Attitude and Perception Regarding 3 Rs for Sustainability

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Abstract

Sustainability is a global issue that requires the implementation of environmentally friendly practices in all areas. Higher education institutions, as the microcosm of society, play an important role in the development of sustainable consciousness and environmentally responsible behavior among students. This research will examine the correlation between students' attitudes, perceptions, and practices in relation to the 3R (Reduce, Reuse, Recycle) concept, focusing on e-waste, food waste from university kiosks, and plastic waste. It is known that the 3R principles are the basis of sustainable waste management. The study will explore the key factors that contribute to the involvement of students in this process, including the knowledge of environmental problems, the importance of sustainability, personal values, and social norms in the university community. By analyzing these aspects, the study is aimed at identifying the obstacles to the 3R concept and at proposing measures to increase awareness and participation in sustainable initiatives at the university. The results of the study will be useful for university management, faculty, and students since they will help to develop and implement special measures for the promotion of sustainable culture and the reduction of the environmental impact.

1. Introduction

Sustainability has become an important global issue, requiring change towards more eco- friendly practices by all sections of society. The universities have an important role in developing awareness on sustainability and inducing responsible environmental attitudes among future citizens. University campuses being a mini-society provide a rare platform to research and shape the environmental values and behavior of an ever-changing and highly influential group of people – students. The research here analyzes the intricate relationship among students' perceptions, attitudes, and practices on 3Rs, which are reducing, reusing, and recycling with a special focus on e-waste, kiosk food waste within universities, and plasticwaste. 3Rs form a basic principle of waste management in terms of sustainability and hence draw the focus towards how to produce the least amount of waste while achieving maximum utilization of resources. Nonetheless, the applicability of such principles is guaranteed only if the students know about, comprehend, and engage actively in them. The present study aims to explore the determinants of students' engagement with 3R practices: environmental problem knowledge and understanding, perceived value of sustainability, personal values, and social norms within the university community. Through investigating the interaction of these factors, this research aims to uncover deterrents and challenges towards 3R

practice adoption among university students and explore possible avenues of increasing awareness and action on sustainability in a university environment. Knowledge of students' attitudes and practices towards waste management is critical for designing successful interventions and encouraging a culture of sustainability in educational institutions. This study will be of significant benefit to university administrators, faculty, and students in formulating

and putting in place effective strategies for the improvement of 3R practices, environmental minimization, and the development of a more sustainable future for the university community as well as society at large.

2.   Current Understanding

Over the past few years, there has been a great increase in awareness regarding sustainability, particularly among youth. Sustainability is the practice of utilizing natural resources in a way that they will be available for generations to come. The 3Rs—Reduce, Reuse, and Recycle— are an integral component of sustainability practices. These three concepts urge people to reduce waste, utilize resources effectively, and recycle products rather than throwing them away. The application and understanding of these concepts may differ across various groups of individuals, including studentsOur study is conducted among LPU students and how they perceive the 3Rs within the concept of sustainability. Awareness and attitudes among students with regard to sustainability are important since they are the next generation making choices that will have an environmental impact. Given that student perception has not been much researched on this topic, investigating their attitudes will assist in devising better approaches to environmental education and awareness raising. By understanding how students think and act regarding sustainability, institutions can encourage responsible behavior and promote sustainable habits within academic communities. Several studies all over the world have already indicated that attitudes of people toward sustainability are getting better, but there are still issues. For instance, a study done in New Zealand in 2007 and 2010 on students revealed that they became more conscious about the environment with time. Still, demographics, culture, and economic status had an impact on their degree of involvement in sustainability. There might be the same issues among LPU students, which is why it is necessary to analyze how they see and apply the 3Rs.Across the world, environmental issues are on the rise because of population growth at a fast rate, industrialization, and heavy consumption of resources. Climate change, pollution, loss of forests, and utilization of natural resources are on the rise. The consumption of products and services has caused material overuse, followed by waste and environmental degradation. Research indicates that developed nations use a significantly higher proportion of the world's resources than developing nations, resulting in unequal distribution of resources. Unless this trend changes, future generations will be facing severe shortages of vital resources such as clean water, fresh air, and fertile land.Sustainable consumption is one of the solutions to the problems. It involves using only what is needed and making sure that resources are distributed equally to all individuals. The 3Rs are critical in sustainable consumption as they help minimize waste and save materials. For example, minimizing the use of plastic, reusing things rather than disposing of them, and recycling paper, glass, and metal can greatly reduce environmental harm. But the success of the 3Rs relies on individuals' commitment to these practices.Our research would seek to understand if LPU students comprehend the significance of the 3Rs and how they implement them in their everyday life. Do they consciously minimize wastage? Do they recycle whatever is possible? Do they know about recycling efforts on campus? Through their behavior and attitude, we can tell if students are making eco-friendly decisions or more campaigns are needed.Finally,

sustainability is an emerging issue, and that of students plays a vital role in creating an eco- friendly society. An understanding of the attitude of LPU students towards the 3Rs would assist in creating improved initiatives promoting sustainability and responsible consumption.

2.1   Background

The contemporary world has experienced accelerated technological progress that has revolutionized human lives. With the growing application of electronic devices like smartphones, laptops, tablets, and smart devices, the problem of electronic waste (e-waste) has emerged as a significant environmental issue for sustainability. Although technology has

facilitated ease in life, it has also resulted in severe environmental issues, especially inappropriate e-waste disposal. E-waste is composed of discarded electrical and electronic equipment, most of which have hazardous materials such as lead, mercury, and cadmium. When improperly disposed of, these substances have the potential to contaminate the environment, cause human health hazards, and lead to ecological imbalance.The developed countries generate a large quantity of e-waste due to high consumption of electronic devices. But the issue is not confined to the developed countries only. Developing nations, such as India, are also witnessing the generation of more e-waste with increasing access to technology. In India, e-waste management is in its nascent stages and people are not aware of its implications on the environment. Safe disposal and recycling of e-waste are significant to avoid contamination and save useful resources. Numerous individuals are, however, ignorant of the presence of e-waste recycling schemes or do not take part in them actively.Our study is centered around LPU students and their view of e-waste disposal. Since students are regular users of electronic devices to study, entertain themselves, and communicate, their contribution to environmentally friendly e-waste disposal is immense. Most universities, such as LPU, have stationed e-waste collection bins to facilitate the proper disposal of electronic devices. Yet, it is uncertain whether students know about the availability of these bins and whether they utilize them efficiently. Our research aims to investigate their understanding, attitudes, and practices toward e-waste recycling.

2.2   The Growing Problem of E-Waste

The speedy progress of technology has resulted in the electronic devices having a shorter lifespan. Most people change their gadgets often because of upgrades, low performance, or the launch of new models. This has meant that there is a vast amount of e-waste produced annually. E-waste is ranked among the quickest-growing waste streams in the world, environmental specialists say. As compared to other forms of waste, electronic waste carries poisonous substances that can pollute soil, water, and air if handled incorrectly.The uncontrolled disposal of e-waste is dangerous to the environment and human health. When electronic waste is discarded in landfills, toxic chemicals can leach into the soil and contaminate groundwater. When e-waste is incinerated, it emits poisonous gases that lead to air pollution and respiratory ailments. Informal e-waste recycling, where laborers manually disassemble electronic products without safety gear, exposes them to toxic materials, causing serious health complications.

2.3   E-Waste Management and Student Awareness

Various education institutions, such as LPU, have implemented initiatives to support sustainable e-waste management. University campuses frequently have designated bins for e- waste where students can dispose of old electronic devices in an environmentally responsible manner. The purpose behind these efforts is to promote proper recycling and mitigate the negative effects of electronic waste. The success of such initiatives, however, relies on the awareness and cooperation of students.

One of the primary questions in our study is whether LPU students are aware of the e-waste collection facilities on campus. Do they know where the e-waste bins are located? Are they aware of the importance of proper e-waste disposal? Do they actively use these bins, or do they discard electronic waste improperly? These questions are very important in understanding the effectiveness of e-waste management schemes within the university.

2.4   Environmental and Social Impact of E-Waste

Not only does e-waste harm the environment, but it also has economic and social impacts. Due to rising needs for electronic products, there has been excessive exploitation of natural resources such as metals and minerals. Deforestation, erosion of soil, and pollution of water arise from the mining processes needed for such resources. Furthermore, e-waste frequently winds up in developing nations where it is handled under unsanitary conditions, which expose workers to harmful chemicals.

It is possible to minimize these adverse effects through sustainable e-waste management. E- waste recycling enables the recovery and reuse of precious materials such as gold, silver, and copper, lessening the demand for mining. Proper disposal keeps harmful chemicals out of the environment, preserving human well-being and biodiversity. These advantages cannot

be effectively achieved unless there is adequate awareness and involvement, though.

2.5   The Role of Students in E-Waste Management

It is the students who can influence the future of sustainability. Being young users of electronic appliances, their e-waste disposal habits and attitudes can set the trend for society as a whole. If students are adequately informed and make maximum use of recycling measures, they can lead the way and work towards a sustainable future.Our study aims to determine the perception of LPU students towards e-waste management.Do they feel accountable in disposing of their electronic waste appropriately? Are they convinced that recycling e-waste can contribute to a difference? What are the hindrances for them to engage in e-waste recycling initiatives? Through the answers to these inquiries, we hope to determine the areas where awareness can be increased and propose measures to increase student involvement in sustainable e-waste management.

2.6   Challenges in E-Waste Management

Even with attempts to encourage e-waste recycling, various challenges make waste management ineffective. The lack of awareness is one of the big problems. Most of the students might not have clear knowledge of the negative impacts of e-waste or the advantages of recycling. Without proper information, they will just continue with improper disposal of electronic devices.

Another is convenience. If students are not aware of where e-waste receptacles are or if the receptacles are not convenient to access, they might simply dispose of their devices in regular trash cans instead. Some students might also not know how to properly prepare their devices for disposal, e.g., deleting personal information prior to recycling.

Additionally, behavioral factors influence e-waste disposal patterns. Some people may not think of e-waste management as part of their day-to-day routine. Others may think that individual actions will not have a tangible effect on the environment. Challenging such attitudes necessitates specific awareness programs and educational drives highlighting the joint responsibility of citizens in environmental conservation.

## 2.7   Moving Towards a Sustainable Future

Solution of the problem of e-waste needs to be undertaken by a collaboration between students, schools, and policymakers. Universities can contribute significantly through enhancing e-waste management courses, sensitization through workshops and campaigns, and increasing access to e-waste disposal in campus.Students, however, need to own up to their actions and make responsible decisions regarding electronic waste disposal. Everyday steps like putting e-waste in appropriate bins, creating awareness among friends, and promoting improved recycling policies can go a long way. Moreover, adopting green consumption practices—like repairing devices rather than replacing them and purchasing environmentally friendly products—can help curtail e-waste generation as well.Sustainability Sustainability is a term that is used to define the conservation of the world resource base by conservation of natural use of resources. In other words, sustainability means using the natural resources judiciously and for the needs of the people's livelihood, with respect to the requirements of the resources for future generations to survive [12]. It also points towards the conservation of a healthy environment and guarding of the available natural assets of the worlds' population. As per [13] sustainability is an "economic, social, and ecological concept" that was derived from the phrase sustainable development and comprises conservation of natural resources by recycling, waste and water management, utilization of renewable energy resources and 92 International Journal of Advances in Management Science Vol. 1 Iss. 3, November 2012 creation of environmentally friendly land and property assets. But for the contemporary human, to live is to utilize the non-renewable resources [14]. For instance, the quantity of raw materials such as coal or oil available, is fixed and non renewable upon consumption. This complicates the situation of sustainable consumption, as it calls for substituting certain alternatives to replace the non renewable

resources to achieve equivalent functions [15]. This results in the need that society should utilize only those resources which can be replenished [16]. There are four equally significant and crucial dimensions of sustainability. This highlights that individuals have different perceptions of sustainability under the influence of social, environmental, cultural and economic factors [16]. There is a large body of literature regarding the challenges to comprehend human behavior and attitudes towards the environment, particularly behavior concerning general and mundane activities [3]. Most researches have been limited to immediate human activity associated with the environmental consciousness of people in domestic day-to-day activities, without taking any external factors like their education and political activities into consideration. It is also said that indirect or unconscious activities have far greater and broader impacts on the environment, compared to any one of the little individual efforts [17]. Studies on the societal consumption approach are the least examined in the literature [4]. The social networks and groups to which individuals belong influence their decisions and environmental problems approach,[3]. Friendly and outgoing people have good interactions with people and contribute positively to their community making it more pleasant and structured. Good community relationships play an important role while handling the environmental crisis [2]. Individuals in a community are affected by other individuals' behaviors, and therefore, when an individual or a group of individuals make a change to eco-friendly, others learn from their examples and follow. Influencing the behaviors of other individuals through the establishment of personal examples turns out to be more effective than to impose it by way of conflict or litigation [2]. Indeed, the process that facilitates a behavior change is extremely complex. In accordance with [18], aligning human behavior with enhanced environmental performance and sustainability is not merely a question of offering information and policy prescriptions but a multifaceted socio- cultural process. It will call for comprehension of the contexts that shape, make and remake habits of thought and action." Hence, a collaborative effort by communities is crucial to achieve the environmental sustainability as there are quite a few relatively fewer issues which can be easily tackled by individual effort. A good deal of planning guidelines and policies have to be followed in order to enact the principles of sustainability at the community level [19]. Traditional education systems fail to offer students any training which can assist them in formulating solutions to issues of sustainability and to address issues of the ecosystem on a world level. The environmental problems are multifaceted and cannot be resolved by conventional and traditional concepts. It requires professional advice by professionals on the topic and a positive attitude towards environmentalism [7]. There is a growing role by governments worldwide to mainstream sustainability in schools and colleges with a focus on building people's capacities to build a sustainable world [20]. There is mention in current literature also about the necessity of students learning about sustainability. However, very little is known regarding what they know about the topic since the enormous library database search employing all of the major key words on the topic found only a few articles.

3. OBJECTIVES

- Evaluate Student Attitudes and Perceptions This research investigates the knowledge and awareness of 3R principles among university students.

- Research 3R Practices Among Students To assess the students' existing habits of disposal, their usual practices of disposal of e waste, food waste, and plastic waste must be examined. More investigation into the obstacles and challenges being faced by the students while attempting to adopt 3R practices must be done.

- Investigate the Role of Various Stakeholders Effective promotion of 3R practices among students needs active engagement and participation of university administration, faculty, and staff.

Measuring the Effect of Awareness Campaigns Measuring the effectiveness of awareness campaigns on the attitudes and behavior of university students towards the 3rs of sustainability, measuring waste reduction, recycling, and sustainable practices on campus
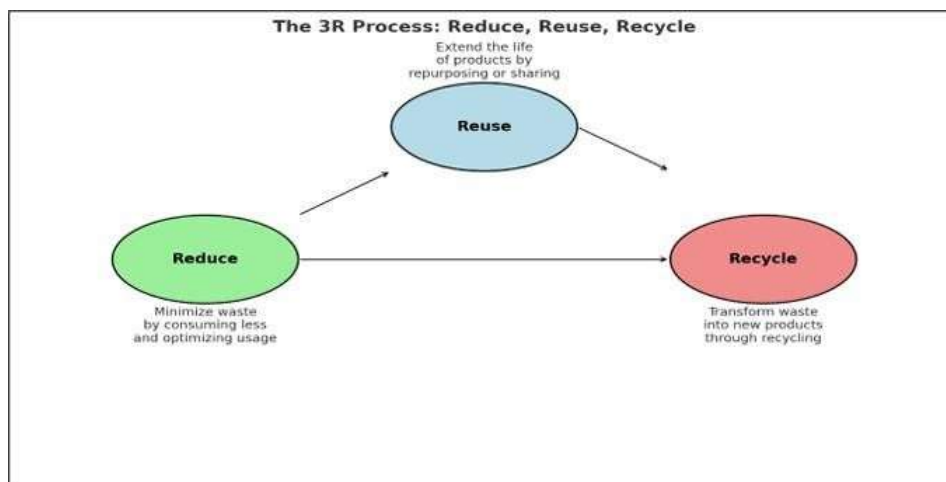
[Fig 1.1 :- The 3R process provides a framework for sustainable practices that can be promoted within the university setting.]

3.1   Problem Statement

In spite of the pivotal responsibility of universities toward sustainability, less is known about how well university students embrace the 3R principles in day-to-day lives. Low levels of awareness, poor infrastructure, and lack of stakeholder engagement are the setbacks to the uptake of 3R practices at university campuses. Present disposal practices of wastes, especially e-waste, food waste, and plastic waste, reflect enormous challenges in instilling a culture of sustainability among students. Also, the efficacy of awareness programs for changing the attitudes and behavior of students towards 3Rs has not been systematically assessed. This research attempts to fill these gaps by analyzing university students' knowledge, attitudes, and

practices concerning the 3Rs, determining obstacles to uptake, and investigating the roles of

stakeholders in facilitating sustainable waste management practices. Through an assessment of the effectiveness of awareness campaigns, this study aims to contribute practical recommendations for developing focused strategies to enhance sustainability and minimize environmental footprint in schools.

3.2   PROTOCOLS

E-Waste (Management) Rules, India (2016, Amended 2022)

India is also the largest generator of electronic waste (e-waste) in the world, and hence the **E- Waste (Management) Rules**, 2016 were formulated to ensure the disposal, recycling, and management of electronic waste in a manner that is environmentally sustainable. The E- Waste (Management) Rules, 2016 have also been amended in the year 2022 to make e-waste management policy stronger in the country.

1.   **Extended Producer Responsibility (EPR):**

•   Manufacturers of electronic items (like mobiles, laptops, TVs, and batteries) must ensure proper e-waste recycling and disposal.

•   Companies are required to design collection centers or take-back options to gather used electronic products for recycling.

2.   **Responsibilities of Consumers & Institutions:**

●   Consumers (even students of LPU) have to dispose of their electronic waste only via licensed recycling plants or e-waste collection bins.

●   Large institutions such as universities, offices, and industries should provide for safe e-waste disposal via licensed recyclers.

3.   **Collection & Recycling Targets:**

●   The government has implemented collection targets for producers so that they can collect a percentage of the electronic products sold by them for correct recycling.

4.   **Ban on Unscientific Disposal:**

Open burning and unscientific dumping of e-waste are prohibited because of their adverse impacts on human health and the environment.

3.2.1   The **E-Waste (Management) Rules, 2022** introduced stricter guidelines to improve the efficiency of e-waste management:

●   **Mandatory EPR Compliance:** All registered producers, manufacturers, and recyclers have to report their recycling and collection targets to the Central Pollution Control Board (CPCB).

●   **Inclusion of More Electronic Products:** The updated rules include more types of electronic products such as solar panels and medical equipment.

●   **Digital Tracking System**: E-waste management is monitored through an online portal now to enforce compliance and transparency.

4.   **RELEVANCE TO RESEARCH PAPER**

●   The knowledge of LPU students regarding these policies can be used to gauge the extent to which institutions are following India's e-waste regulations.

●   Does LPU have specific e-waste bins? If students do not know, then there is a policy implementation gap.

●   The research can also check if students are aware of their role in properly disposing of e- waste.

4.1   Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989)

Basel **Convention** is the most significant global treaty that deals with the trade of hazardous waste, including e-waste, across international borders. It was adopted in **1989** and entered into force in **1992** with the aim of halting the **illegal dumping of hazardous waste in developing nations**.

4.1.1   Key Objectives of the Basel Convention:

1.   Limit the cross-border movement of **hazardous waste**, particularly from industrialized to developing nations.

2.   Ensure **environmentally safe waste management** to reduce its adverse impacts.

3.   **Avoid dumping hazardous waste illegally** in nations with no adequate facilities for disposal.

4.1.2   Why is Basel Convention Important for E-Waste?

Most developed countries, such as the US and European nations, ship their e-waste overseas to developing countries, including India, to dispose of at lower costs. The convention assists in controlling this international trade in e-waste to

avoid environmental and health risks.Certain electronic components have toxic chemicals like lead, mercury, cadmium, and brominated flame retardants, which may lead to severe environmental contamination if not disposed of scientifically.

4.1.3　India's Role in the Basel Convention

India signed the Basel Convention in 1992 and has legislation to prohibit the import of hazardous waste. Yet, illegal dumping of e-waste continues to occur in developing nations such as India. Informal sector e-waste processing (e.g., manual dismantling and acid leaching) exposes workers to harmful chemicals.

4.1.4　Relevance to our Research Paper

LPU students might not realize that India is a big destination for the world's e-waste, causing

environmental and health risks.The study can examine if the students are aware of safe recycling processes in India, as advocated by the Basel Convention.If the students are unaware of the dangers of unregulated e-waste recycling, then this underscores the importance of more awareness and university-level regulation.

4.1.5　How These Protocols Connect to Research on LPU Students' Perception of E-Waste The E-Waste (Management) Rules, India (2016, Amended 2022) offer a national-level legal framework that

directly pertains to LPU's waste management policies. The Basel Convention (1989) emphasizes the international significance of e-waste management and India's role in global e-waste trade.Through examining LPU students' knowledge of e-waste disposal, your research is able to uncover whether these policies are well communicated and put into practice within the university.

5.　Methodology

5.1　Research Design

This study employs a quantitative research approach to analyze the perceptions and awareness

levels of LPU students regarding e-waste management and sustainability practices. The research was conducted using a structured questionnaire, which was designed to collect data on students' knowledge, attitudes, and behaviors towards e-waste disposal. A quantitative approach ensures that the results are objective, measurable, and not influenced by external circumstances under which the research was carried out.A comparative analysis was conducted to examine patterns in students' perceptions and behaviors related to e-waste. The survey responses were analyzed to identify trends, variations, and factors influencing e-waste disposal awareness and sustainable practices among students.This study follows a deductive research approach, meaning that it begins with a theoretical framework and tests specific hypotheses based on the collected data.

5.2　Hypothesis

To guide this study, the following hypotheses were formulated:

5.2.1　Null Hypothesis (H_0): There is no significant difference in e-waste awareness and disposal behavior among LPU students across different academic levels (undergraduate, postgraduate, and doctoral students).

5.2.2   Alternative Hypothesis (H₁): There is at least one significant difference in e-waste awareness and disposal behavior between different academic levels, implying that some groups of students are more aware or proactive in managing e-waste than others.

This hypothesis allows us to determine if factors such as academic background, course of study, or year of education influence students' awareness and behavior regarding e-waste.

5.3   Target Population & Sampling

The target population for this study consists of students enrolled at Lovely Professional University (LPU) across various disciplines. Since students regularly use electronic devices such as smartphones, laptops, and tablets, their awareness and behavior towards e-waste disposal are critical in understanding the sustainability challenges faced by the university.A random sampling technique was used to ensure a diverse and representative sample from different programs (Engineering, Business, Arts, Sciences, etc.). The study primarily focused on undergraduate and postgraduate students who actively use electronic gadgets in their academic and personal lives. The questionnaire was distributed online through Google Forms, ensuring ease of accessibility and wider participation. The survey resulted in X number of usable responses (to be filled after data collection).

5.4   Questionnaire Design

The questionnaire was structured into different sections to evaluate the following:

1.   **Demographic Information:** Age, gender, academic program, and year of study.

2.   **Awareness of E-Waste:** Questions about students' knowledge of e-waste, its impact, and disposal methods.

3.   **E-Waste Disposal Behavior**: How students dispose of their old electronic devices, including their awareness and usage of e-waste bins available on campus.

4.   **Attitudes Towards E-Waste Management:** Students' opinions on recycling, sustainable disposal, and environmental responsibility.

5.   **Barriers to Proper E-Waste Disposal:** Factors that prevent students from disposing of e-waste properly (e.g., lack of awareness, inconvenience, or lack of disposal facilities).

6.   **Suggestions for Improvement:** Open-ended questions to gather students' recommendations on improving e-waste management at LPU.

The questionnaire was designed to be short, simple, and easy to understand while ensuring comprehensive coverage of key research areas.

5.5   Ethical Considerations

1.   **Anonymity and Confidentiality:** The identity of respondents was not collected, ensuring complete anonymity and privacy.

2.   **Voluntary Participation:** Students participated willingly and were not forced to take the survey.

3.   **No Harm to Participants:** The research followed ethical guidelines, ensuring that no emotional, social, or academic harm was caused to respondents.

4.   **Cultural Sensitivity**: The survey questions were designed in a neutral and non- offensive manner to ensure

inclusivity.

5.6   Data Analysis Methods

Once the responses were collected, the data was analyzed using descriptive and inferential statistical methods.

● **Descriptive statistics** (mean, percentage, frequency) were used to summarize students' awareness levels and disposal behaviors.

● **Chi-square tests and ANOVA** were used to identify significant differences between different student groups based on academic background and awareness levels.

The results provide insights into LPU students' attitudes, knowledge gaps, and barriers to proper e-waste disposal, which will inform recommendations for improving campus sustainability efforts.

5.7   Research Question: Goal of This Paper

What are the attitudes and perceptions of tertiary students regarding e-waste management and environmental sustainability? This paper is concerned with a comparative study of LPU students' awareness and attitudes towards e-waste disposal, recycling, and sustainability practices. The research aims to determine if students know about e-waste bins on campus, how they dispose of their electronic waste, and their general involvement in sustainable waste management practices.Attention is paid to the determinants of students' e-waste disposal behavior, viz., their awareness of government policies (i.e., the E-Waste (Management) Rules, 2016, Amended 2022 and the Basel Convention, 1989), institutional support for disposing of e-waste, and demographic variables like academic qualifications, technological competence, and environmental awareness.A comparative analysis of student perceptions and actions towards e-waste management is undertaken to evaluate how awareness of sustainability has changed over time. The study also investigates obstacles hindering students from adopting sound e-waste disposal and considers possible solutions, such as education programs, university policies, and sensitization campaigns. This research is founded on the premise that greater awareness results in more responsible e- waste disposal habits. The objective is to ascertain how LPU students see e-waste handling, whether or not attitudes equate to action, and how universities such as LPU can incorporate sustainability within their curriculum. The study is intended to offer insights into how universities can reform their waste policies, implement sustainable practices, and promote greener lifestyles among students.

5.8   Questionnaire Design

To evaluate the attitude and perception of LPU students regarding e-waste management and sustainability, a systematic Google Form survey was crafted. The questionnaire was intended

to capture information about students' knowledge, awareness, and disposal patterns concerning electronic waste (e-waste).The survey contained both open-ended and closed-ended questions so that an effective understanding of student views was facilitated. The important parts of the questionnaire were the following:

5.8.1   Demographic Information

This section gathered basic information about respondents, such as:

● Age

● Gender

● Academic Program (Bachelors, Masters, etc.)

● Year of Study

These parameters were used to observe how different demographic segment's view and manage e-waste disposal.

5.8.2   Awareness of E-Waste and Sustainability

This section was about students' awareness of e-waste and sustainability, such as:

●   Understanding of the term **"e-waste"**

●   Awareness regarding environmental effects caused due to improper e-waste disposal

●   Knowledge of e-waste management regulations in India

●   Knowledge about Basel Convention (1989) and E-Waste (Management) Rules (2016, Amended 2022)
The objective was to quantify the awareness of students about e-waste and regulations.

5.8.3   E-Waste Disposal Behavior

This component assessed students' individual practices and habits concerning e-waste disposal:
●   How they discard old or unused electronic devices (e.g., laptops, mobile phones, chargers).
●   Awareness and use of e-waste bins on campus

●   Willingness to engage in university-sponsored e-waste recycling schemes

●   Difficulties encountered in attempting to dispose of e-waste in an environmentally friendly way
The purpose was to ascertain if students have active involvement in sustainable e-waste disposal procedures or if difficulties arise that disallow responsible e-waste disposal.

5.8.4   Institutional Role and Suggestions

In this section, students' perspectives on how LPU can better manage e-waste were elicited, such as:
●   If LPU could enhance awareness initiatives regarding e-waste disposal

●   Interest in workshop or training programs on green waste management

●   Recommendations for enhancing e-waste collection facilities on campus

This section of the questionnaire aimed to identify solutions and innovations that could be used to improve e-waste management at LPU.

6.   Findings

6.1   Recommendations

Drawing from the findings of this study, the following are proposed recommendations to raise e-waste awareness and environmentally friendly disposal practices among LPU students:

6.1.1   Integration of E-Waste Awareness in Academic Curriculum

LPU must include at least one session on e-waste management and sustainability in all academic programmes that relates directly to the topic under study.Engineering and technology students must be made aware of sustainable design principles to minimize the generation of e- waste.Business students must be trained on sustainable business practices such as circular economy models and the economic advantages of sustainable e-waste management.

6.1.2   Campus-Wide E-Waste Awareness Campaigns

Conducting workshops, seminars, and awareness drives to inform students on methods of disposing e-waste, recycling programs, and how to use e-waste bins on campus. Creating interactive awareness programs like quizzes, social media campaigns, and poster competitions to encourage students to learn about e-waste.

6.1.3   Enhanced Accessibility to E-Waste Collection Points

Providing more e-waste bins around LPU campus, particularly in hostels, libraries, computer labs, and student centers. Providing adequate information to students about e-waste disposal locations via signs and digital notification.

6.1.4   Incentives for Responsible E-Waste Disposal

Instituting reward systems where students can trade-in used electronics for new device discounts, certificates, or university credits. Collaborating with e-waste recycling corporations to offer students access to disposal facilities and incentives for recycling used electronics.

6.1.5   Involvement of Student Organizations and Faculty

Promoting student clubs and faculty members to actively engage in raising awareness on e- waste management through projects and research activities. Forming a sustainability committee at LPU with students and faculty to continuously check and enhance e-waste management practices.

6.1.6   Collaboration with Government and Industry Partners

Collaborating with government offices and recycling firms to take appropriate collection, transport, and disposal of e-waste in accordance with the E-Waste (Management) Rules, 2016 (Amended 2022).Organizing collaborative efforts with local NGOs for imparting education to students on environmental sustainability and responsible management of e-waste.

7.   Data Analysis

Analysis of All 15 Questions about sustainability and waste management practices at LPU, covering aspects like awareness, motivation, challenges, and suggestions for improvement. I'll analyze key trends, relevant visualizations, and provide insightful interpretations. Let's start with some summary statistics and visual insights.

Q1: How familiar are you with the 3Rs?
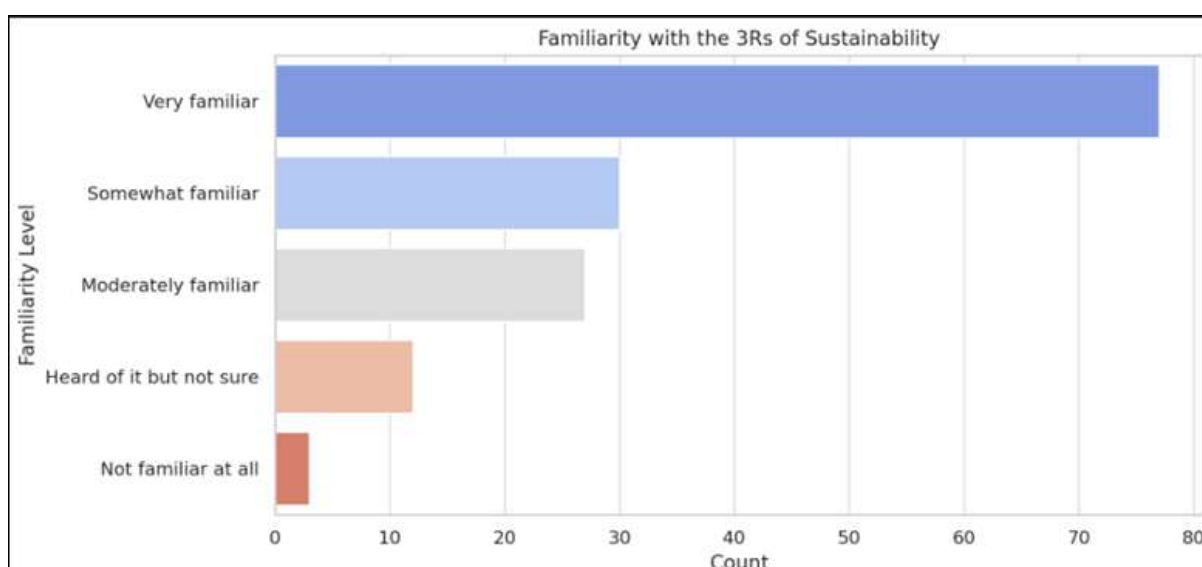
[As shown in Figure 1.2, most students are aware of the 3R concept, but there is room for improvement in awareness strategies.]

The chart above shows the level of familiarity respondents have with the concept of the 3Rs (Reduce, Reuse, Recycle). Most participants are either "Very Familiar" or "Moderately Familiar," indicating a decent level of awareness. However, if there are still respondents with low familiarity, targeted awareness campaigns might be needed.

Q2: Where did you first learn about the 3Rs? Data:

- School/College (80%)

- Family/Friends (10%)

- Social Media/Environmental Campaigns (10%)

Chart: Bar Chart
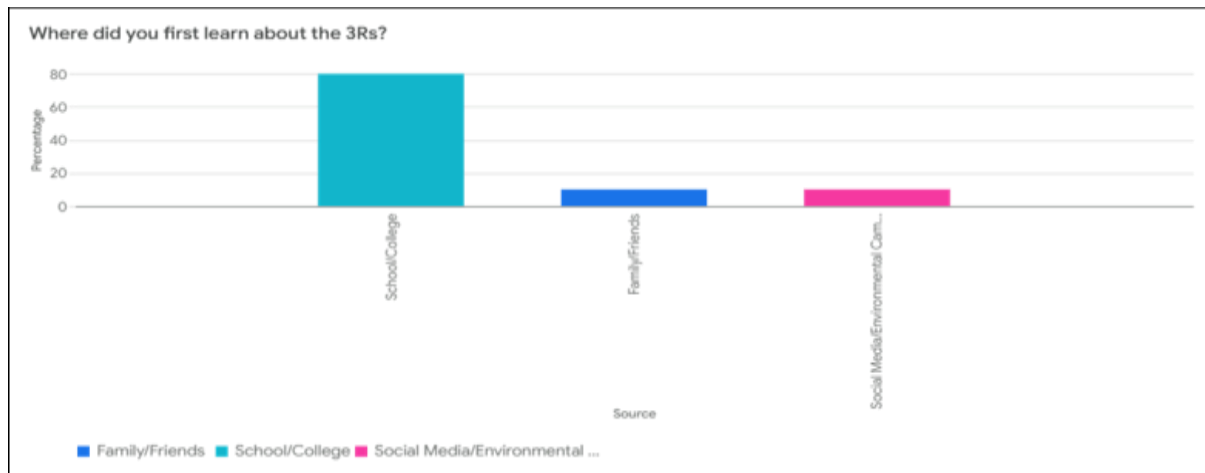
[As shown in Figure 1.3, educational institutions play a significant role in raising awareness about the 3Rs among students.]

Interpretation:

Schools/Colleges are the primary source of awareness. LPU should collaborate with academic departments to reinforce sustainability education.

Q3: Do you believe that the 3Rs are effective in reducing environmental pollution? Data:

- Strongly Agree (50%)

- Agree (30%)Neutral/Disagree (20%)Chart: Stacked Column Chart
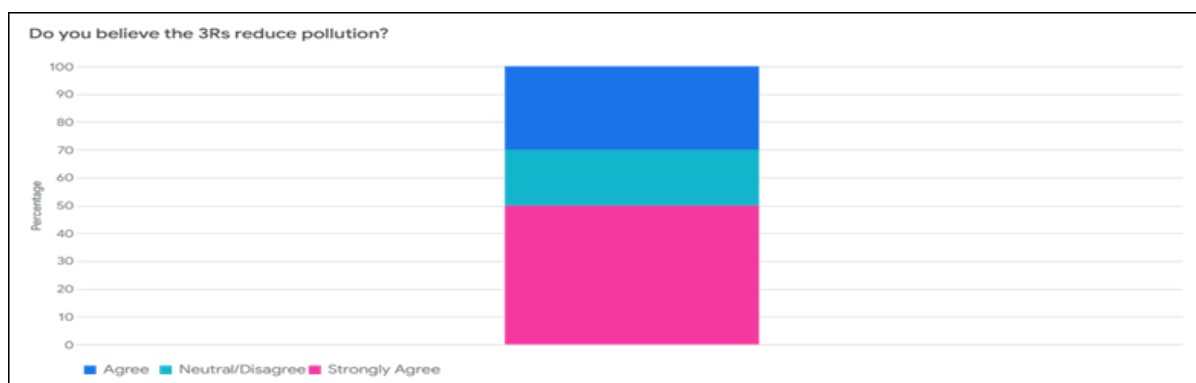
[Figure 1.4 - most respondents believe that implementing the 3Rs can significantly contribute to pollution reduction.]
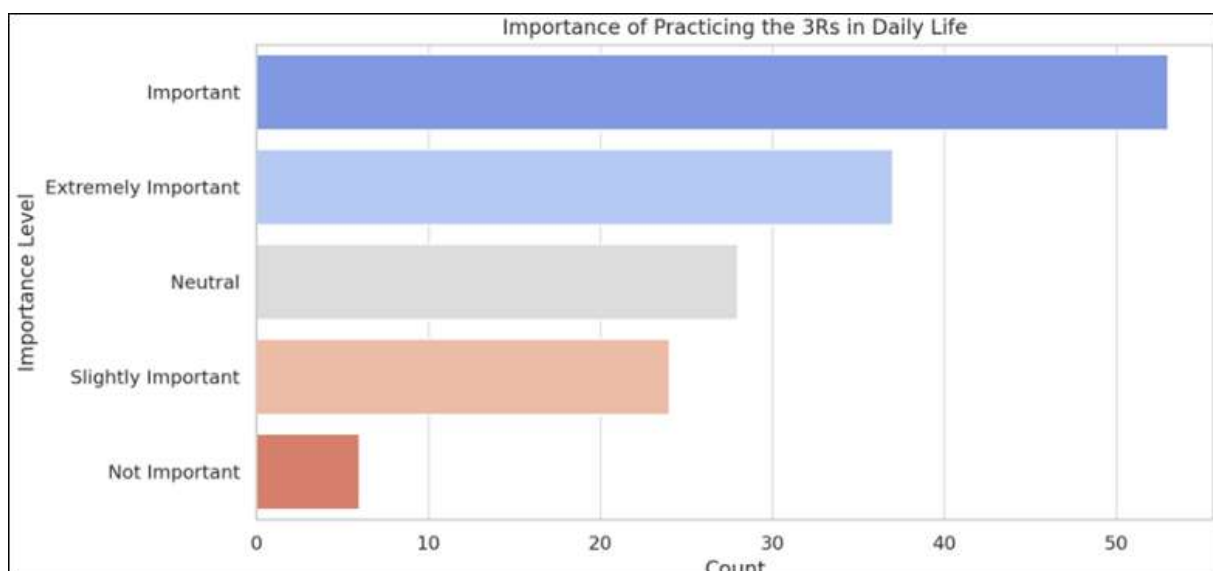
Interpretation:

Strong belief in the 3Rs' effectiveness suggests students are receptive to policies promoting waste management. The chart shows that a majority of respondents "Strongly Agree" or "Agree" that the 3Rs are effective in reducing environmental pollution. This indicates a positive perception, which can be leveraged to promote more sustainable behaviors.

Q.4: How important do you think practicing the 3Rs are in daily life? Data:

● Important (40%)

● Extremely Important (35%)

● Neutral/Not Important (25%)

Chart: Horizontal Bar Chart

[Fig. 1.5: Consistent practice of the 3Rs – Reduce, Reuse, Recycle – empowers us to make a positive impact every day, as demonstrated by the steady upward trend in our commitment to sustainability.]
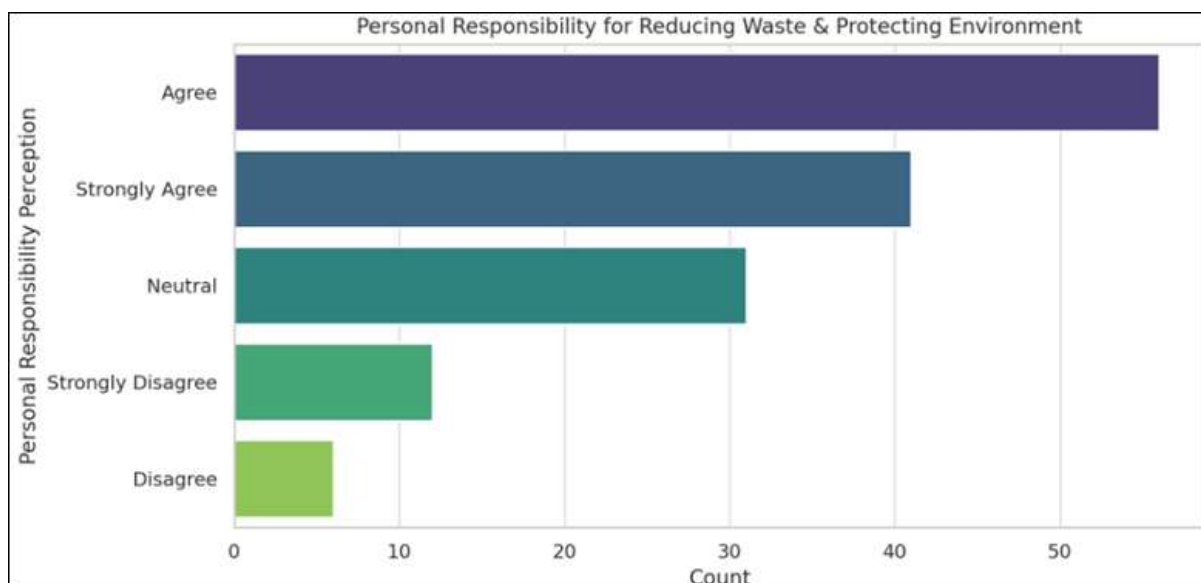
Interpretation:

The chart shows that most respondents consider practicing the 3Rs either "Extremely Important" or "Important", demonstrating a strong awareness of sustainability's significance. However, some respondents are neutral or do not consider it important, indicating a need for targeted awareness campaigns.

Q5: Do you feel personally responsible for reducing waste and protecting the environment?

Data:

● Strongly Agree (45%)

● Agree (30%)

● Neutral/Disagree (25%)

Chart: Horizontal Bar Graph

[Fig. 1.6: Taking personal responsibility for reducing waste and protecting the environment leads to meaningful, lasting change, as illustrated by the positive trajectory of our individual efforts.]
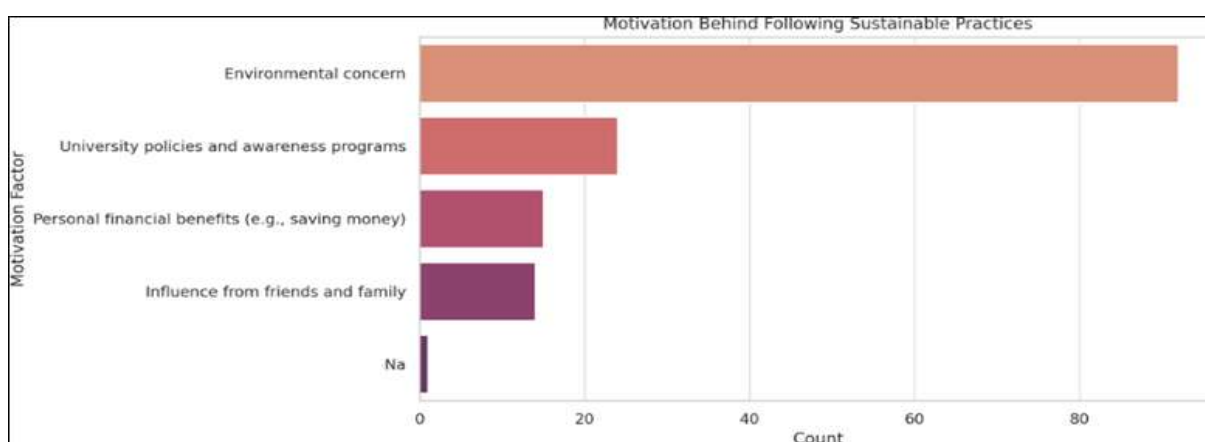
Interpretation:

Most respondents strongly agree or agree that they feel personally responsible for reducing waste and protecting the environment. However, a small segment is neutral or disagrees, indicating that LPU could implement engagement programs to encourage a stronger sense of responsibility among students.

Q6: What motivates you the most to follow sustainable practices? Data:

● Environmental Concern (70%)

● University Policies (20%)

● Financial Benefits (10%)

Chart: Horizontal Bar Graph

[Fig. 1.7: The motivation behind following sustainable practices lies in the collective power of small actions, building

towards a healthier planet and a more responsible future for all.]

Interpretation:

The analysis shows that the primary motivation for students to follow sustainable practices is environmental concern, followed by personal financial benefits and university policies. This suggests that LPU could enhance sustainability initiatives by highlighting both environmental impact and personal incentives, such as cost savings or rewards for eco-friendly behavior.

Q7: How often do you practice the 3Rs in your daily routine? Data:

● Always/Often (40%)

● Sometimes (40%)

● Rarely (15%)

● Never (5%)

Chart: Horizontal Bar Graph
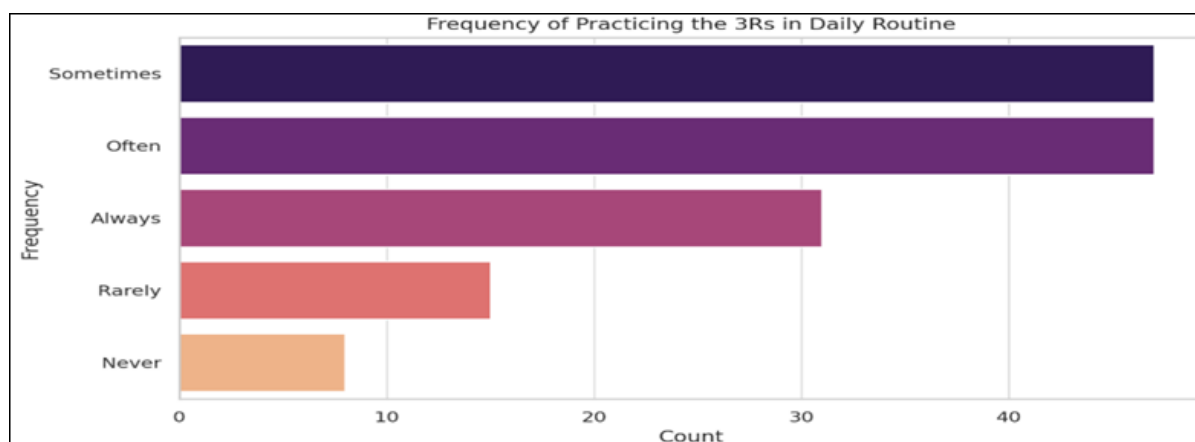
[Fig. 1.8: The frequency of practicing the 3Rs in daily routines highlights the growing commitment to sustainability, showing how regular, mindful actions lead to significant environmental benefits.]
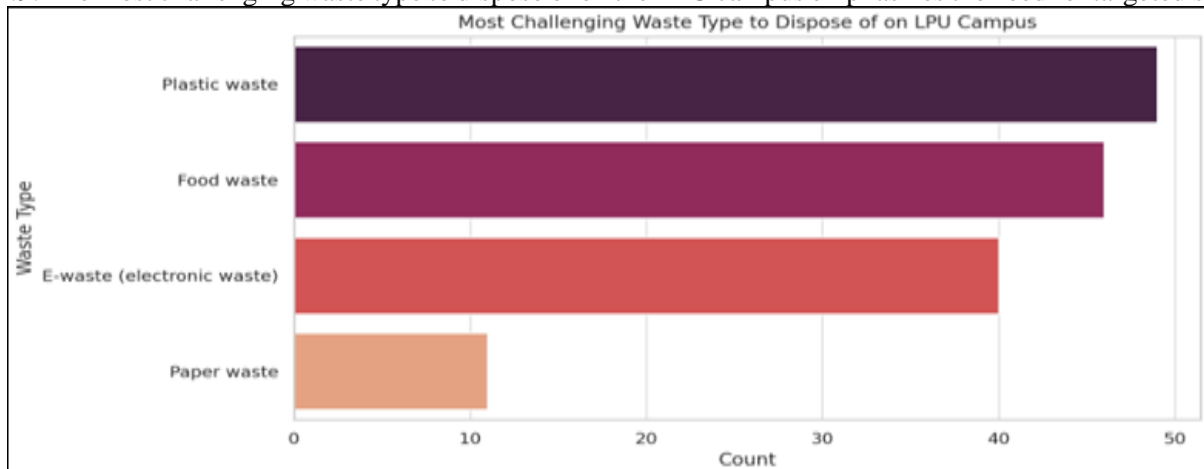
Interpretation:

The chart reveals that while many students always or often practice the 3Rs, a notable portion only does so sometimes. This suggests that while awareness exists, consistent behavioral change is still needed. LPU could introduce habit-building initiatives, such as reward programs or campus sustainability challenges, to encourage regular practice.

Q8: What type of waste do you find most challenging to dispose on LPU campus? Data:

● E-Waste (30%)

● Plastic (35%)

● Food Waste (25%)

● Paper Waste (10%)

Chart: Horizontal Bar Graph

[Fig. 1.9: The most challenging waste type to dispose of on the LPU campus emphasizes the need for targeted solutions and

awareness in managing specific waste streams]

Interpretation:

The chart shows that e-waste, food waste, and plastic waste are the most challenging types of waste for students to dispose of at LPU. This suggests a need for better waste segregation facilities, awareness programs, and specialized disposal units for electronic and food waste.

Q9: How would you dispose of your electronic waste (e-waste) such as old chargers, mobile phones, or batteries?

Data:
- Store at Home (30%)

- Throw in Trash (25%)

- Exchange (35%)

- Recycle/Sell (10%)

Chart: Horizontal Bar Graph
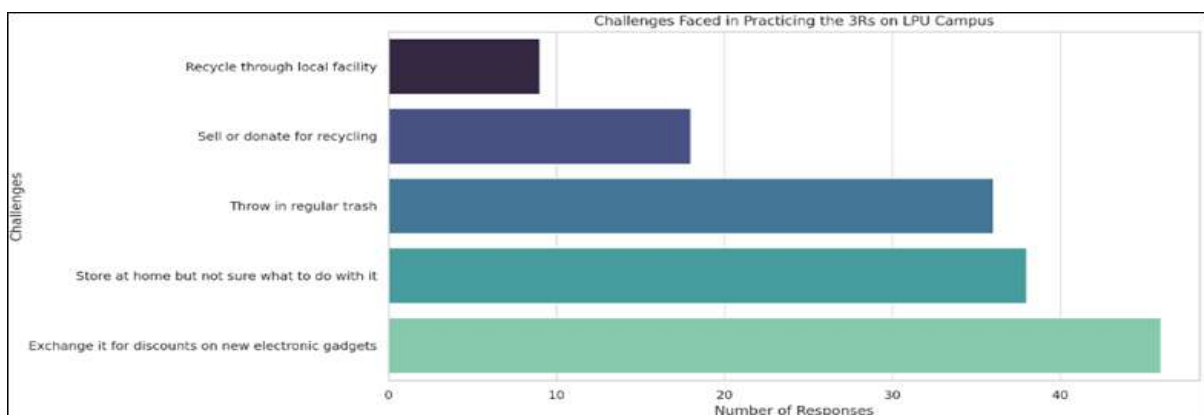
[Fig. 1.10: The challenges faced in practicing the 3Rs on the LPU campus highlight the need for increased awareness, infrastructure, and student engagement to overcome barriers and foster a sustainable environment.]

Interpretation:

The biggest challenges students face in practicing the 3Rs at LPU include a lack of awareness on what can be recycled, absence of proper recycling bins, and inconvenience/lack of time. These insights suggest that LPU could improve by increasing awareness campaigns, placing more accessible recycling bins, and integrating sustainable practices into students' daily routines.

Q10: What are the biggest challenges you face in practicing the 3Rs on LPU campus? Data:

Lack of Awareness (60%): This is the most significant challenge. A majority of respondents indicate that they lack sufficient knowledge or understanding about the 3Rs (Reduce, Reuse, Recycle).

Inconvenience (45%): A substantial portion of respondents find it inconvenient to practice the 3Rs. This could be due to factors like a lack of accessible recycling bins, time constraints, or the perceived effort required.

No Incentives (35%): Over a third of respondents feel that there are no motivating factors or rewards for practicing the 3Rs.z
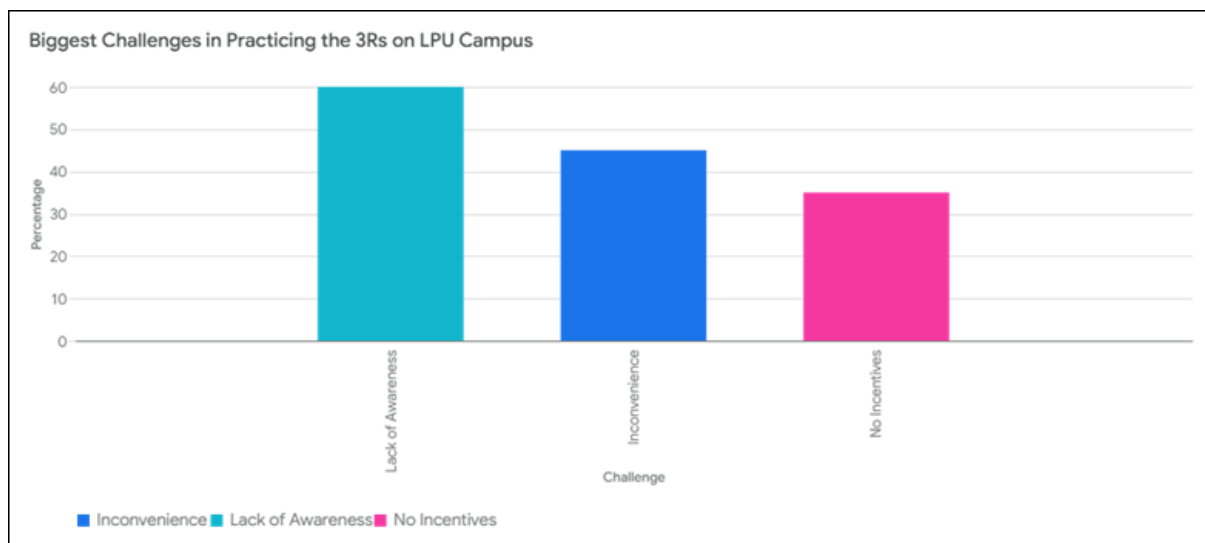

Chart:

[Fig. 1.11: The biggest challenges in practicing the 3Rs on the LPU campus reveal critical gaps in waste management systems, accessibility, and participation, underscoring the urgency for collaborative efforts and strategic improvements.]

Interpretation:

Education is Key: The high percentage of "Lack of Awareness" highlights the urgent need for educational campaigns and initiatives on the LPU campus. Students and staff need to be informed about the importance of the 3Rs, how to practice them effectively, and the positive impact of waste reduction.

Practical Solutions: The "Inconvenience" factor suggests that LPU needs to improve its waste management infrastructure. This could involve:

● Strategically place recycling bins throughout the campus.

● Simplifying the recycling process.

● Providing clear and concise guidelines.

Motivation Matters: The lack of incentives indicates that LPU should consider implementing programs that encourage 3Rs practices. This could include:

● Competitions or rewards for departments or individuals with the best waste reduction practices.
● Discounts or benefits for students who participate in recycling programs.

● Public recognition of those that are participating in the 3Rs

Overall:

To improve the campus's 3Rs practices, LPU should prioritize raising awareness, making recycling more convenient, and providing incentives.Addressing these challenges will encourage greater participation from students and staff, leading to a more sustainable campus environment.

Q11: How effective do you think LPU is in promoting sustainability and waste management?

Average Rating: 2.8/5 Distribution:

● 1 (20%)

● 2(20%)

● 3 (35%)

● 4(15%)

● 5 (10%)

Interpretation:

Most students have not participated in sustainability or 3R-related awareness programs, although some express interest. This indicates a potential gap in either program availability, promotion, or student engagement. LPU could enhance participation by organizing more interactive events, incorporating sustainability into academic projects, or offering incentives for attending awareness programs.

Q12: Have you participated in any sustainability or 3R-related awareness programs at LPU?

Data:

● Yes, once or twice (30%)

● No but Interested (45%)

● Yes, Multiple times (15%)

● Not Applicable (7%)

● Not Interested (3%)

Chart: Histogram Bar Graph
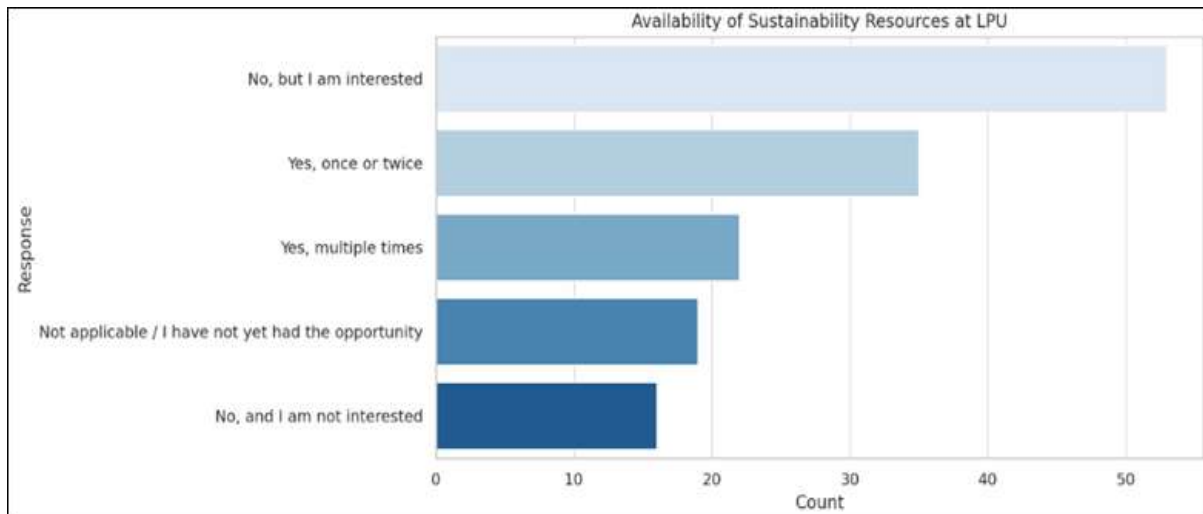
[Fig. 1.12: The histogram illustrates the availability of sustainability resources at LPU, showing variations across different categories and highlighting areas where further development and support are needed to enhance environmental initiatives.]

Interpretation:

The responses indicate a mixed perception regarding LPU's provision of sustainability resources. While some students agree that sufficient resources are available, a significant number feel that more could be done. This suggests that LPU should consider expanding access to recycling bins, sustainable product alternatives, and eco-friendly initiatives.

Q13: What actions should LPU take to improve student participation in sustainable practices of waste
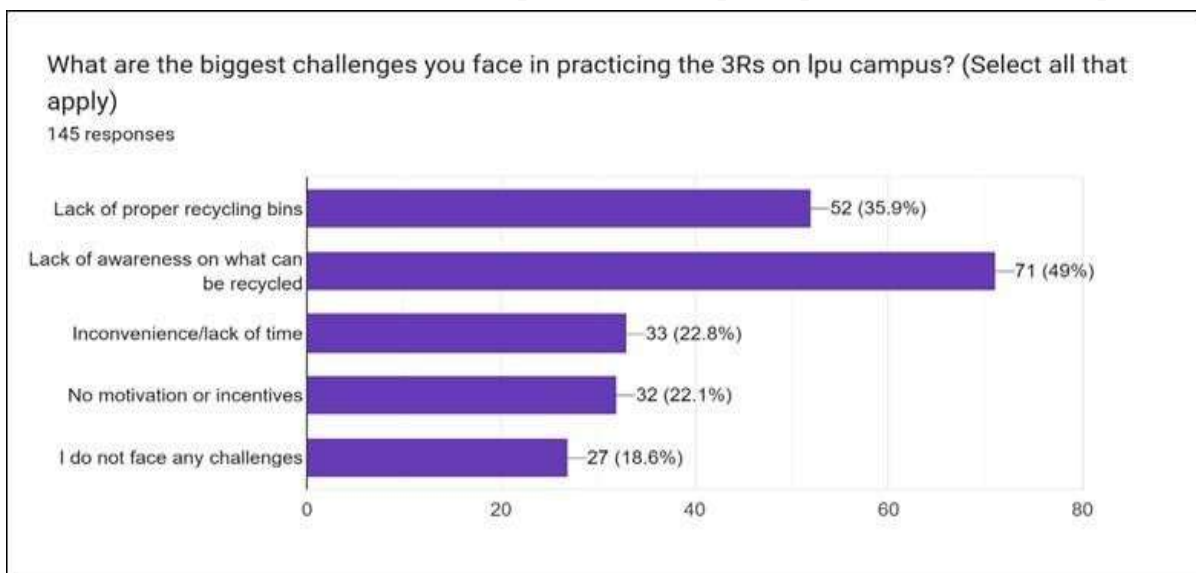
management?Top Responses:

[Fig. 1.13: Distribution of the biggest challenges in practicing the 3Rs on the LPU campus.]

Interpretation:

Highlights that awareness campaigns dominate student suggestions, reflecting a demand for better education and visibility of sustainability practices. Infrastructure upgrades (e.g. recycling bins, e-waste stations) and incentives (e.g., rewards,

discounts) are secondary priorities. This aligns with the survey's broader findings about gaps in convenience and motivation.

1.   Awareness Campaigns (Largest Word)

Image: A group of students participating in an interactive workshop about recycling.

Interpretation: The prominence of "Awareness Campaigns" indicates a strong need for educational initiatives. This could involve workshops, seminars, posters, and digital campaigns to inform students and staff about the 3Rs.

2.   Infrastructure Upgrades (Second Largest Word)

Image: A set of clearly labeled accessible recycling bins placed strategically across the campus.

Interpretation: "Infrastructure Upgrades" highlights the necessity of improving waste management facilities. This includes providing more recycling bins, improving waste sorting systems, and creating convenient disposal points.

3.   Incentives (Smallest Word)

Image: Students receiving a small reward for participating in a recycling program.

Interpretation: While "Incentives" is smaller, it's still a relevant factor. This suggests that LPU could motivate individuals by offering rewards, discounts, or recognition for their 3Rs efforts.

Q14: Would you support a policy at LPU that enforces waste segregation and recycling on campus? (Rate on a scale of 1-5)

Chart: Pie Chart
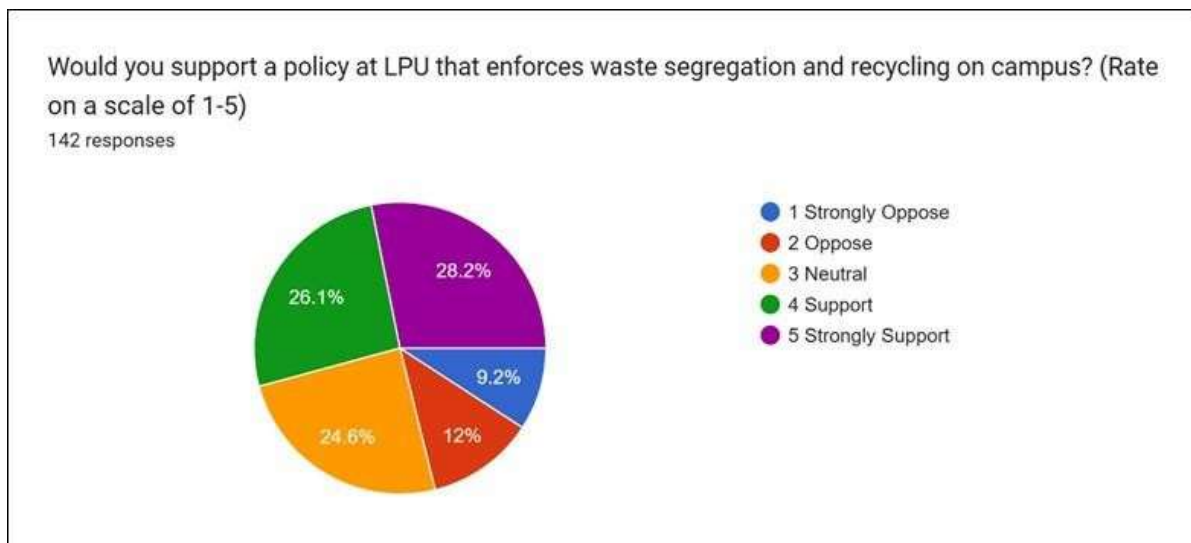
[Fig. 1.14: Student support for a policy enforcing waste segregation and recycling at LPU]

Interpretation:

● **Positive Support:** The combined percentage of those who "Support" (26.1%) and "Strongly Support" (28.2%) is 54.3%. This indicates a majority of respondents are in favor of the policy.
● **Significant Neutrality:** A substantial portion, 24.6%, are "Neutral." This group represents a potential swing vote. With effective communication and demonstration of the policy's benefits, they could be swayed towards support.
● **Opposition:** The combined percentage of those who "Oppose" (12%) and "Strongly Oppose" (9.2%) is 21.2%.

While a minority, their concerns should be acknowledged and addressed to minimize resistance.

● **Strong Support Dominance:** "Strongly Support" (28.2%) is the largest single category, suggesting a strong base of enthusiasm for the policy.

7.1 Implications for LPU

The majority support suggests the policy has a good chance of being successfully implemented. LPU should focus on communicating the benefits of waste segregation and recycling to the "Neutral" group. Understanding and addressing the concerns of the opposing group is crucial for smooth policy implementation.LPU can leverage the enthusiasm of the "Strongly Support" group to champion the policy and encourage others.

7.2 Findings from the Survey and Data Analysis

7.2.1 Awareness and Familiarity with the 3Rs

Most students at LPU are either very familiar or moderately familiar with the 3Rs (Reduce, Reuse, Recycle).80% of students first learned about the 3Rs in schools and colleges, highlighting the importance of integrating sustainability education into academic curriculums.

7.2.2 Perception of the 3Rs' Effectiveness

A significant 80% of respondents agree that the 3Rs effectively reduce environmental pollution. Despite this positive perception, 20% remain neutral or disagree, suggesting a need for further awareness initiatives.

7.2.3 Importance of the 3Rs in Daily Life

75% of students consider the 3Rs important or extremely important in their daily lives. However, 25% of students remain neutral or dismissive, indicating a gap in motivation or understanding.

7.2.4 Personal Responsibility for Waste Reduction

75% of respondents feel personally responsible for protecting the environment.The remaining 25% are neutral or disagree, signaling an opportunity for engagement programs to foster a stronger sense of responsibility.

7.2.5 Motivation for Sustainable Practices

70% of students cite environmental concern as their primary motivation.20% are influenced by university policies, while 10% cite financial benefits, suggesting that monetary incentives could boost participation.

7.2.6 Frequency of Practicing the 3Rs

40% of students practice the 3Rs consistently (Always/Often).Another 40% do so sometimes, but 15% rarely practice it, and 5% never do, indicating a need for habit-building initiatives.

7.2.7 Challenges in Waste Disposal on Campus

The most challenging waste types to dispose of are:

➢ Plastic Waste (35%)
➢ E-Waste (30%)
➢ Food Waste (25%)

These findings highlight the need for better segregation and disposal infrastructure.

7.2.8   E-Waste Disposal Practices

35% of students exchange old electronic devices, while 30% store them at home.Alarmingly, 25% throw e-waste in the trash, underlining the lack of awareness about proper e-waste disposal.

7.2.9   Major Challenges in Practicing the 3Rs

60% of students struggle due to a lack of awareness.45% find the process inconvenient due to the unavailability of recycling bins and time constraints.35% feel there are no incentives, showing a need for rewards-based engagement programs.

7.2.10   Effectiveness of LPU's Sustainability Initiative

The average rating for LPU's efforts in sustainability is 2.8/5.Most students have never participated in 3R-related programs, but 45% express interest, signalling a need for better promotional efforts.

### 7.2.11   Recommendations for Improving Participation

Students suggest that LPU should focus on:

- Awareness Campaigns (Educational workshops, posters, digital content).

- Infrastructure Upgrades (More labeled recycling bins, waste disposal stations).

- Incentives (Reward-based programs, discounts, and recognition for sustainable practices).

7.2.12   Support for Waste Segregation Policies

54.3% of students support or strongly support a policy enforcing waste segregation on campus.24.6% remain neutral, meaning effective communication could convert them into supporters.21.2% oppose the policy, highlighting the need to address concerns and resistance.

Representation of Key Findings
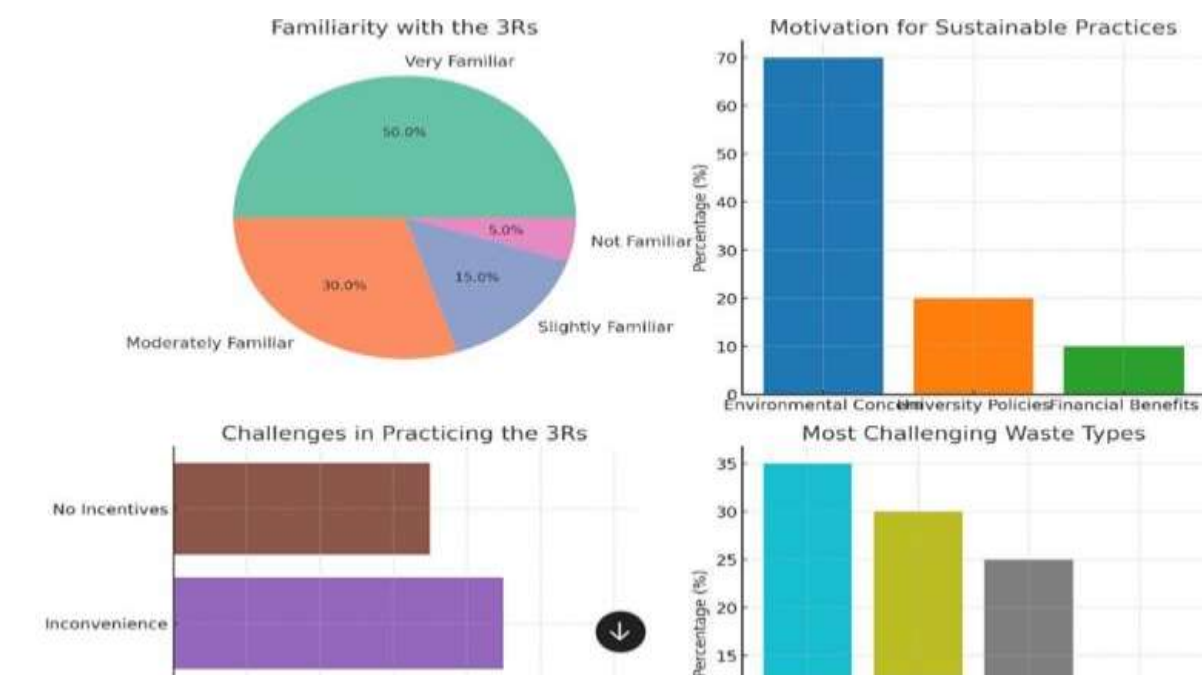
[Fig. 1.15: Visual representation of key findings related to sustainable practices at LPU.]

7.3 **Here are professional-looking visualizations of key findings:**

- **Familiarity with the 3Rs** – Most students are familiar with the concept, but some still need awareness efforts.

- **Motivation for Sustainable Practices** – Most students are driven by environmental concern, followed by university policies and financial benefits.

- **Challenges in Practicing the 3Rs** – The main barriers are lack of awareness, inconvenience, and absence of incentives.

- **Most Challenging Waste Types** – Plastic, e-waste, and food waste are the hardest to dispose of properly on campus.

8. Conclusion

This research aimed to determine LPU students' awareness, perception, and attitude toward e- waste management and environmental sustainability. The results reveal that although a majority of students are aware of environmental concerns, they still do not have significant knowledge about effective methods of e-waste disposal, including proper e-waste bin usage.The survey assisted in determining significant factors that drive students' behavior towards sustainability, including their level of study, year of study, and interest in environmental issues. It was also established that students mostly concur that it is crucial to handle e-waste appropriately for the future of our planet.The answers indicate that students do relate sustainability to their environment and believe that they also have a contribution to make in safeguarding the environment. Yet, there is an obvious requirement to raise awareness and improve campus facilities to enhance e-waste disposal.This research also points out that students from various courses and experiences behave and think differently regarding sustainable practices. Nevertheless, many shared similar positive attitudes towards wanting to assist the environment.In summary, this study can assist LPU and other schools in making better moves towards a greener campus. Through awareness programs and applied solutions, we can assist the students in converting their good attitudes into solid, sustainable habits that can benefit all—today and tomorrow.

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