

A Project Report on
"Analytical study on the Role of General Public in Mitigating the Harmful Effects of Plastic Disposal in Nagpur"

Submitted to
Department of Management Sciences & Research (DMSR)
G.S. College of Commerce and Economics, Nagpur
(An Autonomous Institution)

Affiliated to:
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

In partial fulfilment for the award of the degree of
Master of Business Administration

Submitted by
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Under the Guidance of
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NAAC Accredited "A" Grade Institution



Academic Year 2023-24

**Department of Management Sciences and Research,
G.S. College of Commerce & Economics, Nagpur
NAAC Accredited "A" Grade Institution**



Academic Year 2023-24

CERTIFICATE

This is to certify that **Ms. Charulata Vinayakrao Madankar** has submitted the project report titled, "**Analytical Study on the Role of General Public in Mitigating the Harmful Effects of Plastic Disposal in Nagpur**", under the guidance of **Dr. Madhuri V. Purohit** towards the partial fulfillment of **MASTER OF BUSINESS ADMINISTRATION** degree examination.

It is certified that he/she has ingeniously completed his/her project as prescribed by **DMSR, G. S. College of Commerce and Economics, Nagpur, (NAAC Accredited "A" Grade Autonomous Institution)** affiliated to **Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.**

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**Department of Management Sciences and Research,
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Academic Year 2023-24

DECLARATION

I, **Charulata Madankar** here-by declare that the project with title **"Analytical Study on the Role of General Public in Mitigating the Harmful Effects of Plastic Disposal in Nagpur"**, has been completed by me under the guidance of **Dr. Madhuri V. Purohit** in partial fulfillment of **MASTER OF BUSINESS ADMINISTRATION** degree examination as prescribed by **DMSR, G. S. College of Commerce and Economics, Nagpur, (NAAC Accredited "A" Grade Autonomous Institution)** affiliated to **Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**.

This project was undertaken as a part of academic curriculum and has not been submitted for any other examination and does not form the part of any other course undertaken by me.

Charulata Madankar

Place: Nagpur

Date:

**Department of Management Sciences and Research,
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Academic Year 2023-24

ACKNOWLEDGEMENT

With immense pride and sense of gratitude, I take this golden opportunity to express my sincere regards to **Dr. Praveen J. Mustoor**, Principal, G. S. College of Commerce & Economics, Nagpur.

I tender my sincere regards to the Coordinator, **Dr. Madhuri V. Purohit** for giving me guidance, suggestions and invaluable encouragement which helped me in the completion of the project.

I am extremely thankful to my Project Guide **Dr. Madhuri V. Purohit** for her guidance throughout the project.

I would like to thank **Dr. Archana Dadhe** for her constant support & guidance throughout the project.

Last but not the least, I am very much thankful to all those who helped me directly and indirectly in successful completion of my project.

Charulata Madankar

Place: Nagpur

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CHAPTER I

INTRODUCTION

Introduction of Plastic Pollution

This year's World Environmental Day focuses on the plastic pollution crisis. The reason is Humanity produces more than 430 million tons of plastic annually, two-thirds of which are short-lived products that soon become waste, filling the ocean and often working their way into the human food chain.

Unlike other materials, plastic does not biodegrade. It can take up to 1000 years to break down, so when it is discarded, it builds up in the environment until it reaches a crisis point.

This pollution chokes marine wildlife, damages soil and poisons groundwater, and can cause serious health impacts.

Plastic is everywhere. From soda bottles to cars, packaging to electronics, fishing gear to clothing and everywhere. It has been observed that disposal of plastic waste is a serious concern due to improper collection and segregation system.

Only 60% of the plastic produced is recycled, balance 9400 tons of plastic is left unattended in environment causing land, air and water pollution.

Hazardous waste and unsafe waste treatment such as open burning can directly harm waste workers or other people involved in waste burning and neighbouring communities.

Children are especially vulnerable to chemical exposure because of their higher intake of air, food.

Nagpur generated **45.69** tons of plastic waste per day.

Nagpur: Of the 60 major [plastic waste](#) generator cities, Nagpur stands at 16th in the country and third in the state, shows the data of Central Pollution Control Board ([CPCB](#)). Two cities of the state — Mumbai and Pune — are among the top 10 cities of the country in terms of plastic waste generation. The board recently directed the states and Union territories to step up actions

so that the country can meet its 2022 goal.

Around the world, one million plastic bottles are purchased every minute, while up to five trillion plastic bags are used worldwide every year. In total, half of all plastic produced is designed for single-use purposes – used just once and then thrown away.

Plastics including micro plastics are now ubiquitous in our natural environment. They are becoming part of the Earth's fossil record and a marker of the Anthropocene, our current geological era. They have even given their name to a new marine microbial habitat called the "plastisphere". Most plastic items never fully disappear; they just break down into smaller and smaller pieces. Those micro plastics can enter the human body through inhalation and absorption and accumulate in organs. Micro plastics have been found in our lungs, livers, spleens and kidneys; A study recently detected micro plastics in the placentas of new-born babies. The full extent of the impact of this on human health is still unknown. There is, however, substantial evidence that plastics-associated chemicals, such as methyl mercury, plasticizers and flame retardants, can enter the body and linked to health concerns.

Plastics are inexpensive and durable, making them very adaptable for different uses; as a result, manufacturers choose to use plastic over other materials. However, the chemical structure of most plastics renders them resistant to many natural processes of degradation and as a result they are slow to degrade.

Plastic pollution can afflict land, waterways and oceans. It is estimated that 1.1 to 8.8 million tons of plastic waste enters the ocean from coastal communities each year. It is estimated that there is a stock of 86 million tons of plastic marine debris in the worldwide ocean as of the end of 2013, with

an assumption that 1.4% of global plastics produced from 1950 to 2013 has entered the ocean and has accumulated there.

Some researchers suggest that by 2050 there could be more plastic than fish in the oceans by weight. Living organisms, particularly marine animals, can be harmed either by mechanical effects such as entanglement in plastic objects, problems related to ingestion of plastic waste, or through exposure to chemicals within plastics that interfere with their physiology. Degraded plastic waste can directly affect humans through direct consumption (i.e. in tap water), indirect consumption (by eating plants and animals), and disruption of various hormonal mechanisms.

As of 2020, the global mass of produced plastic exceeds the biomass of all land and marine animals combined.[19] A May 2019 amendment to the Basel Convention regulates the exportation/importation of plastic waste, largely intended to prevent the shipping of plastic waste from developed countries to developing countries.

The amount of plastic waste produced increased during the COVID-19 pandemic due to increased demand for protective equipment and packaging materials. Higher amounts of plastic ended up in the ocean, especially plastic from medical waste and masks.

Several studies have attempted to quantify plastic leakage into the environment at both national and global levels which have highlight the difficulty of determining the sources and amounts of all plastic leakage. **One** global study has estimated that between 60 and 99 million tons of mismanaged plastic waste were produced in 2015. Borrelle et al. 2020 has estimated that 19–23 million tons of plastic waste entered aquatic ecosystems in 2016.

Plastic waste can clog storm drains, and such clogging can increase flood damage, particularly in urban areas.[93] A buildup of plastic garbage at trash cans raises the water level upstream and may enhance the risk of urban flooding.

A 2017 study found that 83% of tap water samples taken around the world contained plastic pollutants. This was the first study to focus on global drinking water pollution with plastics, and showed that with a contamination rate of 94%



Alka Zadkaonkar innovated a pollution-free technology in 2003 that converts plastic to fuel using de-polymerization. With her husband, Dr Umesh, she discusses their technology, the challenges they faced along the way and how we can manage plastic waste better.

The woman behind this technology was Nagpur-based Alka Zadgaonkar, former professor and head of department of applied chemistry at Rasoni College of Engineering. While working in her lab, Alka discovered a technology to convert plastics into fuel without causing pollution. This could include plastic waste of any kind broken buckets, pet bottles, tetra paks, e- waste or plastic bags.

In 2018, when Maharashtra imposed a ban on the manufacture, usage, transport, distribution, wholesale and retail sale, storage and import of plastic, the move invited the appreciation of environmental activists, but alongside came the wrath of producers, retailers and shopkeepers who use plastics as packaging.

We've all come across plastic waste in some form or other. You can find it in our homes, in our streets, and in our oceans. Plastic pollution has become a global issue that needs to be addressed urgently.

We've all come across plastic waste in some form or other. You can find it in our homes, in our streets, and in our oceans. Plastic pollution has become a global issue that needs to be addressed urgently.

While there have been some inroads over the years in terms of attempting to reduce plastic usage and changing the way plastic is dealt with once it is discarded, plastic usage continues to increase in most countries. This means the plastic problem poses a significant threat to the environment, and yet more needs to be done.

This can lead to the contamination of both land and water with plastic debris. To make matters worse, plastic does not degrade easily and can stay in the environment for a long time. Depending on the plastic it can take between twenty and five hundred years for the plastic to decompose.

The plastic waste problem has been around for many years, but it is only recently that people have started recognizing it as a major environmental issue that needs to be addressed.

One of the main causes of plastic pollution is by the use of single use plastics. Common single use plastics include water bottles, straws, food containers, plastic bags and plastic packaging. As the name suggests this type of plastic is designed to be used once and then disposed of. This has the potential to cause a number of issues. While single-use plastics have made our lives convenient, this has come at a cost.

One of the big problems relates to the improper disposal of plastic. Much of the plastic waste comes from the single-use plastic types which are not always recycled. As a result, these plastics accumulate in the environment and ultimately cause plastic pollution.

However not all plastics are destined for incineration or recycling. Some do not even get that far and instead are dumped in the environment where over time they decompose.

Plastic is versatile, lightweight, flexible, moisture resistant, strong, and relatively inexpensive. Those are the attractive qualities that lead us, around the world, to such a voracious appetite and overconsumption of plastic goods. However, durable and very slow to degrade, plastic materials that are used in the production of so many products, ultimately, become waste. Our tremendous attraction to plastic, coupled with an undeniable behavioral propensity of increasingly over-consuming, discarding, littering and thus polluting, has become a combination of lethal nature.

The disposal of plastics is one of the least recognized and most highly problematic areas of plastic's ecological impact. Ironically, one of plastic's most desirable traits: its durability and resistance to decomposition, is also the source of one of its greatest liabilities when it comes to the disposal of plastics. Natural organisms have a very difficult time breaking down the synthetic chemical bonds in plastic, creating the tremendous problem of the material's persistence.

Plastic is a material made to last forever, and due to the same chemical composition, plastic cannot biodegrade; it breaks down into smaller and smaller pieces. When buried in a landfill, plastic lies untreated for years.

CHAPTER II GOVERNMENT SCHEMES

Government notifies the Plastic Waste Management Amendment Rules, **2021**, prohibiting identified single use plastic items by 2022. Thickness of plastic carry bags increased from 50 to 75 microns from 30th September, 2021 and to 120 microns with effect from **the 31st December, 2022**.¹³ Aug 2021.

To provide for a framework to enable the country to achieve its goal of eliminating single use plastic by the year 2022 and for matters connected therewith or incidental thereto. 1. (1) This Act may be called the Single-use Plastic (Regulation) Act, 2022. (2) It extends to the whole of India.

Plastic is highly non-biodegradable causing permanent damage to the environment by disrupting ecosystems. Single-use plastic can block waterways and exacerbate natural disasters. By clogging sewers and providing breeding grounds for mosquitoes and pests, plastic bags can increase the transmission of vector borne diseases like Malaria. Troubles with single use plastic came to the fore during floods in various parts of the country on the source of pollution as addition to landfills is adversely impacting the already frail ecological balance. Heaps of plastic wastes were washed ashore highlighting the lack of awareness and infrastructure to effectively deal with the product.

The Plastic Waste Management Rules, **2016**, mandate the generators of plastic waste to take steps to minimize generation of plastic waste, not to litter the plastic waste, ensure segregated storage of waste at source & hand over segregated waste in accordance with rules.

GOVERNMENT ACTION ON SINGLE USE PLASTIC

India has brought rules on 12th August 2021 for phasing out of identified single-use plastic items, which have low utility and high littering potential by the 1st July 2022, through the elimination of light weight plastic bags, buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice- ...14 Jul 2023.

This presents the commitment to eliminate single use plastic products pollution, including ban on single use plastic products which have low utility and high littering potential by France and India.

Single-use plastic products are defined by the UN Environment Programmed (UNEP) as "an umbrella term for different types of products that are typically used once before being thrown away or recycled" [2], which include food packaging, bottles, straws, containers, cups, cutlery and shopping bags. Single-use plastic products, with low utility and high littering potential should be phased out and replaced by reusable products based on a circular economy approach. Solutions exist and have been clearly identified [4] and tackling this issue can bring new opportunities for innovation, competitiveness and job creation.

India had mandated Extended Producer Responsibility on producers, importers and brand owners for plastic packaging waste in 2016.

9 REASONS TO REFUSE SINGLE-USE PLASTIC



1 Made from fossil fuels



2 Huge carbon footprint



3 Will still be here in hundreds of years



4 Only a tiny percentage is recycled



5 Leaches toxins into food & drink



6 Causes hormone disruption & cancers



7 Pollutes our oceans



8 Kills marine animals and birds



9 Enters our food chain

**LESS
PLASTIC.**

WWW.LESSPLASTIC.CO.UK

Single-use plastic is everywhere. In a matter of mere decades, it has seeped into every corner of our lives.

Think of the immense quantities of plastic that are required to feed that addiction over the years, whether it's in your household, your town, your country, or globally... it's truly mind boggling!

In line with the clarion call given by **Prime Minister Shri Narendra Modi** to phase out single use plastic by 2022, keeping in view the adverse impacts of littered plastic on both terrestrial and aquatic ecosystems, the Ministry of Environment, Forest and Climate Change, Government of India, has notified the Plastic Waste Management Amendment Rules, 2021, which prohibits identified single use plastic items which have low utility and high littering potential by 2022.

The manufacture, import, stocking, distribution, sale and use of following single-use plastic, including polystyrene and expanded polystyrene, commodities shall be prohibited with effect from the **1st July, 2022: -**

In order to stop littering due to light weight plastic carry bags, with effect from **30th September, 2021**, the thickness of plastic carry bags has been increased from fifty microns to seventy five microns and to one hundred and twenty microns with effect from the 31st December, 2022. This will also allow reuse of plastic carry due to increase in thickness.

The Government has also been taking measures for awareness generation towards elimination of single use plastics and effective implementation of **Plastic Waste Management Rules, 2016**. A two-month long Awareness Campaign of Single Use Plastic 2021 has been organized. The Ministry has also organized pan India essay writing competition on the theme for spreading awareness amongst school students in the country.

India Plastic Challenge – Hackathon 2021, has been organized for students of Higher Educational Institutions and start-ups recognized under Start-up India Initiative.

As we have already touched on, governments have needed to address the plastic problem through increased legislation and dictates on what materials can be used for certain product types, typically revolving around single-use items.

Nobody like bans but often change does not occur without intervention from the state. These laws and regulations have been introduced to help reduce the amount of plastic waste that is being created. This includes banning single-use plastics, such as straws and bags, and implementing taxes and fines on plastic products.

Many countries have already started to do this – but there is no global mandate for this. Any initiative that currently implemented is on a country-by-country basis and therefore the effectiveness of these legislations tends to be limited. When legislations and laws can be an effective way to reduce plastic pollution, these rules need to be in place in the first place, and not every country is committed to the same degree.

In addition to the plastic waste problem, there is also the problem of micro plastics. Micro plastics are tiny pieces of plastic, which are smaller than 5mm in size. These micro plastics come from the breakdown of larger plastic materials, such as bottles and bags, and can accumulate in the environment. Recently, micro plastic particles have even been found in human blood. The long-term effects of this are still to be understood fully.

Solutions to the Plastic Waste Problem

The plastic waste problem is a global issue and requires global action. There are various ways the issues surround plastic waste can be tackled.

- developing sustainable alternatives
- reducing plastic usage.

Role of General Public to Reduce Plastic use in Nagpur city

Reducing plastic use in Nagpur, or any city, requires collective effort, and the general public plays a crucial role in this endeavor. Here are several ways the general public can contribute to reducing plastic use in Nagpur:

1. **Awareness and Education:** The public can educate themselves and others about the harmful effects of plastic on the environment and human health. This can be done through workshops, seminars, social media campaigns, and educational programs.
2. **Reduce, Reuse, and Recycle:** Encourage the habit of reducing plastic consumption by opting for alternatives such as reusable bags, bottles, and containers. Reusing plastic items whenever possible and properly recycling them can also significantly reduce plastic waste.
3. **Support Plastic-Free Initiatives:** Support local businesses and initiatives that promote plastic-free alternatives. Patronizing shops that offer sustainable options.
4. **Encourage Plastic-Free Events:** When organizing or attending events, encourage organizers to opt for plastic-free alternatives for packaging, utensils, and decorations.

Harmful Effects of Plastic Disposal

The disposal of plastic poses numerous harmful effects on the environment, wildlife, and human health:

1. **Pollution:** Plastic waste contaminates the environment, including land, water bodies, and air. Improper disposal leads to littering in natural habitats, urban areas, and oceans, contributing to pollution worldwide.
2. **Marine Pollution:** Plastic debris in the oceans harms marine life through ingestion, entanglement, and habitat destruction. Marine animals often mistake plastic items for food, leading to digestive issues, starvation, and death.
3. **Micro plastics:** Plastic debris breaks down into smaller fragments called micro plastics, which can persist in the environment for hundreds of years. Micro plastics are ingested by marine organisms and enter the food chain, posing risks to both aquatic and terrestrial ecosystems.
4. **Chemical Leaching:** Some plastics contain toxic chemicals such as biphenyl A (BPA) and phthalates, which can leach into the environment and contaminate soil, water, and air. These chemicals have been linked to various adverse health effects, including hormonal disruptions, reproductive issues, and developmental abnormalities in humans and wildlife.
5. **Greenhouse Gas Emissions:** The production, transportation, and disposal of plastic contribute to greenhouse gas emissions, exacerbating climate change. Plastic manufacturing processes, particularly those involving fossil fuels, release carbon dioxide and other pollutants into the atmosphere.

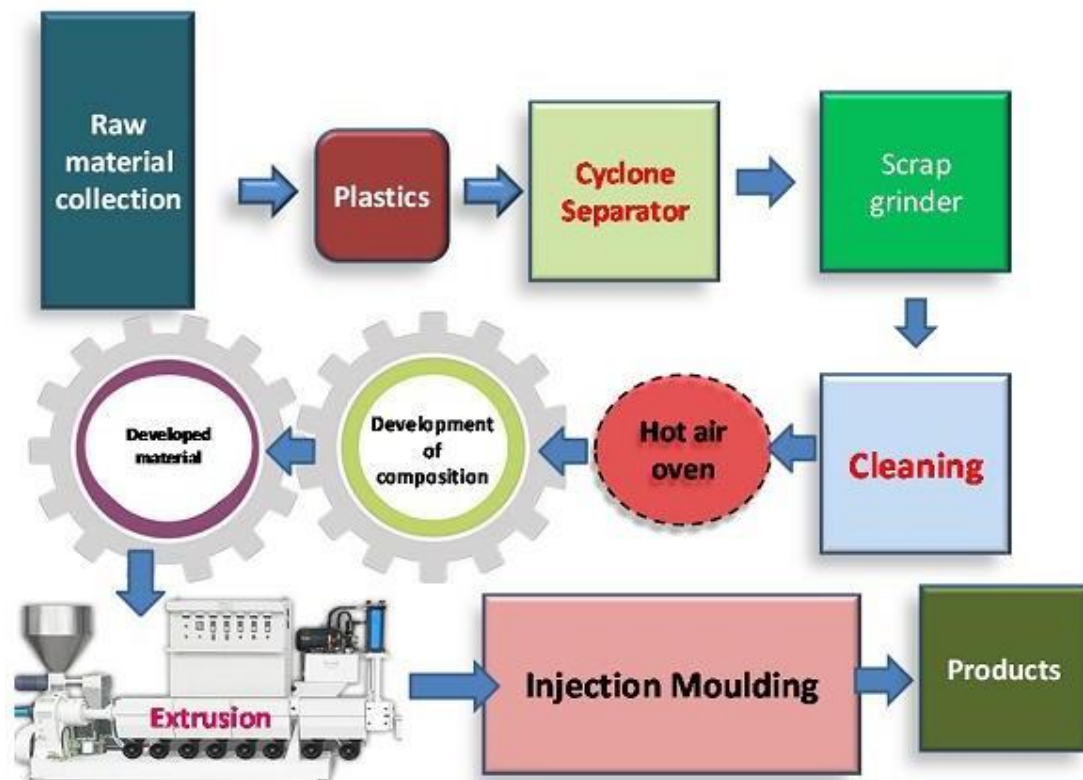
Impact On Health Of Plastic Disposal

- ❖ **Chemical Exposure:** When plastics are disposed of in landfills or incinerated, they can release harmful chemicals into the air, soil, and water.
- ❖ **Food Contamination:** Plastics that break down into smaller particles, known as micro plastics, can contaminate food and water supplies. Micro plastics have been found in seafood, drinking water, and salt, raising concerns about their potential health effects on humans.
- ❖ **Respiratory Issues:** Burning plastic waste, either intentionally or unintentionally, releases toxic fumes and particulate matter into the air. Inhalation of these pollutants can exacerbate respiratory conditions such as asthma, bronchitis, and other pulmonary diseases.
- ❖ **Hormonal Disruption:** Certain chemicals found in plastics, such as BPA and phthalates, are known as endocrine disruptors. These chemicals can interfere with the body's hormonal system, potentially leading to reproductive disorders, developmental abnormalities, and other adverse health effects.
- ❖ **Microbial Growth:** Plastic debris in the environment can provide a conducive environment for the growth of pathogenic microorganisms. Bacteria, viruses, and other pathogens may colonize plastic surfaces, increasing the risk of infection and disease transmission to humans and animals.

Overall, while the direct impact of plastic disposal on human health may not be immediately apparent, the accumulation of plastic pollution in the environment poses long-term risks to public health through chemical exposure, food contamination, respiratory issues, hormonal disruption, and microbial contamination.

Applications of plastic waste disposal:

1. Used in construction of Road.
2. Used in construction of plastic bricks and tiles.
3. Used to prepare aggregates
4. Used in food packaging.
5. Separation of petrol & crude oils from plastic.
6. Hydrocarbons recovered from plastic waste can be red in an internal combustion engine to produce electricity.
7. Produce an agricultural pipe.
8. Used in Soil stabilization.
9. Used in the railway sleepers for strengthening.



Central Institute of Plastics Engineering & Technology (CIPET): [A1] School for Advanced Research in Polymeric materials (SARP), Bhubaneswar developed an eco-friendly viable technology for streamlining of segregation methodology, categorization of plastics waste and value addition of plastics for commercial exploitation.

CHAPTER III
LITERATURE REVIEW



Most of the times, the Municipal Solid Waste containing about 12% of plastics is burnt, releasing toxic gases like Dioxins, Furans, Mercury and Polychlorinated Biphenyls into the atmosphere. Further, burning of Poly Vinyl Chloride liberates hazardous halogens and pollutes air, the impact of which is climate change.

The review of literature in a research report is a summary of current knowledge about a particular problem and includes what is known and not known about the problem. The purpose of the review was to obtain information about the use of plastic, its hazards and safe disposal. The relevant literature reviewed has been organized.

1. “Plastic Waste: Challenges and Opportunities to Mitigate Pollution and Effective Management”

Authors name: Md. Golam Kibria, Nahid

Imtiaz Masuk,

Rafat Safayet,

Huy Quoc Nguyen &

Monjur Mourshed **Year:** 20

January 2023

Conclusion: The present world is now facing the challenge of proper management and resource recovery of the enormous amount of plastic waste. Lack of technical skills for managing hazardous waste, insufficient infrastructure development for recycling and recovery, and above all, lack of awareness of the rules and regulations are the key factors behind this massive pile of plastic waste. The severity of plastic pollution exerts an adverse effect on the environment and total ecosystem. In this study, a comprehensive analysis of plastic waste generation, as well as its effect on the human being and ecological system, is discussed in terms of source identification with respect to developed and developing countries.

2. “Solutions and Integrated Strategies for the Control and Mitigation of Plastic and Micro plastic Pollution”

Author name: Tony R. Walker, Armando C. Duarte, Teresa Rocha-Santos, Joana C. Prata

Year: 7 July 2019

Conclusion:

Misuse and mismanagement of durable plastics has led to large accumulations of this material in the environment (plastic pollution), posing a risk to organisms, ecosystems, and human health. This study discusses current knowledge on improvements to production, consumption, and

disposal of plastic, providing stakeholders with 10 recommendations to reduce the loss of plastic to the environment during production, consumption, and disposal. The life-cycle of plastics must be improved through an integrated waste management system, reducing their environmental impacts and following the hierarchy of waste management using the four R's: reduce, reuse, recycle, and recover. Thus, (micro)plastic production and consumption must decline by improving design or using alternatives materials (reduce) and creating durable products (reuse).

3. “Public views on plastic pollution: Knowledge, perceived impacts, and pro-environmental behaviors”

Author name: Joana Soaras, Isabel Miguel

Year: 11 August 2020

Conclusion: Nowadays, plastic pollution is considered an issue of global concern. This environmental problem results from human industrial and domestic activities, associated with poor management, from manufacturing processes to products end life. In this perspective, human consumption and management of daily used plastic materials can play a determinant role to control this environmental issue. Thus, understanding public perceptions about plastic pollution may be a valuable resource to engage society in solutions to reduce its environmental release.

4. “Tackling the plastic problem: A review on perceptions, behaviour and interventions”

Author

name: Isabella Bablok ^{a 1}, Stefan Drew's ^{c d}, Claudia Menzel 8 January

Year: 2019

Conclusion: The excessive production and consumption of plastic has serious consequences on the environment and human health. The reduction of plastic has therefore become a major global challenge. As technical solutions might be insufficient to curb the problem, a perspective highlighting the impact of human behaviour is needed.

The current literature review provides an overview of the existing social-scientific literature on plastic, ranging from risk awareness, consumers' preferences, and predictors of usage behaviour to political and psychological intervention strategies. By reviewing the literature, we aim to identify potential factors for future interventions to reduce plastic consumption. The 187 studies reviewed show that people much appreciate and routinely use plastic, despite a pronounced awareness of the associated problems.

5. “Impacts of Plastic Pollution on Ecosystem Services, Sustainable Development Goals, and Need to Focus on Circular Economy and Policy Interventions”

Author name: Rakesh Kumar, Anurag Varma, Arkajyoti Shome, Rama Sinha

Year: 11 July 2021

Conclusion: Plastic pollution is ubiquitous in terrestrial and aquatic ecosystems. Plastic waste exposed to the environment creates problems and

is of significant concern for all life forms. Plastic production and accumulation in the natural environment are occurring at an unprecedented rate due to indiscriminate use, inadequate recycling, and deposits in landfills. In 2019, the global production of plastic was at 370 million tons, with only 9% of it being recycled, 12% being incinerated, and the remaining left in the environment or landfills. The leakage of plastic wastes into terrestrial and aquatic ecosystems is occurring at an unprecedented rate. The management of plastic waste is a challenging problem for researchers, policymakers, citizens, and other stakeholders.

6. “Mitigation measures to avert the impacts of plastics and micro plastics in the marine environment”

Author name: Alkalay R, Pasternak G, Zask A and Amir R, Allen R, Jarvis D, Sayer S, Mills C (2012)

Year: 22 February 2018

Conclusion: The increasing demand for and reliance on plastics as an everyday item, and rapid rise in their production and subsequent indiscriminate disposal, rise in human population and industrial growth, have made the material an important environmental concern and focus of interest of many research. Historically, plastic production has increased tremendously to over 250 million tonnes by 2009 with an annual increased rate of 9%. In 2015, the global consumption of plastic materials was reported to be > 300 million tonnes and is expected to surge exponentially. Because plastic polymers are ubiquitous, highly resistant to degradation, the influx of these persistent, complex materials is a risk to human and environmental health.

7. “Forecasting plastic waste generation and interventions for environmental hazard mitigation”

Author name: Yee Van Fan, Peng Jiang, Raymond R. Tan, Kathleen B. Aviso, Fengqi.

Year: 27 June 2021

Conclusion: Plastic waste and its environmental hazards have been attracting public attention as a global sustainability issue. This study builds a neural network model to forecast plastic waste generation of the EU-27 in 2030 and evaluates how the interventions could mitigate

the adverse impact of plastic waste on the environment. The black- box model is interpreted using SHapley Additive explanations (SHAP) for managerial insights. The dependence on predictors (i.e., energy consumption, circular material use rate, economic complexity index, population, and real gross domestic product) and their interactions are discussed. The projected plastic waste generation of the EU-27 is estimated to reach 17 Mt/y in 2030. With an EU targeted recycling rate (55%) in 2030, the environmental impacts would still be higher than in 2018, especially global warming potential and plastic marine pollution.

8. “Occurrence, sources, human health impacts and mitigation of micro plastic pollution”

Author name: Samaneh Karbalaei, Parichehr Hanachi, Tony R. Walker & Matthew

Year: 31 October 2018

Conclusion: The presence and accumulation of plastic and microplastic (MP) debris in the natural environment is of increasing concern and has become the focus of attention for many researchers. Plastic debris is a prolific, long-lived pollutant that is highly resistant to environmental degradation, readily adheres hydrophobic persistent organic pollutants and is linked to morbidity and mortality in numerous aquatic organisms. The prevalence of MPs within the natural environment is a symptom of continuous and rapid growth in synthetic plastic production and mismanagement of plastic waste.

9. “Current plastics pollution threats due to COVID-19 and its possible mitigation techniques: a waste-to-energy conversion via Pyrolysis”

Author name: Tadele Assefa Aragaw, Bassazin Ayalew Mekonnen

Year: 20 January 2021

Conclusion: It can be concluded that the medical plastics can be recycled into oil due to their thermoplastics nature having high oil content and the waste to energy conversion can potentially reduce the volume of PPE plastic wastes. The extensive use and production of PPE, and disposal in the COVID-19 pandemic increases the plastic wastes arise environmental threats. Roughly, 129 billion face masks and 65 billion plastic gloves every month are used and disposed of on the globe. The study aims to identify the polymer type of face masks and gloves and sustainable plastic waste management options.

**CHAPTER IV
RESEARCH
METHODOLOGY**

PROBLEM STATEMENT

“Analytical Study on the Role of General Public to Mitigating the Use of Plastic Disposal”

NEED OF THE STUDY

- ✓ Studying the level of awareness among the public regarding plastic pollution, its impacts, and potential solutions.
- ✓ Understanding the factors influencing individual behaviour related to plastic consumption, disposal, and recycling.
- ✓ Evaluating existing policies, infrastructure, and recycling systems to identify gaps and opportunities for improvement.
- ✓ Developing effective communication strategies and educational campaigns to promote responsible plastic use.

OBJECTIVES OF THE STUDY

- ✓ To examine existing policies and regulations related to plastic waste management, recycling initiatives, and sustainable packaging.
- ✓ To explore and promote sustainable alternatives to single- use plastics, such as reusable products.
- ✓ To measure potential impact and feasibility of plastic disposal.

HYPOTHESIS

H (0) - Null Hypothesis:

- [General Public is not playing a major role in mitigating the Harmful Effects of Plastic Disposal.

H (1) - Alternative Hypothesis

- [General Public is playing a major role in mitigating the Harmful Effects of Plastic Disposal.

LIMITATIONS OF THE STUDY

- Respondents may fill false information in the form.
- Respondents tend to avoid filling the feedback form.
- The study is focused on the people from Nagpur.
- The findings of the study maybe specific to the organizational culture, policies and practices within specific area.

RESEARCH METHODOLOGY

A research methodology describes the techniques and procedures used to identify and analyze information regarding a specific research topic. It is a process by which researchers design their study so that they can achieve their objectives using the selected research instruments. It includes all the important aspects of research, including research design, data collection methods, data analysis methods, and the overall framework within which the research is conducted. While these points can help you understand what research methodology is, you also need to know why it is important to pick the right methodology.

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PRIMARY DATA -

DATA COLLECTION –

Primary data refers to original data collected first-hand by the researcher for a specific research purpose. This data is gathered through methods such as surveys, interviews, observations, experiments, and focus groups.

Primary data is tailored to the specific research questions and objectives, allowing researchers to obtain information directly relevant to their study.

Primary data collection can be time-consuming and costly, but it provides unique and specific insights that are not available from other sources

For my research project Questionnaire for in - depth discussion with various respondents to be interviewed through face to face contact with respondents as well as through google form during primary survey.

SAMPLING METHOD —

In - Depth interview for this study was limited in my area, the interview was those people who are want to support for reduce plastic pollution. The sample size was 100 for this study. The random sampling size method was used for selecting samples.

Research Approach

In this study the researcher has used interviews, questionnaire and research papers as a mode of collecting data.

Method of Data Collection

The data will be collected in various forms such as questionnaire, interviews. The data collected through these methods can then be analysed and used to support or refute research hypotheses and draw conclusions about the study's subject matter.

- Interviews
- Questionnaire
- Research papers

Types of Questionnaires

Most of the questions in the questionnaire are closed ended questions except one opened ended question i.e. email address filing.

Measure Scale

The measurement scale used in this research is Ordinal Scale. Under ordinal scale Likert scale types questions are asked to the people.

Universe

The population or universe represents the entire group of units which is the focus of the study. In this research the universe is the people who suffer from pollution in Nagpur.

Sample Size

The minimum sample size taken for this research is 100.

Sampling techniques

Random sampling size method is used. Random sampling is a method of choosing a sample of observations from a population to make assumptions about the population.

Data Analysis Tools

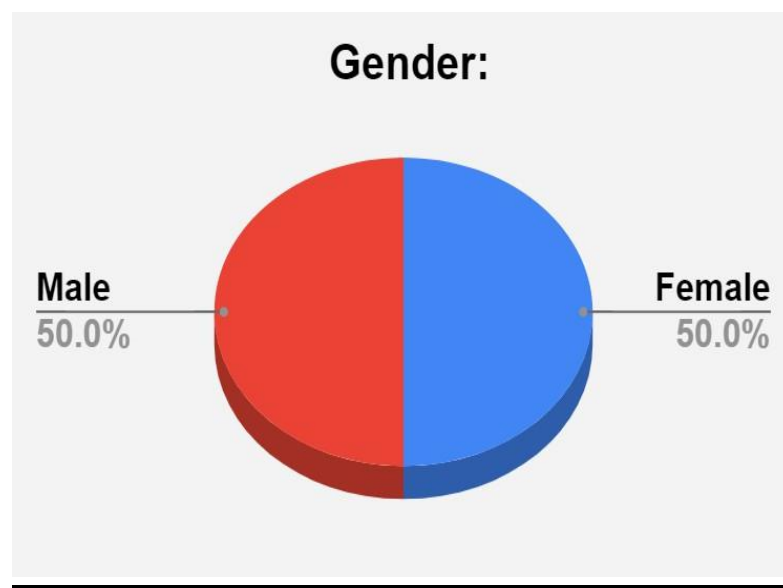
The tools used for this research analysis are tables and pie charts. Pie charts will be used to show the percentage of the responses for each question.

CHAPTER V
DATA ANALYSIS &
INTERPRETATION

Q 1. Gender

- Male
- Female
- Prefer not to say

Options	Respondent	Percentage
Male	40	50%
female	40	50%
Prefer not to say	-	
Total	80	100%

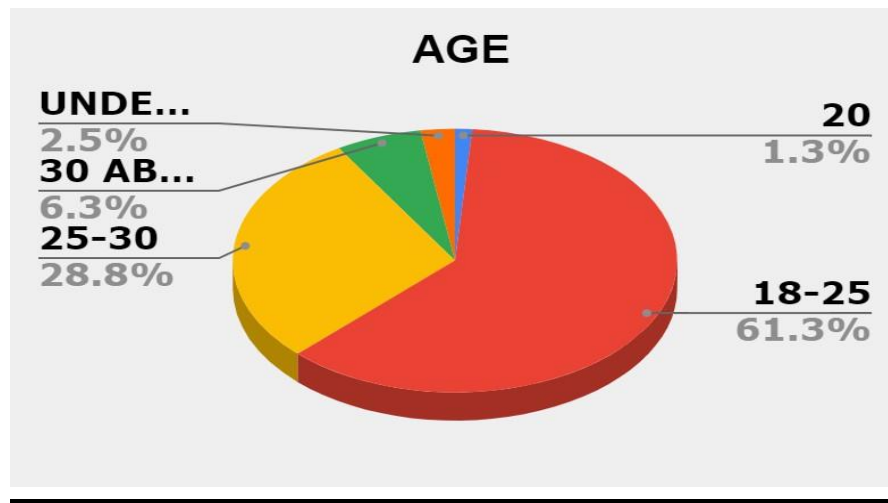


Interpretation: As shown out of 80 respondents, 50% are male and 50% are female respondents.

Q.2 Age

- Under 18
- 18-25
- 25-30
- 30 Above

Options	Respondent	Percentage
Under 18	3	4%
18-25	49	61%
25-30	23	28.75%
30 Above	5	6.25%
Total	80	100%

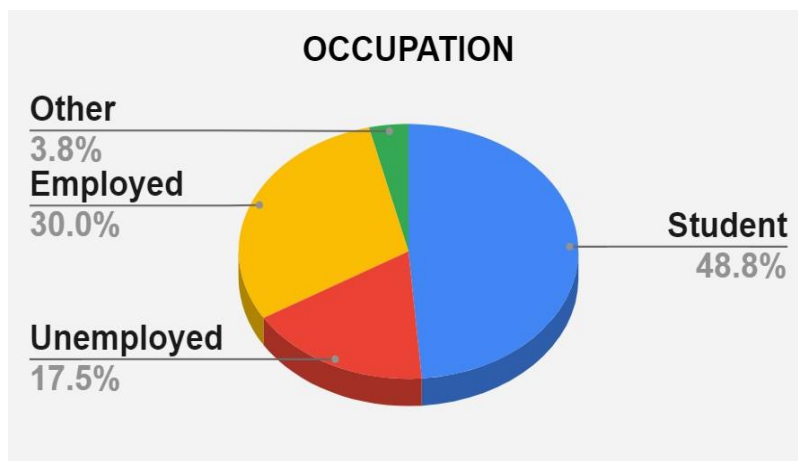


Interpretation: As shown out of 80 respondents 61% respondents fall under 18- 25 age group, 4% from age group under 18.

Q.3 Occupation

- Student
- Employed
- Unemployed
- Other

Options	Respondent	Percentage
Student	39	49%
Employed	24	30%
Unemployed	14	17.50%
Other	3	3.75%
Total	80	100%

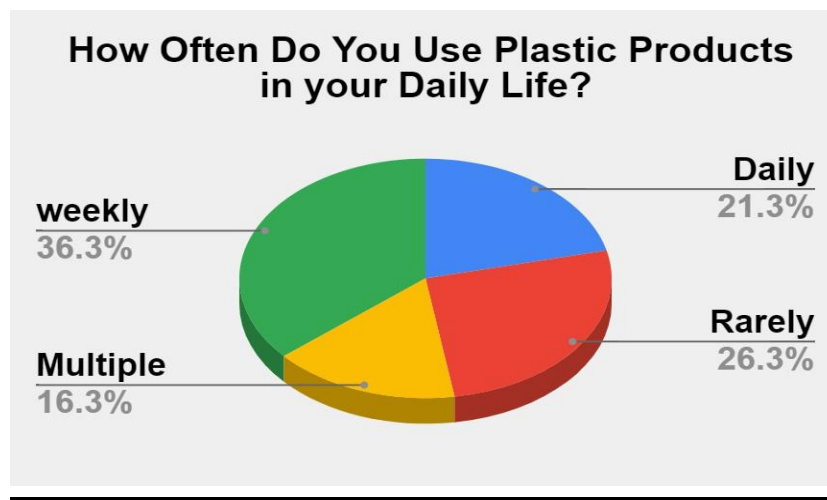


Interpretation: As shown out of 80 respondents 49% respondents are students from the data and 30% respondents are employed.

Q 4. How often do you use Plastic Products in your Daily Life?

- Multiple times a day
- Daily
- A few times a week
- Rarely

Options	Respondent	Percentage
Multiple times a Day	13	16%
Daily	17	21%
A Few times a Week	29	36.25%
Rarely	21	26.25%
Total	80	100%

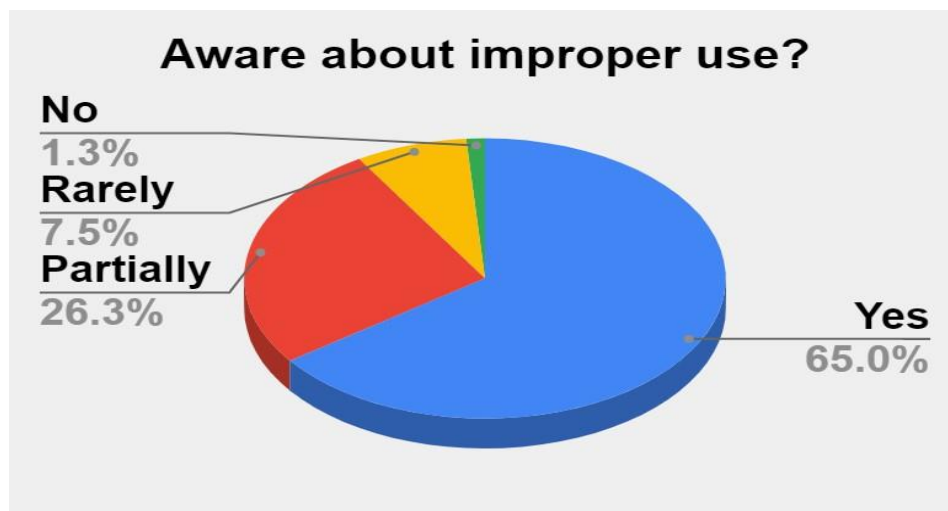


Interpretation: As shown out of 80 respondents 21% respondents used daily plastic and 61% used multiple times a day.

Q 5. Are you aware of the Harmful Effects of Improper Plastic Disposal on the Environment?

- Yes
- No
- Partially
- Rarely

Options	Respondent	Percentage
Yes	52	65%
No	1	1%
Partially	21	26.25%
Rarely	6	7.50%
Total	80	100%

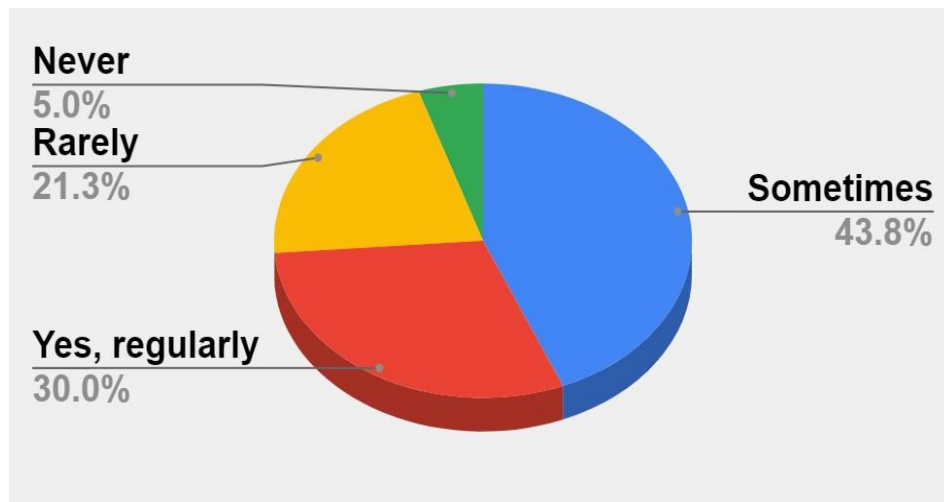


Interpretation: As shown out of 80 respondents 65% respondents aware about the effects of improper plastic disposal on the environment and 1% don't aware about it.

Q 6. Do you actively engage in Activities to reduce your Plastic usage?

- Yes, regularly
- Sometimes
- Rarely
- Never

Options	Respondent	Percentage
Yes, regularly	24	30%
Sometimes	35	44%
Rarely	17	21.25%
Never	4	5.00%
Total	80	100%

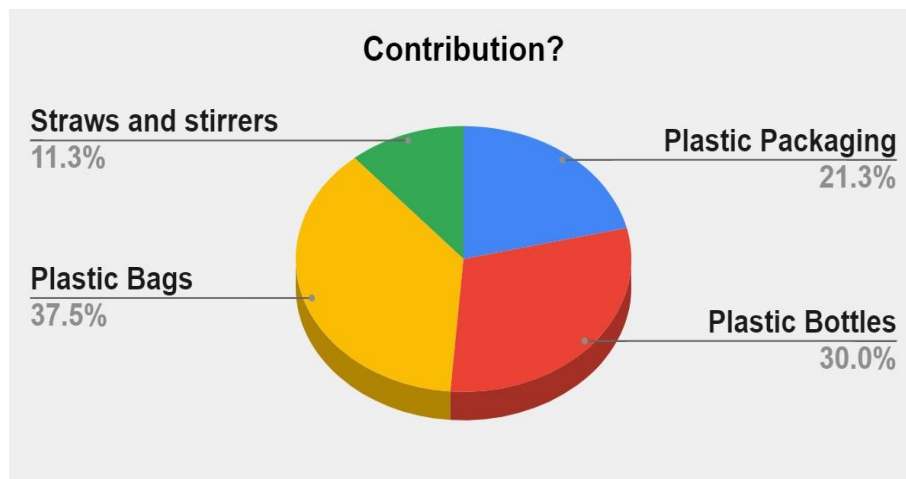


Interpretation: As shown out of 80 respondents 44% respondents sometimes engaged in activities to reduce plastic usage and 30% regularly active.

Q 7. Which of the following do you think contributes most to plastic pollution?

- Single- use plastic bottles
- Plastic Bags
- Plastic Packaging
- Straws and Stirrers

Options	Respondent	Percentage
Plastic Bottles	24	30%
Plastic Bags	30	38%
Plastic Packaging	17	21.25%
Straws and Stirrers	9	11.25%
Total	80	100%

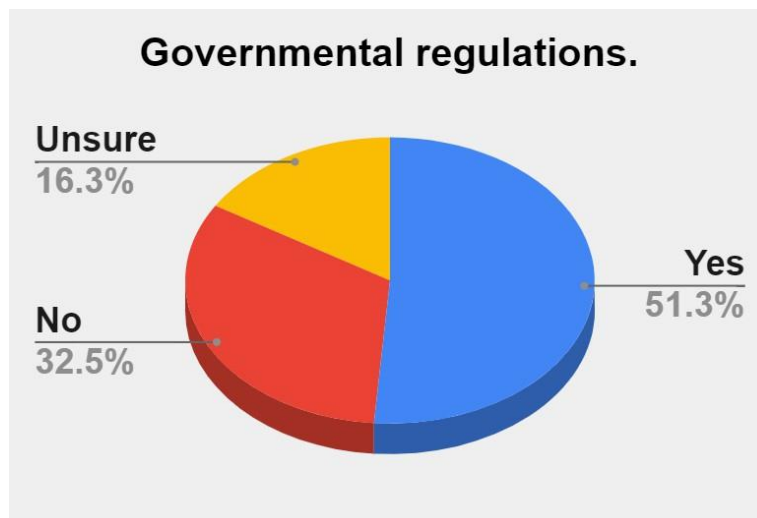


Interpretation: As shown out of 80 respondents 38% respondents use plastic bags and 30% respondents are plastic bottles.

Q 8. Do you think governmental regulations are effective in controlling plastic pollution?

- Yes
- No
- Ensure

Options	Respondent	Percentage
Yes	41	51%
No	26	33%
Unsure	13	16.25%
Total	80	100%

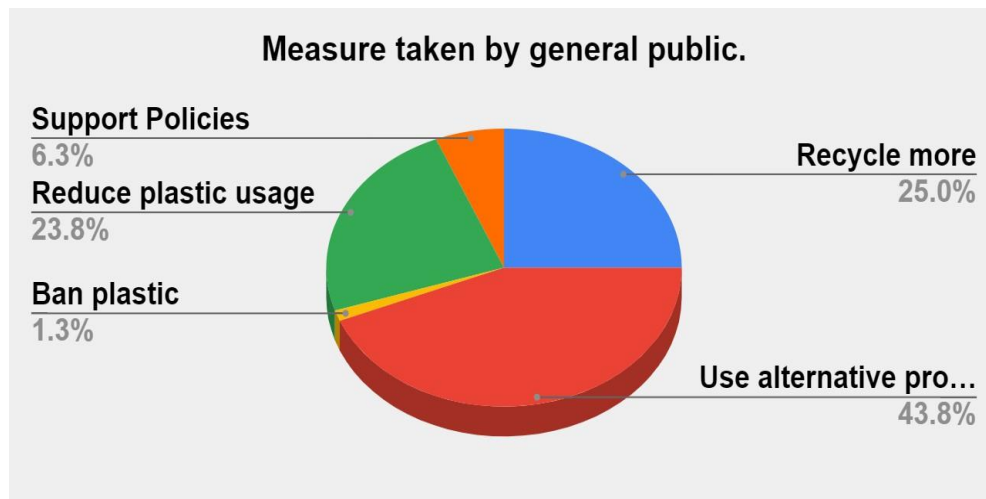


Interpretation: As shown out of 80 respondents 51% of respondents think that governmental regulation are effective in controlling plastic pollution and 33% doesn't agree.

Q 9. What measures do you think can be taken by the general public to mitigate the harmful effects of plastic disposal?

- Reduce plastic usage
- Recycle more
- Use alternate eco- friendly products
- Support policies to ban single- use plastic
- Ban plastic

Options	Respondent	Percentage
Reduce Plastic Usage	19	24%
Recycle more	20	25%
Use alternative products	35	43.75%
Support policies to ban plastic	5	6%
Take initiative for eco- friendly products	1	1%
Total	80	100%

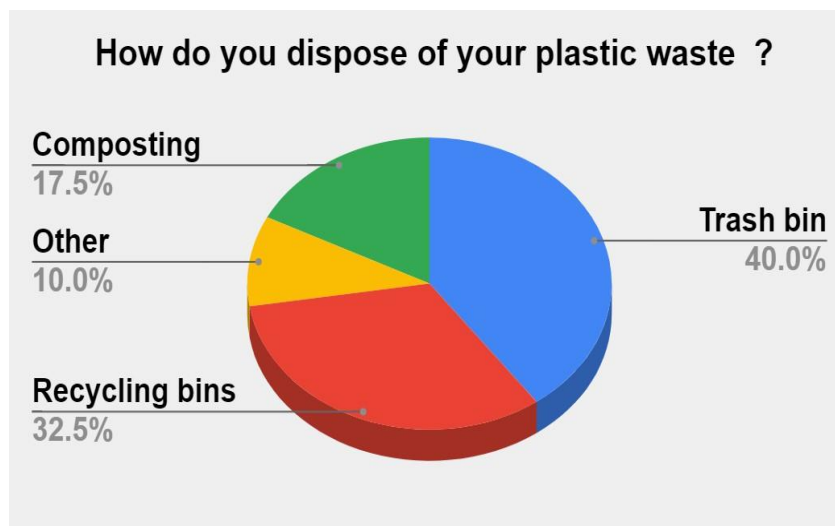


Interpretation: As shown out of 80 respondents 25% of respondents takes measures to recycle more plastic and 24% are involved in reducing plastic use.

Q 10. How do you dispose of your plastic waste?

- Recycling bin
- Trash bin
- Composting
- Other

Options	Respondent	Percentage
Recycling bins	26	33%
Trash bin	32	40%
Composting	14	17.50%
Other	8	10.00%
Total	80	100%

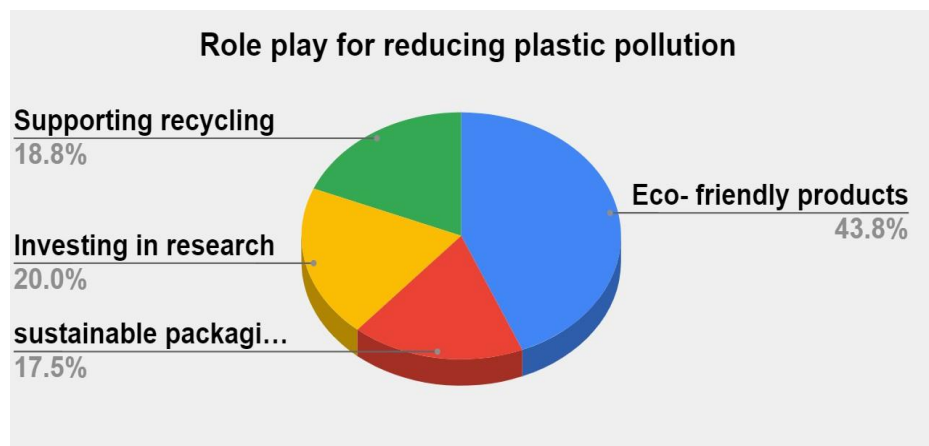


Interpretation: As shown out of 80 respondents 40% of respondents use trash bin to dispose plastic waste and 33% use recycle bin.

Q 11. What role do you think businesses and industries should play in reducing plastic pollution?

- Implementing sustainable packaging practices
- Offering more eco- friendly products
- Investing in research for biodegradable plastics
- Supporting recycling initiatives

Options	Respondent	Percentage
Sustainable	14	18%
Eco-friendly product	35	44%
Investing in research	16	20.00%
Recycling	15	18.75%
Total	80	100%

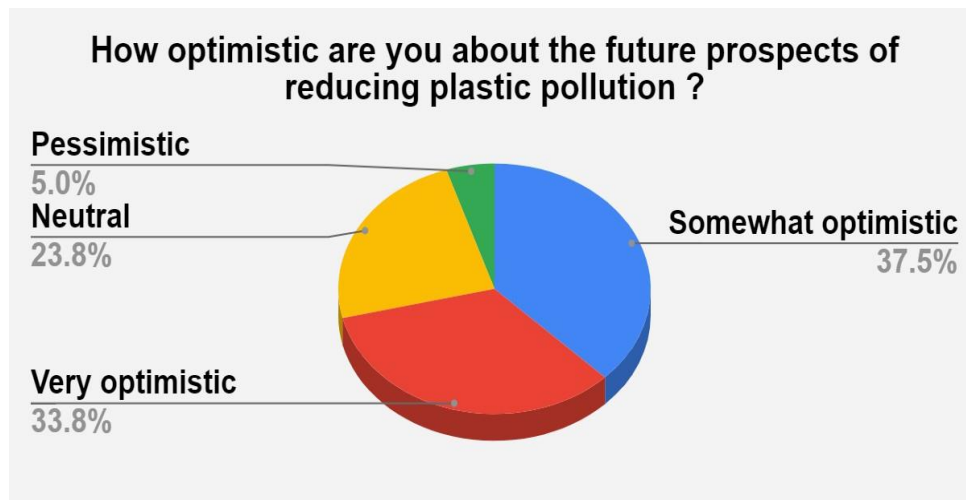


Interpretation: As shown, out of 80 respondents 44% respondents use eco- friendly product and 18% use sustainable product in nature.

Q 12. How optimistic are you about the future prospects of reducing plastic pollution?

- Very optimistic
- Somewhat optimistic
- Neutral
- Pessimistic

Options	Respondent	Percentage
Very optimistic	27	34%
Somewhat optimistic	30	38%
Neutral	19	23.75%
Pessimistic	4	5.00%
Total	80	100%



Interpretation: As shown, out of 80 respondents 38% of respondents somewhat optimistic of reducing plastic pollution and 34% very optimistic.

CHAPTER VI

FINDINGS

- It is found that most of the people are aware about plastic pollution and are taking preventive measures for reducing plastic use.
- It is found that the waste management of plastic can be done from recycling method.
- Most of the respondents are optimistic towards reducing plastic pollution.
- As per respondents' data more than 50% respondents think governmental regulations are effective.
- The data shows that 40% of respondents use trash bin to dispose plastic waste.
- 25% of respondents taken measures to recycle more plastic and 24% are involved in reduce plastic use.

CHAPTER VII

CONCLUSION

In conclusion, the study underscores the critical role of the general public in mitigating the use and disposal of plastic. Through heightened awareness, education, and active participation in recycling programs and sustainable consumption practices, individuals can significantly reduce plastic waste. Additionally, advocating for policy changes and supporting businesses committed to eco-friendly initiatives are vital steps in fostering a collective effort toward a more sustainable future. Ultimately, by empowering and mobilizing the general public, we can effectively address the challenges posed by plastic pollution and work towards a cleaner, healthier environment for generations to come.

Null Hypothesis (H0) i.e., General public is not playing a major role in mitigating the harmful effects of plastic disposal.

Alternative Hypothesis (H1) i.e., General public is playing a major role in mitigating the harmful effects of plastic disposal.

After the analysis of the data, it can be concluded that Null Hypothesis is rejected as general public is playing a major role in plastic disposal.

CHAPTER VIII

REFERENCES

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- ✓ <https://www.sciencedirect.com/science/article/pii/S2666016421000645>
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- ✓ <https://www.nature.com/articles/s41467-019-12666-9>
- ✓ <https://www.cambridge.org/core/journals>

ANNEXURE

Questionnaire

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- Prefer not to say

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- Under 18
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- 25-30
- 30 Above

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- Yes
- No
- Ensure

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- Offering more eco- friendly products
- Investing in research for biodegradable plastics
- Supporting recycling initiatives

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- Very optimistic
- Somewhat optimistic
- Neutral
- Pessimistic