>

⁹ <https://timesofindia.indiatimes.com/city/navi-mumbai/Societies-urge-Navi-Mumbai-citizens-to-try-their-hands-at-composting/articleshow/47303579.cms>

Dumpsites cannot create compost since organic waste is contaminated by non-biodegradable waste like plastics and heavy metals. Also, when waste piles up, the layers below do not get oxygen. Compacted waste gets no air circulation and therefore no oxygen and takes very long to rot. This is called anaerobic decomposition since the organisms that help decompose this waste live without oxygen.

Organic waste can be composted faster using aerobic composting. This composting needs more air or oxygen since it takes place with microorganisms that require oxygen. These microorganisms are naturally occurring and live in the soil.

CREATING COMPOST: INSTRUCTIONS

STEP 1: Divide the class into groups of 10 students each. Each group will start its own compost bin by following the instructions given below:



STEP 2: **Identify Your Composting Spot:** Composting can be done at various places ranging from a corner of the garden or playground to your school's kitchen or canteen. Balconies, terraces and rooftops are also good places to set up your compost bins. While the best place to start composting is outdoors, you can even start the process of composting inside your school.



STEP 3: **Segregate your Waste:** Start by collecting your school's biodegradable waste separately in different containers. Also try to separate your carbon-rich material (the browns) from the nitrogen-rich material (the greens). Since you have to add these in layers.



STEP 4: **Construct Your Composting Bin:** Select a container - it can be anything, from a bucket to a large earthen pot (matka) or a large, normal dustbin. Remember you need the compost to



get air or oxygen into it so drill about 4-5 holes around the container at different levels to let the air inside. You can buy readymade compost containers or plastic crates which do not need holes to be made.

STEP 5: **Start the Composting Process:**

Always start a new compost pile with a fluffy layer of 'browns' at the bottom (at least 6 to 8 inches deep) to absorb moisture from the pile and keep things well-aerated. Then add a layer of 'greens'. To quicken the process, you can add a layer of semi-composted soil to your compost. After the layer of greens you can have another layer of browns. However, right on top keep a thick layer of carbon-rich material or browns, which helps to prevent rain from soaking into the pile and moisture from evaporating out of the pile. This is because the compost needs to be slightly moist.



Source: EdibleNashville

STEP 6: **Once the Compost is Ready:**

If you are preparing compost in stacked containers, stack an empty container on top of a full one. Composting usually takes anywhere from 3 to 6 months to get ready. It is ready or finished when it looks, feels and smells like rich, dark earth rather than rotting vegetables. In other words, it should be dark brown, crumbly and smell like earth.



MAKE SURE THAT THE FOLLOWING ARE NOT ADDED TO THE COMPOST:

- ✗ Meat and fish, oily and watery food and soiled food containers as these may attract rats and other pests.
- ✗ Diseased or insect-infested plants, soiled diapers, soiled cloth as these will pass on germs to the soil.
- ✗ Dead animals, dog and cat faeces, as these might contain harmful germs.
- ✗ Any plants treated with chemical pesticides; as the pesticides might kill composting organisms and pollute soil.
- ✗ Though most of these above materials are biodegradable waste we do not advocate using them for the schools' composting activity. In municipal composting these materials can be used since temperatures go high enough to kill any germs.

OPTIONAL - VERMICOMPOSTING

You can also add a few earthworms into your compost bin if you would like to hasten your composting. Composting in which earthworms are used is called vermicomposting. Earthworms have a very positive effect on the physical, chemical and biological parameters of the soils. The earthworm is a soil biotechnologist and a solid waste manager. Earthworms are known to consume large quantities of organic waste and convert them into manure, which is used as valuable compost, known as 'vermicompost'. This 'vermicompost' provides rich nutrients to plants. It contains five times more nitrogen (N), seven times more phosphate (P) and 11 times more potassium (K) as the given top soil. Collectively known as NPK, these elements are important nutrients in fertilisers. Moreover, as worms burrow their way into the compost they allow more oxygen inside, thus aerating it.



BRAINSTORMING

If half of our waste is wet, organic, biodegradable waste, then it makes sense for all of us in India to start composting it. In turn the compost will be a boon to farmers as they are buying very expensive chemical fertilizers at the moment. In fact, our government has passed a law for converting all organic waste generated in cities into compost or biogas by October 2019, yet this is not being done. So, what is stopping farmers from buying urban compost?

Farmers say that waste is usually contaminated with heavy metals and disease causing germs which pollute their soil. This happens when biodegradable waste gets mixed with other waste and composting rules are not followed. Farmers also say that the compost is not good enough manure.

We need to focus on creating 'clean' and rich compost for the farmers, only then will the biodegradable waste be used by our farmers and lead to less waste on our dumpsites.

It is therefore, necessary to learn the art of composting and make it perfectly so that it can be used as fertilizers by our farmers.



REFLECTION:

1. How does composting reduce waste?
2. What are the other benefits of composting?
3. What gets composted in nature?
4. What can you do if there is more compost than what your school can use?
5. Where can you get the earthworms from for the composting? Where can you learn more about composting from?



ACTIVITY 5: THE 'R'S OF WASTE FOR A ZERO-WASTE SCHOOL

OBJECTIVES

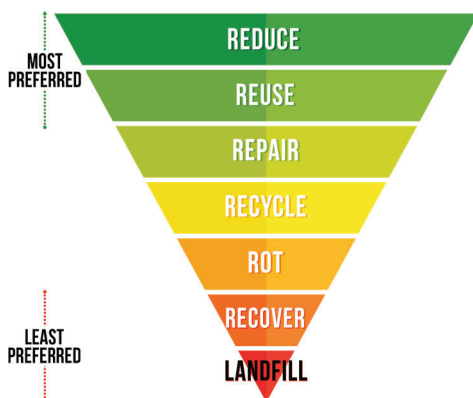
To understand the concept of a Zero-Waste School, to explore the practices and ideas needed to become a Zero-Waste school, to understand the 'Pyramid of Waste Management' and the 'R's of waste, to practice waste segregation and all the other concepts of sustainable waste management.

INSTRUCTIONS

STEP 1: List as many of the R's of Waste as you can

STEP 2: The teacher should then ask students to define each one before taking the class through the order on the R's of Waste (See next page).

STEP 3: Pick a single item of waste and discuss examples of the various 'R's that can be applied to it. An example of how the 'R's can be applied to a bag is given below to help you get started:



- 1. Reduce** – refuse buying a new cloth bag or a school bag
- 2. Reuse** – use the same bag as long as you can or try to get a second hand bag from someone else.
- 3. Repair** – if the bag is torn, stitch it up
- 4. Recycle** – if it is a cloth bag use it as a duster or a mop or if it is a school bag you can make mats and small purses. Zips can be used for some other bags.

THE R'S OF WASTE

REDUCE

Buy less, use less, and throw away less. Buy products with minimal packaging and a longer life span. Choose products that are eco-friendly.

REUSE

Extend the life of an item by using it again. For example, when you wear clothes or shoes that have been passed on to you by another person. Also, if you create a new use for a product, the process should not require the input of energy or any new raw material. For example, if I use my broken water container and use it as a planting pot.

REPAIR

Rather than throwing an item away, see if it can be fixed. For example, if your computer or TV does not work, it is better to repair these rather than buying a new one.

RECYCLE

The process of removing materials from a waste product and using it to make new products is recycling. It prevents mining of fresh raw materials and reduces energy and water usage. For example, your torn shirt is turned into a cloth bag or the metals from your computer parts are used to make watch straps and jewellery.

ROT

Start composting the wet waste.

RECOVER

Sometimes, it may be possible to recover materials or energy from waste which cannot be reduced, reused, or recycled. For example, many schools use their Wet Waste for biogas plants that generate gas for the kitchen.

LANDFILL

If we cannot apply any of the 'R's, then that waste can be disposed, but it will be much less in quantity and the landfill should ensure that it is lined well to prevent leachate from entering the groundwater.

STEP 4:

Play the **Zero Waste Card Game** to understand how a school can become a Zero-Waste School. The purpose of this game is to help you learn the many ways in which you can do so.

INSTRUCTIONS FOR PLAYING THE GAME

1. Familiarise yourself and the students with the game (see the Game Toolkit).
2. Divide students into groups of 10 with 5 on each team.
3. Explain the rules of the game to the class (See "How to Play")
4. Students play the game with their respective teams.
5. Students can play the game as many times as possible by changing teams.
6. After the game, make sure to discuss with the students what are some of the learnings from the game that can be applied to make their school Zero Waste.

GAME TOOLKIT DETAILS

1. A Waste Game Board



2. A set of Green Cards, a set of Red cards and a set of Blue Cards

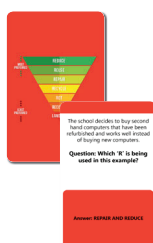
GREEN CARDS CHOOSING GOOD AND BAD WASTE PRACTICES

Help you understand what are good and bad waste practices.



RED CARDS PICK THE RIGHT 'R'

Help you understand the R's of waste.



BLUE CARDS CHOOSE THE RIGHT BIN

Help you understand the segregation of waste.



HOW TO ASSEMBLE THE GAME

1. Stick the Zero Waste Card Game picture onto cardboard so that it is stable.



2. Make the cards by cutting them and sticking the back to the front.

How to make cards: Cut up the cards on the outline given. Then stick them to the matching group for eg. Green text goes with the green coloured card.



3. Provide a dice and counters for the groups (Each group needs one dice and one counter).

HOW TO PLAY

Play the Zero-Waste Card games by dividing the class into smaller groups. Each group of ten plays the game.

Each group of 10 has to be subdivided into two teams of 5 each. These two teams would be playing to win by reaching the end goal which is a Zero Waste School.

The game starts by the groups putting each type of card in stacks. So there should be 3 stacks of cards. Then they open the Game board and each group sits opposite each other.

Both groups start by putting their counter on the 'START BOX'. The first group starts the game by rolling the single dice. They read the number on the dice and move their counter forward according to the number on the dice, so for e.g. if the dice shows 5 they move 5 boxes ahead.

When they land on the box the opposite team picks up any card that matches the colour of the box on which their opposite group has landed. So for example, if the group lands on a green box the opposite team picks up any green card. Then they ask the question on the card. If the first team answers the question correctly they can stay on that box otherwise they move back to the starting point.

Then it is the turn of the next team to throw the dice and move ahead. This time the other team picks out the card and asks them the question if they answer correctly they can stay on the box or they move back to where they were earlier.

The game continues with each team taking a turn. They can stay on the box ONLY if they answer correctly, otherwise they have to move back to the box where they moved ahead from i.e. the last box where they had reached. The team that answers the question correctly first on the very last box wins.



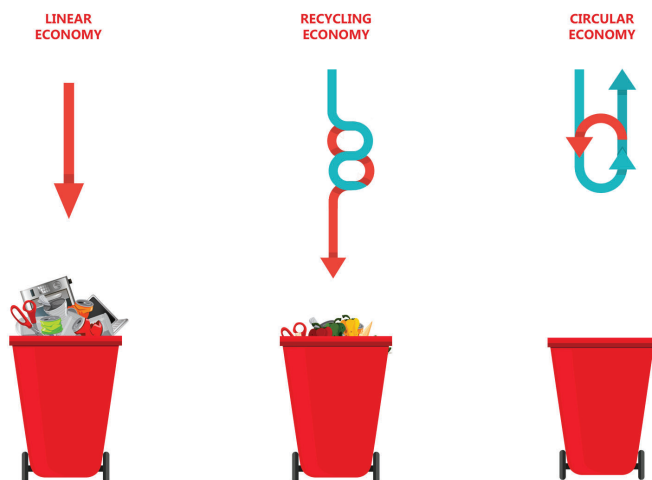
REFLECTION

1. In order to become a Zero Waste School you only segregate waste into different bins. Would that be enough? Why or why not?
2. Why do we need to follow all the 'R's of waste?
3. When you recycle something, do you re-use all of it?
4. Are "ecofriendly" or "green" products always better for the environment? Explain.
5. Watch the film and think of how an office worked to become Zero Waste. How many R's were followed and how many you can practice in your daily life. <https://www.youtube.com/watch?v=4ISNYoDLP9o>.
6. Reflect on how your school can become a Zero Waste School.

BRAINSTORMING

Zero wasters are people who produce no waste whatsoever.

We live in a linear economy where products are designed for the dustbin. Recycling is not a solution, merely a tool to delay the inevitable. Zero wasters believe in following a circular economy where infrastructure, businesses and individuals see the value in the things they use. However, there are many individuals who have managed to be Zero Wasters in India by following most of the R's of waste.





PART A: ELECTIVES

Elective Tasks: Complete ANY TWO of the following tasks to finish the module.

- ☐ **Activity 1:** Then and Now
- ☐ **Activity 2:** The Packaging Problem
- ☐ **Activity 3:** Agriculture and Waste
- ☐ **Activity 4:** A Day in the Life of A Waste Worker

ACTIVITY 1: THEN & NOW

OBJECTIVES

To understand how the production and management of waste at festivals, weddings or community functions and events has changed through the years.

Note: You are required to conduct two interviews, one with a person of your generation and one with a person of your grandparents' generation.

INSTRUCTIONS

- STEP 1:** Think of a festival celebrated in your locality. You can also think about weddings or other functions and events that happen in your community.
- STEP 2:** You are required to conduct two interviews, one with a person of your generation and one with a person of your grandparent's generation. In order to do the interview, follow the guidelines given on the next page and prepare the interview accordingly. You can discuss with your teacher all the processes that you will be following before conducting the interviews.

GUIDELINES FOR CONDUCTING INTERVIEWS

- a. Prepare an interview questionnaire.
- b. Select the interview candidate, explain the purpose of the interview to him/her and take their permission to carry out the interview.
- c. Carry out the interview

Process to be followed while interviewing

1. Introduce yourself
2. Explain the purpose of the interview again
3. Ask questions one at a time and give the person time to respond
4. Try to get the reasons for their answers, for example if the person says that in the olden days they ate at weddings using banana leaves try to find out more about why they did that.
5. If you are interviewing an older person then try to prod them to say what happened in their grandparents' time? So you will get information that is much older.
6. Listen carefully and take notes accurately

Dos and Don'ts

Keep questions open ended and short.

Be courteous, polite and ask questions gently, one at a time.

If you have not understood the answer then let the person know in a gentle manner.

Do not insist on answers if the person is unwilling to reply.

STEP 3: Follow the above guidelines and conduct your interview. Below are some of the questions you can ask the two interviewees with regards the festival or function or event you thought about in Step 1:

1. Is that festival or function still celebrated the way it was when your parents/grandparents were children?
2. What has changed?
3. How does this festival or function contribute to waste?
4. How is the waste produced managed?

5. Do you know anybody who celebrates the festival or event in a more eco-friendly manner?
6. Consider things like decorations, firecrackers, disposable plates/cutlery, left over food etc.
7. Do they practice the R's?
8. How do they effect the environment?
9. Are there eco-friendly alternatives?

STEP 4: Compare and contrast answers of the two different generations. Have things changed - for the better or worse?

STEP 5: Present your project as a Power Point Presentation or as a video. Feel free to include any photographs or research that may illustrate your point.

REFLECTION:

1. Are there any materials we use more now than we did before?
2. Give an example of a positive change and a negative one.
3. What gets people to make that positive change?
4. Look at the Video link below to find out how a wedding can follow sustainable practices. https://www.youtube.com/watch?v=iND8_C3fsNE

SUCCESS STORY: ECOWARE

This company produces eco-friendly food packaging. With over 25 types, Ecoware's products degrade completely within 3 months of being in soil, are 100% compostable and contain absolutely no plastic. It's safe to use them in a microwave, and in addition to this, they are water and oil proof for up to an hour. Production occurs locally, so that Ecoware's products are affordable and fill a demand for sustainable packaging.

www.ecoware.in



ACTIVITY 2: THE PACKAGING PROBLEM

OBJECTIVES

To find ways to design packaging that either reduces the waste produced or creates biodegradable waste.

Note: You have to pick one item and repackage it in a way that creates minimum waste or preferably no waste. You can work on this activity in groups.

DID YOU KNOW?

Plastic packaging makes up about half of the waste plastic problem with most of it thrown away after a few minutes of its first use. Can you believe that 40% of all plastic produced is just for packaging, used once and then discarded.¹⁰ Plastic lasts in the environment between 450 years and forever. Since 1950, 8.3-9 billion metric tonnes of plastic have been introduced into the environment. That's equal to more than four Mount Everests.

INSTRUCTIONS

STEP 1: Pick one item that you plan to repackage. Look at how it is packed and try to answer the following questions:

STEP 2: Try to answer some of these questions, they will help you find out why its current packaging creates unnecessary waste.

1. How does the current packaging of the product impact the environment?
2. Does it protect the product – from breaking, getting spoilt or protecting it from contamination?
3. Does it look nice?
4. Is it easy to open? Or to carry?
5. Is it cheaper to package items this way?
6. Is it overpackaged?
7. How many layers of packaging are there?
8. What is each made of?
9. What alternative materials could you use that are safer for the environment?

¹⁰ <https://news.nationalgeographic.com/2018/05/plastics-facts-infographics-ocean-pollution/>

STEP 3: See if you can re-design packaging for that product that is more eco-friendly and less waste generating, using concepts you've learnt in previous activities.

STEP 4: If you like you can either design a hypothetical packaging concept and share your idea through illustrations. Or you can actually repackage the product with your new packaging concept, if the materials are easily available at home or at school. Document your new idea using photographs.

STEP 5: Create a report of your idea and submit the same.

SUCCESS STORY : BIOLUTIONS GMBH

This company makes packaging material from agricultural waste, an eco-friendly alternative to plastic based packaging. Sourcing materials from agricultural waste gives farmers an additional source of income and prevents the burning of crops' waste, thus lowering pollution levels. A production plant outside Bengaluru uses the leaves of sugarcane, pineapple, tomato, banana and water hyacinth plants to create all-natural and 100% food-grade packaging that is completely biodegradable. This packaging product is now in high demand since Bengaluru has banned plastic.



In 2003, a village in Meghalaya called Mawlynnong was named the cleanest village not just in India, but in all of Asia. It has been plastic free for 14 years and is upheld as an example for the rest of India. The village's reputation brings a large influx of tourists every year, which makes it harder to keep the area clean and its practices sustainable.¹¹

DID YOU KNOW?

¹¹ Pasricha, P. (2018) 'A Day in the Cleanest Village in Asia: Mawlynnong, Meghalaya.' Lonely Planet, June. <https://www.lonelyplanet.in/articles/5506/a-day-at-the-cleanest-village-in-asia-mawlynnong-meghalaya>

REFLECTION

1. Think of a natural form of packaging, something like a banana skin. Why do you think it evolved to be packaged this way?
2. Can similar methods be employed in man-made packaging?
3. Can you think of any product for which the packaging problem can be solved in some innovative way? For example there can be a buy back of plastic bottles, tetrapaks and glass bottles by the manufacturers and some packaging can be returned for example Birthday Cake boxes?
4. What are some of the types of packaging that cannot be recycled easily. For example metalized plastic (most packaging from biscuits to snacks is packaged in a thin layer of plastic bonded with a thin layer of metal). How can those problems be addressed?
5. Which providers or companies need alternatives to packaging since they are packaging a lot? For example online product providers, factories etc.
6. How can they ideate on creating less packaging?
7. Apart from plastics, what other materials are used for packaging (such as Thermocol, which is also known as Styrofoam or Polystyrene)? Are they harmful to the environment? If yes, how?

HOW TO DESIGN PACKAGING FOR ZERO WASTE

- Design for Recyclability or use of Recycled Content.
- Weight Reduction.
- Renewable or Bio-based Materials.
- Compostable Materials.



ACTIVITY 3: AGRICULTURE & WASTE

OBJECTIVES

To understand that most agricultural practices produces waste; to identify types of waste specific to farming; to study the change in waste management over time.

Note: You have to interview one or two farmers to understand what waste gets generated from agricultural activities. Read the section on 'Guidelines for Conducting Interviews' before conducting the interview.

INSTRUCTIONS

STEP 1: Talk to local farmers and interview one or two of them about the waste they generate – both in growing their crops and selling them. Answer the following questions:

1. What kind of waste does agriculture produce? For example plant cuttings, hay stalks, cow dung, empty pesticide bottles, empty fertilizer bags
2. How and where does the farmer dispose of this waste? For example, what happens to the stubble of the wheat plant after it has been harvested?
3. Does any of his or her waste disposal methods have any effects on human health and the environment?

STEP 2: Find out if the farmer or farmers you talked to, is doing anything to reduce their waste production? Are they using their waste to make other products? For example, compost.

STEP 3: If you can't talk to a farmer, talk to someone from a plant nursery, public garden or horticultural facility and change the questions accordingly.

REFLECTION

1. Are there sustainable alternatives to the farmer's current practices? Does the farmer know of these alternatives?
2. Do you think all farmers would answer your questions in the same way? What differences might there be and why? Consider:
 - a. A farmer in a different part of India
 - b. Someone growing a different crop.
 - c. Large scale versus small scale holdings
 - d. Organic farming
3. Were waste management practices any different in the farmer's parents' or grandparents' time? How? Why have things changed?

ACTIVITY 4: A DAY IN THE LIFE OF A WASTE WORKER

OBJECTIVES

To identify the people involved in the disposal of waste and look at the part they play in the waste management system. To develop a deeper understanding of workers involved in waste management and to build empathy for them.

Note: You are required to conduct an interview with a worker in waste management

INSTRUCTIONS

STEP 1: Pick a person from the various stakeholders mentioned below and interview them or interview any person working in waste. (The Process Flow shown below explains the role of each stakeholder or waste worker).



STEP 2: Write a short report on their role in the waste management process.

Questions you should ask could include the ones given below:

1. What kind(s) of waste do they deal with?
2. How did they begin this work? Was it by choice or they had no other source of livelihood?
3. Do they work alone? Are they self-employed? Contracted to a company or an organization?

4. What does their day look like?
5. Do they follow the same routine every day?
6. Do they collect from a particular area every day?
7. How do they collect the waste?
8. Do they have safety regulations that they follow? If not then should these be mandated- why?
9. What are some of the difficulties they face in the collection of waste? Is the waste segregated?
10. What kind of waste cannot be recycled?
11. What do people think of them and the work they do?
12. Does their work pay them well?
13. How would they like to improve the waste management system where they work?

Students are encouraged to add any questions they would like.



Hasiru Dala helps 13,000 households manage their waste sustainably and improves the lives of over 7500 waste workers or rag pickers by creating livelihoods for them. The organisation has composted over 3,000 tonnes of wet waste, recycled 900 tonnes of dry waste and more than 90% of the waste collected by them has been processed rather than being dumped in landfills.





Stree Mukti Sanghatana

(Women's Liberation Organization)

In Mumbai, the Stree Mukti Sanghatana has helped improve the lives of thousands of women waste pickers, or 'ragpickers' as they are often called, by training them in segregation, composting, bio-methanation, micro-saving and leadership skills. It helps them win competitive contracts from the Municipality, thus enabling them to achieve economic independence and gain self-respect. The city, in turn, has benefitted because these women have helped it save crores of rupees and have ensured that the recyclables and compostable wastes have been prevented from reaching the city's already overloaded dumpsites.

REFLECTION:

1. Does a rag picker play an important role in waste management?
2. Could the Hasiru Dala initiative be copied where you live?
3. How can a community improve the lives of rag pickers?

SUCCESS STORY : WASTE VENTURES

Our cities have a big problem: how to collect and properly dispose of all the waste that we produce every day so that none of it reaches our oceans or rivers. The Central Pollution Control Board (CPCB) estimates that Indians throw out about 15,342 tonnes of waste every day. Companies



like Waste Ventures are vital in helping the municipality with dealing with the waste. Based in Hyderabad, they collect waste, sort it and then send all recyclable materials to recyclers. Even though they work on 150 tonnes per month, that is just 0.1% of Hyderabad's total waste.¹²

¹² <https://economictimes.indiatimes.com/industry/indl-goods/svs/paper/-/wood/-/glass/-plastic/-marbles/india-wants-to-double-consumption-of-cheap-material-in-5-yrs-what-about-its-plastic-waste/articleshow/59301057.cms>



PART B: COMPULSORY

WRITING AN ESSAY TO CHANGE LOCAL WASTE MANAGEMENT STRATEGIES

'Part B' is aimed at making you understand more about how waste is managed in your communities and making you think about how these waste management strategies can be improved. It is about motivating you to become the 'change makers' in your communities and helping them switch over to more sustainable waste management practices.

OBJECTIVES

You have studied waste practices in your school and home. You have understood what needs to change. Can you now apply your own knowledge to bring about a change in the way waste is managed in your community? Are you able to identify some of the gaps in waste management? Can you explain what needs to be done in order to bridge those gaps? Is it possible to find out what prevents your village, town, housing society or city from practicing sustainable waste management?

You have learned many of the sustainable waste practices in Part A including segregating, composting and the different R's of waste. How can you help your local community switch over to sustainable waste management? Design an action plan for moving ahead and help your local body create a campaign for waste management. You can also aim higher and think of motivating individuals from your community towards embracing a Zero Waste Society and perhaps convince them to make the Circular Economy a reality.

MOVING COMMUNITIES TOWARDS SUSTAINABLE WASTE MANAGEMENT

Our country is facing a huge waste management challenge. Would you believe that 31% of the waste from our towns and cities is not even collected – it is lying on our streets and land and in our rivers and seas. 50% is collected but dumped in landfills and **ONLY 19%** of India's waste gets treated!

Our governmental bodies, housing societies and municipalites are unable to cope with the waste problem, and **81%** of our waste is lying unmanaged. This is adversely impacting our health and our environment as well as creating vast social and economic problems.¹³

We need to switch over to sustainable waste management and start by moving to a circular economy to ensure that waste is not created in the first place. We need to ensure proper segregation of waste at its source, become Zero Waste and follow all the R's of waste, especially reduction of consumption, recycling and resource recovery. At most, only the final residue should then be deposited scientifically into engineered landfills. Setting up of waste-to-compost and bio-methanation plants would greatly reduce the biodegradable component of India's solid waste, which is currently estimated at a little over 50%. E-waste is another growing menace in our country with toxic smoke being emitted from unscientific recycling processes, while hazardous chemicals leach into the water table from landfills. The list is endless but the solutions are aplenty, and just a click away with all the technological advancement. Along with that, successful case studies are constantly being reported about in the news and on the internet. They are easily accessible on social media and sites such as YouTube.

We must understand that now we need to involve the entire community in waste management, and this is the only way forward for efficiently managing our country's waste. You may select any local body, like the Gram Panchayat in your village, the local municipality in your town or city, your 'housing society or residential colony and help them move towards sustainable waste management. However, they must be able to ensure that the local community participates in this mission. Your initiative in this section will definitely make a difference, waste will soon be seen as a precious resource and none of it will ever be thrown away! In fact, there will soon be a demand for eco-friendly products which will be redesigned to ensure that there is no waste. This will propel India towards a Circular Economy where waste no longer exists!

¹³ <https://www.downtoearth.org.in/blog/waste/india-s-challenges-in-waste-management-56753>

INSTRUCTIONS

Write an essay of about 2500 words which will help the local body in your area switch over to sustainable waste management practices and ensure that all its inhabitants actively participate in making the change.

You can select a local body that operates in your area. Or you can select **any one** of the following local bodies:

- i. Gram Panchayat (local village authority)
- ii. Municipal Council (local town authority)
- iii. Housing Society or Residential colony (in your area)

(Select **any one** of the above)

The essay should be able to answer the following basic questions:

“Why is a change in waste management needed?”

“What needs to change?”

“How can the change be achieved?”

Your essay should be based on independent research and should include inputs from experts and organisations working in waste management as well as the staff of the local body, Housing Society or Residential colony or municipality. This will ensure that your essay has practical ideas that can be implemented easily. Try to implement some of the ideas at your own school or residential society and share your experience as a part of the essay. Your essay should rely on some of your own experiences learned while undertaking activities of Part A.

Makes sure to include photographs, sketches, pictures and posters but do not download ready visuals from the internet.

GUIDELINES:

Make sure your essay includes the following 4 sections. The questions below each section will guide you through that topic.

1) INTRODUCTION

On a map of India indicate where your selected entity (which could be the Gram Panchayat or the Municipality or Housing Society) is situated. Define waste and explain some of the basic concepts of waste and the general problems associated with it. Interview a few of the relevant staff members who manage waste in that selected body to understand the role of your local body in waste management.

Guiding Questions:

- i. What is waste?
- ii. Which local body is in charge of managing waste? How is it structured?
- iii. What are some of the general problems associated with waste?

2) PRESENT WASTE MANAGEMENT PRACTICES AND THE NEED FOR THE CHANGE IN YOUR LOCALITY

You should describe in detail some of the prevailing waste management practices and systems and why those need to be changed.

Write how the entire community treats waste – starting with the household/school level and then at the Gram Panchayat or Municipal level. Prove what needs to change and why the change is needed. You can interview some of the management level people in the housing societies, municipalities, etc. to understand the process better.

Guiding Questions:

- i. How is waste managed currently at the source?
- ii. How is it collected and managed by your selected entity (which could be the Gram Panchayat or the Municipality or Housing Society)?
- iii. What are the problems associated with the way waste is currently being managed? Any costs?
- iv. What prevents your selected entity (which could be the Gram Panchayat or the Municipality or Housing Society) from making changes in waste management?

3) THE WAY FORWARD

Specify an action plan and design at least 4 to 5 main initiatives that can be suggested to make the housing society or local body's waste management practices more sustainable. You can interview experts from the local body, housing society or from waste organisations to learn more about these practices. Reading case studies on the internet will further help you understand these initiatives better. Explain these initiatives properly.

Guiding Questions:

- i. How can your selected entity (which could be the Gram Panchayat or the Municipality or Housing Society) improve its collection and management of waste?
- ii. How can they ensure that the community participates in this mission?
- iii. How can you improve packaging related problems, especially reducing and tackling the use of plastic?
- iv. What will ensure that generators of the waste will follow the R's of waste?
- v. How can you handle waste for which there is no solution? For example, non-recyclable metalized plastics can be used for making roads, etc.
- vi. What are some of the eco-friendly products and practices that it can promote to move into a Circular Economy?
- vii. Who are some of the partners that can be involved in waste management?
- viii. Where can one learn about sustainable waste management practices?

4) CREATING A CAMPAIGN

The local body or housing society would need to publicise some of the initiatives that they are planning to undertake for improving their waste management practices. Think of ways that they can pass on the message of these initiatives to the community, housing societies and individuals. Write these down. Explore all kinds of possibilities to spread the message of sustainable waste management to your entire community. Design at least two sample waste posters that you can create for them that will help them in their campaign.

Guiding Questions:

- i. How can your selected entity (which could be the Gram Panchayat or the Municipality or Housing Society) spread the message about their improved waste management practices to the larger community?
- ii. What are the different platforms your selected entity can use to spread the message?
- iii. How can your selected entity document these practices?
- iv. How can they work closely with the *Swachh Bharat Abhiyan* and other such government initiatives?

REFLECTION:

Do not stop with the questions above. See if you can think of other aspects of waste that can be added to your essay. Find out how waste can be linked to other environmental sustainability issues like Climate Change, Water, Biodiversity, Afforestation and Energy. Explore if there are success stories of individuals in waste or in Zero Waste municipalities that you would like to include. Perhaps you would like to share a list of NGOs, Ragpicker organisations and Recycling companies that would work closely with the local bodies. The sky is the limit; you can add anything that will help your selected entity, achieve its mission in practising sustainable waste management.

At the end of your project, please tick the activities you've completed to ensure you haven't missed any. This will also help with the evaluation process.

This is compulsory

Sustainability & Waste – Completion Checklist

PART A

Compulsory Activities

- ☐ **Activity 1:** Waste Scavenger Hunt
- ☐ **Activity 2:** Categorising Waste: Is All Waste the Same?
- ☐ **Activity 3:** Where Does Waste Go And Why Is It A Problem?
- ☐ **Activity 4:** Segregating Waste and Composting**
- ☐ **Activity 5:** The 'R's' Of Waste for a Zero Waste School**

Elective Activities (Any TWO of the following)

- ☐ **Activity 1:** Then and Now
- ☐ **Activity 2:** The Packaging Problem
- ☐ **Activity 3:** Agriculture and Waste
- ☐ **Activity 4:** A Day in the Life of A Waste Worker

PART B

Compulsory Activities

- ☐ **Moving Communities Towards Sustainable Waste Management**

Thank you for participating in earthian.

Hope you enjoyed the experience.

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