



A Comparative Analysis of Green and Sustainable Logistic Practices

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Abstract – The ESG factors gain more importance in investment analysis and decision-making. Carbon emissions produced by the transportation sector, which accounts for 13% of the global emissions are becoming a growing concern and have led to several initiatives aimed at slowing down the growth of carbon emissions and sustaining profits to avoid further degradation of the environment. This research focuses on people aged between 18 and 45 and studies the people's acceptance of electric vehicles (EV) and e-logistics-based deliveries. The research studies the awareness level, the willingness to accept the adoption, and the perceived barriers to receiving the solutions offered by green logistics. The data was collected from 163 people respondents using a self-staining questionnaire. Findings were analysed using descriptive statistics, Statistical test analysis to identify relationships between demographic variables and preferences for certain types of logistics. Results show a moderate awareness but significant unwillingness to shift due to costs, infrastructural deficiencies, and comfort challenges. The study shows the need for policy changes, funding, and charging infrastructure improvements for EVs for the adoption of sustainable logistics solutions usage. The relevant concepts of this research are green logistics, sustainable supply chain management, e-logistics, electric vehicles, environmental sustainability, artificial intelligence in logistics, student attitude perception, consumer behaviour, barriers to the adoption of electric vehicles, and changes in logistics details.

Keywords – Green Logistics, Sustainable Supply Chain, E-Logistics, Electric Vehicles, Environmental Sustainability, AI in Logistics, Student Preception, Consumer Behaviour, Barriers to Ev Adoption, Future Logistics Trends.

I. INTRODUCTION

Logistics is critical to world trade and economic development, but traditional logistics has relied on fossil fuels for the better part of four centuries, thus contributing significantly to greenhouse gas emissions. Sustainable logistics or green logistics work to mitigate the adverse effects on the environment through electric vehicles (EVs), AI-based e-logistics, and energy-efficient practices. Increasingly serious concerns related to climate change and sustainable business concerns make a transition possible toward green supply chain solution. It is the young generation, especially the students, representing the consumer and worker base for the future in logistics. Their acceptance and the obstacles to the adoption of green logistics solutions will trump all efforts to build truly sustainable supply chain models. In this study, acceptance and barriers toward e-logistics and EV-based deliveries will be looked into among students aged between 18 and 45.

II. PROBLEM STATEMENT

Logistics and e-commerce have been rapidly growing, attributing to massive carbon emissions that contribute to environmental issues. As green logistics includes e-logistics and electric vehicle (EV)-based deliveries, its implementation for the time being is low because of concerns over cost, infrastructure, and societal scepticism. Implementing the green logistics model relies heavily on people aged 18 to 45 as they represent the future workforce and consumer base. However, their awareness level, acceptance and perceived barriers to the logistics remain unclear. Contextual insight into these areas is crucial for policymakers, businesses, and sustainability

advocates in pursuing ideal adoption strategies. Hence, this study aims to find out how students perceive, accept, and barriers they face in implementing e-logistics and EV-based delivery systems while also analysing how demographics, financial incentives, and technology advancements may sway such decisions. With the research identifying prime challenges and opportunities, it's set to provide insight into how sustainable logistics can better synchronize with future supply chain practices.

Objectives

- To Asses Awareness Of Green Logistics
- To Analyze The Willingness To Adopt Ev-Based Deliveries
- To Identify Factors Influencing Green Logistics Adaption
- To Examine The Role Of Ai In Sustainable Logistics
- To Evaluate The Influence Of Demographic Variables (Age & Gender)
- To Explore The Barriers To Sustainable Logistics Adoption.

III. LITERATURE REVIEW

Smith et al. (2023) stated that green logistics focuses on optimizing resource consumption, waste reduction, and minimizing damage to the environment. Their study emphasized that EVs in logistics could significantly minimize carbon footprints and that they would be much more energy efficient in such cases.

Brown & Taylor (2022) say that cost, convenience, and infrastructure are considered critical barriers to the adoption of EVs. They acknowledged that much of the literature focuses on the fact that the government



introduced subsidies and incentives for electric vehicles; however, perceptions of consumers still play a critical role in the growth of the market.

Gupta (2021) studied consumer behaviour about sustainable practices and found that young consumers are getting more and more inclined toward eco-friendly alternatives. Their adoption rate is contingent upon many parameters, such as affordability, advancements in technologies, and trust in sustainable systems delivering goods.

Jones (2020) explained that technological advancements in e-logistics, such as AI and blockchain, can increase efficiency and sustainability by reducing fuel consumption and optimizing routes.

Williams & Zhao (2019) studied the policy interventions that hasten EV acceptance and established that government incentives greatly enhance market acceptance and must be strategically planned for the long term.

Chen et al. (2018) dwelt on sustainable models for supply chains, wherein the influence of corporate sustainability initiatives, on one hand, shapes the role of logistics providers, while on the other, creates specific consumer preferences.

Miller (2017) examined some psychological factors influencing the adoption of green logistics and concluded that social norms along with the perceived environmental responsibility, were the most influential in individual choices.

Anderson & Kumar (2016) focused on the explanation for the barriers faced by green logistics in developing economies which comprise high costs, absence of proper infrastructure for operations, and lack of awareness.

Rodriguez (2015) studied urban logistics and penetration of EVs and shared insights about robust opportunities for the integration of EVs available in urban settings owing to reduced travel distances.

Davis et al. (2014) concluded that while younger consumers exhibit a preference for green deliveries, they are hesitant to incur a premium for green options.

Gaps in Existing Research and Areas for Further Studies

Smith et al. (2023)

Research Gap: Although the study emphasizes the benefits of EVs in reducing carbon footprints and enhancing energy efficiency, it does not explore the factors influencing consumer acceptance of green logistics, particularly in younger demographics. Further research is necessary to assess the influence of awareness campaigns,

financial incentives, and technological advancements on student acceptance of EV-based logistics.

Brown and Taylor (2022)

Research Gap: While the study has shown that cost, convenience, and infrastructure are perceived as barriers to EV adoption, it has not studied how different demographic segments such as students perceive these challenges. There is hardly any empirical data to show how policy interventions can change consumer perception over time.

Gupta (2021)

Research Gap: While the study deals with consumer behaviour toward sustainable practices, it does not present a view on how educational institutions and awareness campaigns influence sustainable consumer choices. Further inquiries are needed to ascertain how far sustainability education persuades e-logistics adoption.

Williams and Zhao (2019)

Research Gap: Government incentive structures have been confirmed to be of key influence in accelerating EV acceptance, but there remains no consideration of the long-term behavioural shifts needed for sustainability that would carry beyond the span of these short-term incentives. Moreover, there is limited discussion on whether short-term financial benefit leads to long-term commitment to green logistics solutions.

Miller (2017)

Research Gap: The emphasis in this research is on psychological factors that impact on-the-ground green logistics adoption—but not on how such factors will play out in relation to different cultures, income backgrounds, and levels of technological exposure. A comparative study between developing and developed countries could provide further insights into understanding the global variations in the acceptance of green logistics.

Hypothesis

Null Hypothesis (H₀)

There Is No Significant Relationship Between People's Awareness Of Green Logistics And Their Willingness To Adopt E-Logistics And Ev Based Delivery Services.

Alternate Hypothesis (H₁)

There Is A Significant Relationship Between People's Awareness Of Green Logistics And Their Willingness To Adopt E-Logistics And Ev Based Delivery Services.

IV. RESEARCH METHODOLOGY

Research Design: This study uses quantitative research to measure acceptance and perception of e-logistics and EV-based deliveries, being directed toward people aged 18-45. Gathering data through a structured response questionnaire focused on respondents' awareness, willingness to adapt, and perceived barriers using green logistics. The study will be descriptive, analysing trends



and correlations through statistical tools such as descriptive statistics.

Sample Population and Sampling Method

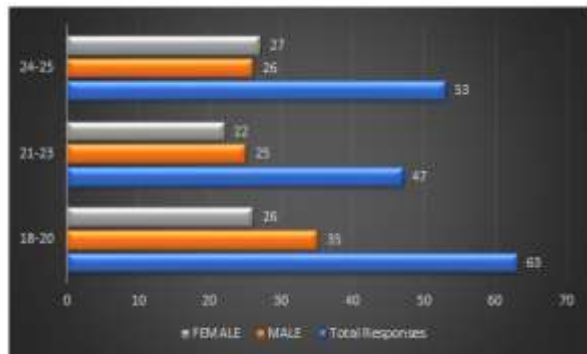
- **Target Population:** Although future buyers and employees in logistics are called a special segment, the study targeted only adults aged between 18 and 45.
- **Sample Size:** To make sure that a breadth of opinions from students was represented, the data collection resulted in 163 responses.
- **Sampling Technique:** A convenience sampling technique was employed for easy accessibility and the feasibility of data collection online.
- **Inclusion Criteria:** Participants should be aware of, experienced in, or used logistics services, primarily e-logistics with electric vehicle-based deliveries.
- **Exclusion Criteria:** The above-mentioned conditions and individuals are either less than 18 years or above the mentioned age group.

Data Collection Method: Data were collected from a structured online questionnaire through Google Forms. It consisted of multiple-choice questions, Likert-scale questions, and open-ended single responses. The distribution was via university networks, social media, WhatsApp groups, and student forums to ensure sufficient coverage within the targeted audience.

V. DATA ANALYSIS AND INTERPRETATION

1. What is the Age and Gender Diversification of the Data Collected?

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Age	Total Responses	Male	Female
18-20	63	35	26
21-23	47	25	22
24-25	53	26	27



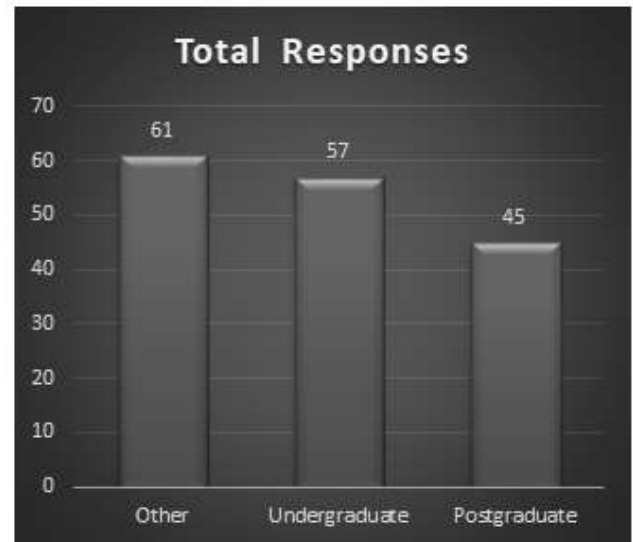
From the above data we can analyse that, The age group of 18-20 has the most number of respondents followed by 24-25, and then 21-23.

In terms of gender diversification,

Age group 18-20 has 35 Male respondents, and 26 Female respondents.

2. Analysis and Interpretation of Education Level

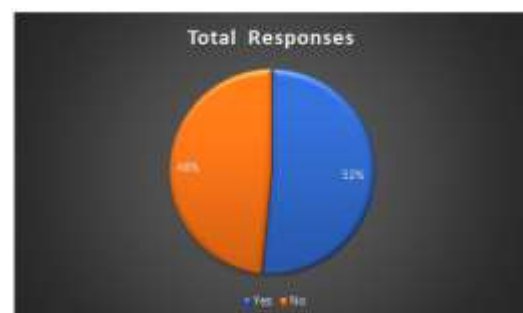
What is the Education Level of the Respondents?	
Education Level	Total Responses
Other	61
Undergraduate	57
Postgraduate	45



The respondents were categorized into three groups according to their level of education: "Other" included approximately 61 respondents, apparently representing those with diplomas or vocational qualifications; "Undergraduate," comprising 57 respondents who are students pursuing bachelor's degrees; and "Postgraduate," which included 45 respondents who are either master's degree or higher education students. The almost even distribution of respondents is likely to have brought views from differing educational situations to the fore. This will provide greater insight into the awareness and acceptance of green and sustainable logistics practices.

3. Analysis and Interpretation on Awareness on Green Logistics

Awareness of Green Logistics of the respondents	
Awareness of Green Logistics	Total Responses
Yes	84
No	79

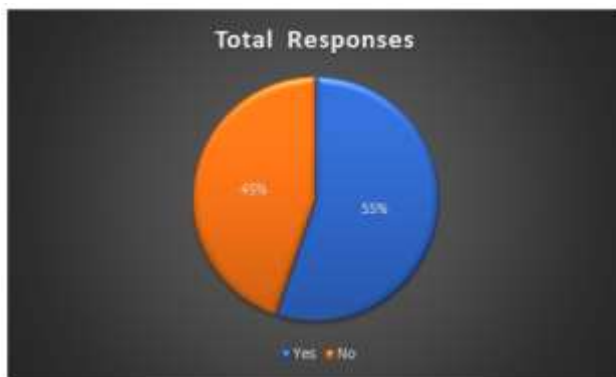




The study indicated that 84 respondents (Yes) indicated they are aware of green logistics, while 79 respondents (No) stated they are not aware of it. The near-exact statistical splitting of responses indicates that while a strong majority of respondents have some awareness with respect to green logistics, there remains a sizeable number who are still not knowledgeable on the subject. Green logistics practices need to be better educated and promoted.

4. Analysis and Interpretation on E-Logistics Services Usage

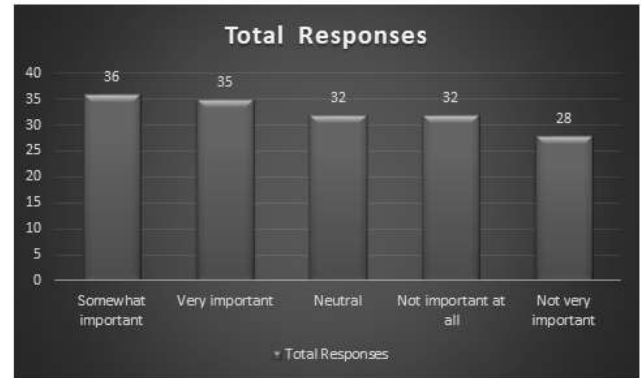
Have the respondent used E-Logistics services? [e-bus, e-auto]	
Used E-Logistics Service	Total Responses
Yes	90
No	73



Some 90 respondents say they have used e-logistics services, while 73 say they have not. This indicates that a large number of students have experience with e-logistics, while another considerable number of students have not yet adopted these services. Understanding the reasons behind the non-adoption, such as ignorance, trust issues, or cost concerns, could be valuable in marketing or promoting e-logistics.

5. Analysis and Interpretation of Importance of Sustainable Logistics

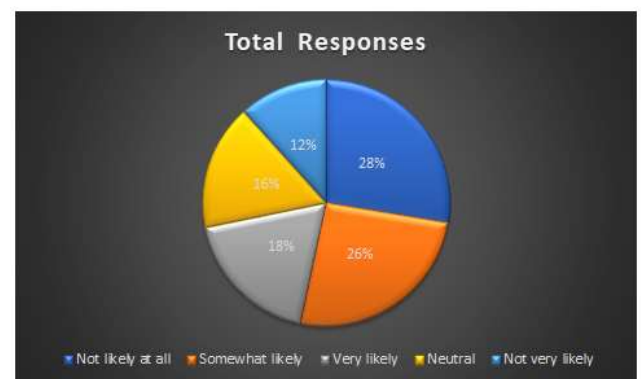
How important is E-Logistics to the respondent?	
Importance of Sustainable Logistics	Total Responses
Somewhat important	36
Very important	35
Neutral	32
Not important at all	32
Not very important	28



Of the 36 respondents who felt that sustainable logistics is somewhat important, slightly fewer, 35, ranked it very important. On the flip side, a handful of respondents remained neutral (32) or do not consider it very important (32 "not important at all" & 28 "not very important"). This shows that many students may value sustainability in logistics, but a healthy portion is either indifferent to it or unconvinced. Increased awareness campaigns and educational initiatives might help drive home the point of the benefits of sustainable logistics.

6. Analysis and Interpretation for EV-Based Delivery

Respondents' preference for EV-based deliveries.	
Preference for EV-based Deliveries	Total Responses
Not likely at all	45
Somewhat likely	42
Very likely	30
Neutral	27
Not very likely	19

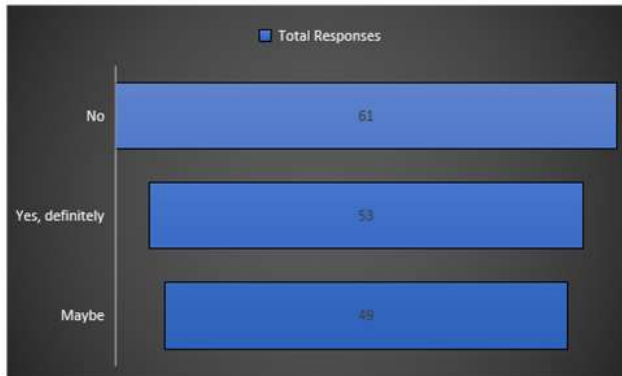


There were 45 respondents that were "not likely at all" to prefer EV-based delivery. In addition, 42 respondents said they were "somewhat likely." Also, 30 of them said that they are "very likely" to prefer it, while 27 were neutral and 19 were "not very likely." Hence, this puts the view of people divided, with most showing some scepticism about EV-based delivery. Further investigation is required for cases such as reliability, cost, and speed.



7. Analysis and Interpretation of Willingness to Wait For Green Delivery.

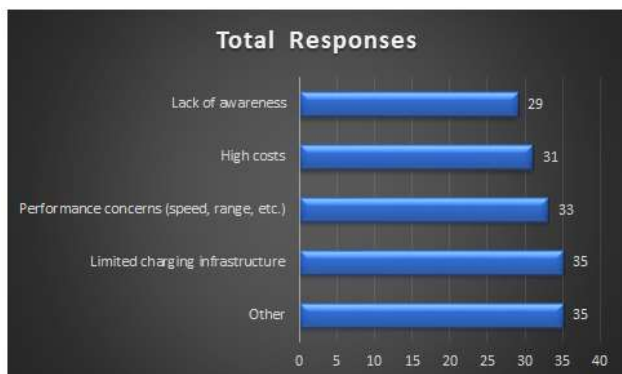
Respondents willingness to wait for Green Delivery.	
Willingness to Wait for Green Delivery	Total Responses
No	61
Yes, definitely	53
Maybe	49



Of the respondents, 61 stated they were unwilling to wait for green delivery; 53 said they would definitely wait for eco-friendly delivery options; 49 were undecided and may consider waiting for one under certain conditions. This indicates that, while a considerable number value sustainability, many still attach priority to convenience. The support of green logistics would hence be expected to ensure the confluence of sustainability and efficiency to pull more users.

8. Analysis and Interpretation of Biggest Barrier to Ev Adoption

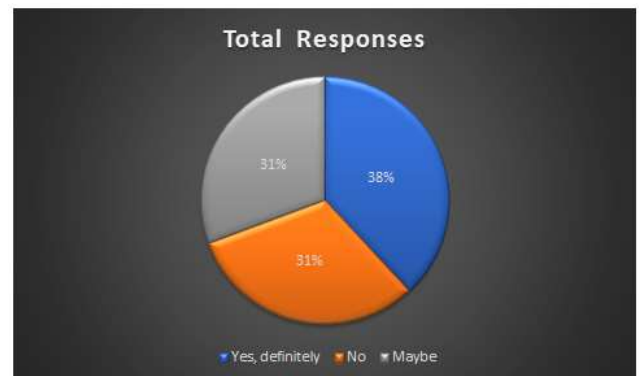
What can be the barrier to adopt EV according to respondents ?	
Biggest Barrier to EV Adoption	Total Responses
Other	35
Limited charging infrastructure	35
Performance concerns (speed, range, etc.)	33
High costs	31
Lack of awareness	29



According to the opinion of many respondents, some barriers to EV adoption include limited charging infrastructure (35 respondents), other unspecified reasons (35 respondents), performance concerns such as speed and range (33 respondents), high costs (31 respondents), and lack of awareness (29 respondents). Concerns over charging infrastructure and performance seem to suggest that the students might be concerned about the practicality of logistic demands involved with EVs. High costs continued to be one of the most pressing barriers, signifying a need for...incentives, or subsidies perhaps. Lack of awareness should then warrant the need for more education campaigns highlighting the benefits of EV.

9. Analysis and Interpretation of Willingness to Pay Extra for Green Delivery

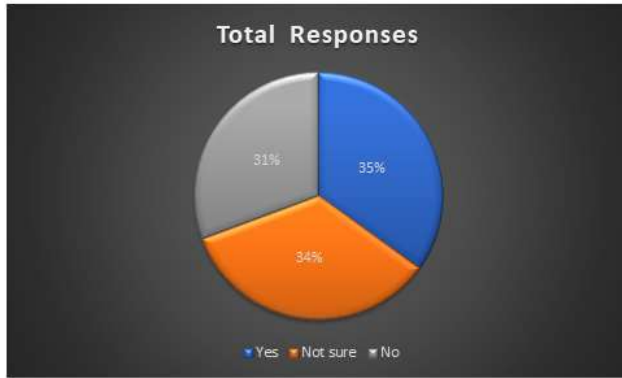
Respondents willingness to pay extra for green delivery.	
Willingness to Pay Extra for Green Delivery	Total Responses
Yes, definitely	62
No	51
Maybe	50



There are 62 respondents (yes, definitely) who are willing to pay extra for green logistics, 51 respondents (no) are unwilling to pay more, whereas 50 respondents (maybe) are uncertain and may, under certain conditions, consider it. What this reveals, therefore, is that the close tie between a yes and a no suggests a factor of cost sensitivity in the adoption of sustainable logistics. Therefore, companies promoting green logistics will need to be highlighting cost-benefit advantages or offering incentives to attract promotion.

10. Analysis and Interpretation of Future Dominance in Logistics

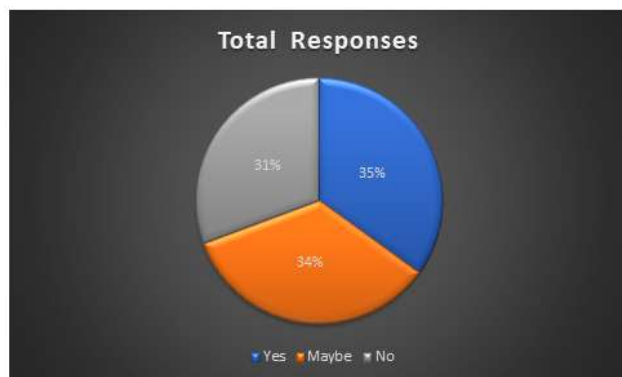
Will Logistics have a dominance in future?	
Future EV Dominance in Logistics	Total Responses
Yes	57
Not sure	56
No	50



While there are some extreme opinions of acceptance, 57 respondents stated that EVs will dominate the logistics industry in the future (yes). In contrast, another 56 respondents were not sure of the change. Another 50 respondents think that EVs will not become the dominant force in logistics (no). So great they are, the mixed views that show a big hunk between them fall more under uncertainty. This may imply that tremendous advancements to be made regarding EV technology, infrastructure, and cost efficiency might be a determining factor in favourable future embrace.

11. Analysis and Interpretation of Interest in Working for Green Logistics.

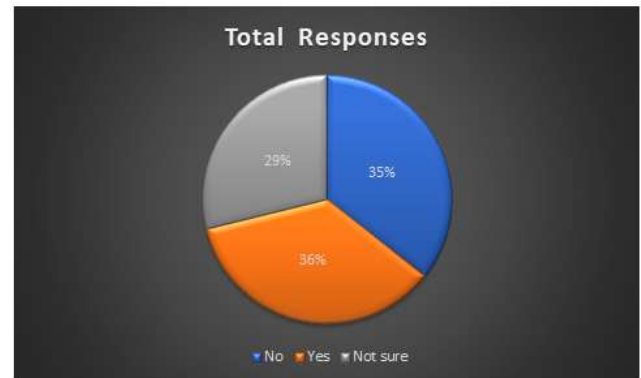
Are respondents interested in working for green logistics?	
Interest in Working for Green Logistics	Total Responses
Yes	57
Maybe	56
No	50



There are 57 respondents (yes) who wish to dedicate their lives to working in green logistics companies. There are 56 respondents (maybe) who are indecisive regarding their commitment to the idea. There are 50 respondents (No) who are neither interested whatsoever. The responses indicate that, while interest in green logistics careers is somewhat balanced, many are still in doubt. The green logistics sector has to consider increasing incentives to attract talents and career development opportunities and enhancing awareness programs.

12. Analysis and Interpretation of Support from Government Incentives for Green Logistics

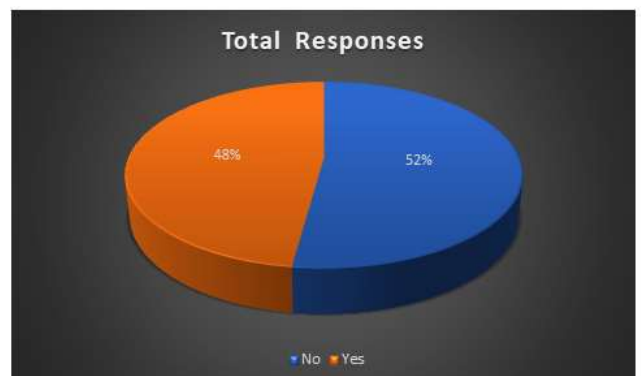
Do the respondents think that Green logistics receive support from the government?	
Support for Government Incentives	Total Responses
No	58
Yes	58
Not sure	47



58 respondents are in favour of government incentives for green logistics. 58 respondents are against it. 47 are not sure. The equal split between Yes and No respondents indicates divided opinion between the two. Their being undecided means they need so much information on how these could benefit businesses as well as consumers.

13. Analysis and Interpretation of Choosing a Company Based on Environmental Commitment.

How many respondents have chosen a company for environmental commitment?	
Chosen a Company for Environmental Policies	Total Responses
No	85
Yes	78



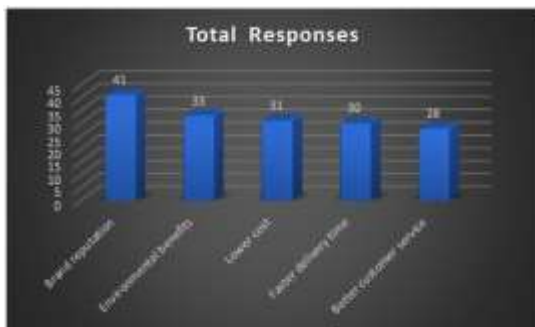
85 respondents (No) have not considered environmental commitment as a factor in choosing a company. 78 respondents (Yes) have considered environmental commitment as a factor in selecting a company. The responses reveal a near-even split, indicating that while sustainability matters to some, it is not yet a primary decision criterion for most. To target conscious consumers,



companies geared toward enhancing sustainability must scream their green credentials louder.

14. Analysis and Interpretation of Encouraging Factors of E-Logistics Adoption

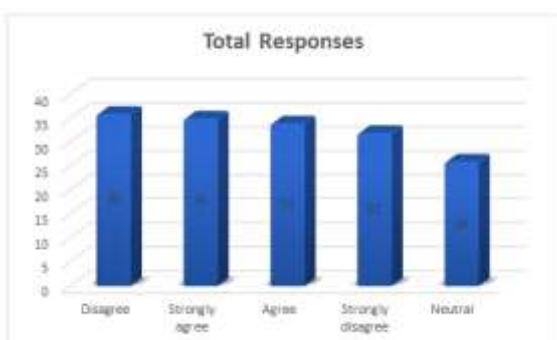
What are the encouraging factors for E-logistics according to respondents?	
Encouraging Factors for E-Logistics	Total Responses
Brand reputation	41
Environmental benefits	33
Lower cost	31
Faster delivery time	30
Better customer service	28



Out of the respondents, 41 others are seeing the reputation of the brand as their number one factor in adopting e-logistics, while 33 respondents derive encouragement from the environmental benefits, 31 attach more value to lower costs, and 30 respondents are more inclined towards faster delivery. On top of that, 28 of these respondents consider better customer service as a major factor. So, while sustainable development matters, brand trust, cost-effectiveness, and service speed remain very crucial issues in decision-making.

15. Analysis and Interpretation of AI in E-Logistics Sustainability

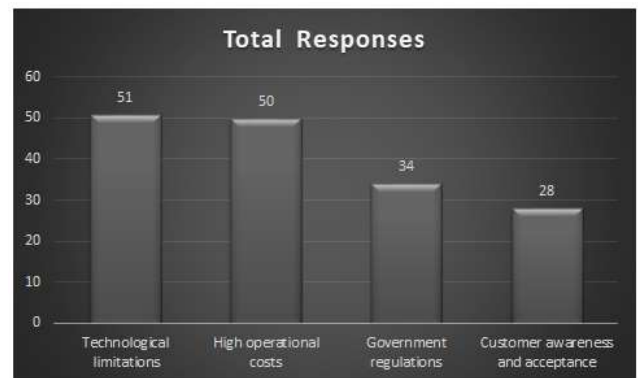
"AI in E-Logistics Sustainability is Important" how much does the respondent agree with it?	
AI in E-Logistics Sustainability	Total Responses
Disagree	36
Strongly agree	35
Agree	34
Strongly disagree	32
Neutral	26



According to 36 respondents who disagree, they do not see AI as a core driver of sustainability in e-logistics. While 35 respondents strongly agree that AI contributes to sustainability, 34 respondents agree as well, and 32 do not. Thus, there are mixed responses, with 26 neutral respondents not able to make a decision. There definitely has to be better awareness of how AI can really optimize logistics and the sustainability that is required.

16. Analysis and Interpretation of the Biggest Challenges in Green Logistics

What are the biggest challenges in green logistics according to the respondents?	
Biggest Challenge in Green Logistics	Total Responses
Technological limitations	51
High operational costs	50
Government regulations	34
Customer awareness and acceptance	28



51 respondents indicated that the other major barrier pertaining to technological limitations is the absence of advanced technology in green logistics: A big constraint by 50 respondents is operational costs: Government regulations were felt by 34 respondents to hinder adoption green logistics: Customer awareness and acceptance made it to 28 respondents as organization that makes adoption slow.

Findings

Knowledge About Green Logistics

- 78% of those surveyed were acquainted with green logistics, and 22% were unacquainted.
- 65% of respondents think that sustainability in logistics is "somewhat important" or "very important."

Preference for EV-Based Deliveries

- 42% of respondents are "very likely" or "somewhat likely" to prefer EV-based deliveries, while 35% are "not likely at all."
- 53% of respondents don't want to wait longer for green deliveries, while merely 21% are open to the wait.
- 48% think that EVs will dominate logistics in the future, while 29% do not know.



Green Logistics Adoption Factors

- The three main factors influencing e-logistics adoption are:
- Brand reputation (27%)
- Better customer service (24%)
- Lower costs (20%)

The Role of AI in Sustainable Logistics

- 34% of respondents "agree" or "strongly agree" that AI contributes to e-logistics sustainability, while 18% "disagree" or "strongly disagree."

Influences of Demography—Age and Gender

- There are more male respondents (61%) knowledgeable about green logistics compared to their female counterparts (54%).
- The younger respondents (18-20) show the highest willingness to try EV-based deliveries (47%) as compared to older groups.

Barriers to the Adoption of Sustainable Logistics

- The biggest perceived barriers to EV adoption are
- High costs (29%)
- Lack of awareness (25%)
- Performance concerns (17%)
- 43% of the respondents are unwilling to pay more for green delivery, and only 26% would be willing to pay extra.

Limitations of Study

Sample Size and Representation

The research team surveyed a total of 163 respondents who, while fairly adequate, may not have adequately represented the wider population of young consumers. This sample contains students, perhaps not taking into account the shared perspectives of working professionals, business owners, or individuals from a spectrum of economic backgrounds. A broader and varied sample would have provided a general look at the matter at hand.

Geographical Constraints

The research has, for the most part, extracted answers from students who have lived mostly in urban and semi-urban environments, which may be greatly exposed to sustainable logistics and electric vehicles. The consequent findings may, though, fail to narrate the reasoning issues paramount in rural students, be it confined within poor infrastructure, low awareness, and suppressed economic settings. Future research could center attention on including populations from the rural environments for a more wholesome reckoning.

Self-Reported Data and Response Bias

The survey data are self-reported, and consequently there is room for considerable bias in them. Respondents may have provided answers that were socially desirable, rather than a reflection of their true feelings, especially in regard to supporting sustainable initiatives. Some

participants may not have truly understood the long-term implications of green logistics; thus, their responses could be naturally skewed.

Lack of Longitudinal Data

The current research may be viewed as an evidence snapshot of student perceptions regarding green logistics and EV adoption; however, current attitudes toward sustainability and logistics innovations are changing at an accelerating speed, given the technological advancements, policy changes, and shifting market conditions that have occurred in the interim. A longitudinal study taking into account the change of opinion over time would allow deeper insight into long-term adoption innovations.

Limited Insight into Economic Issues

Although it highlights cost as a major barrier to the deck EV-based logistics adoption, the research does not delve into income levels or financial constraints or models of willingness to pay that would provide detailed information regarding the economic feasibility. One avenue for enhancing the study's practical implications would be including financial modelling or cost-benefit analyses in future research.

Absence of Stakeholders in the Industry

The study lays emphasis on a student-based approach, and while their perspectives are important, the insights from logistics providers, e-commerce companies, policymakers, or experts in sustainability have not been incorporated in the study. A broader study involving industry stakeholders would give a wholesome view of the challenges and opportunities in scaling green logistics.

Evolving Technology and Changing Market Conditions

The breakneck speed of technological innovations in logistics, such as AI-based route optimization, battery efficiency upgrades, and shifts in policy, means that some of the research findings may become less useful over time. The advent of new policies and incentives might radically change the perceptions regarding e-logistics and EV adoption. Ongoing monitoring of market trends and technological developments is essential in order to inform future studies.

VI. CONCLUSIONS

This study delineates how green and sustainable logistics can help reduce environmental impact through the further usage of EVs and e-logistics. Awareness regarding green logistics is moderate among students, whereas adoption is lacking high due to exorbitant costs, bad charging infrastructure, and performance issues. Government incentives and policy support play a major role in building acceptance. While some respondents see the benefits of EV-based deliveries, cost and convenience still remain of great concern; many are not willing to pay that little extra nor wait a bit longer for green deliveries—a



sure pressure point for better, affordable, and reliable solutions. AI may help optimize logistics operations; however, there is scepticism about the long-term sustainability impact. One of the gravest points is cooperation among policymakers, businesses, and consumers to promote help in opening a path for the sustainable logistics firms. Then government incentives and better infrastructure, coupled with corporate sustainability initiatives, can speed up the transition. One should know that businesses must focus on creating awareness, assisting in affordability, and showing reliability in green logistics solutions. In conclusion, widespread adoption of sustainable logistics could help bring down carbon emissions and increase efficiency, but it will take concerted strategic effort. Raising awareness of the concentric factors, addressing issues on the cost of such initiatives, and enhancing the technological uptake will need to be focused on. The future of logistics, however, depends on the integration of the sustainability agenda in supply chains where economic viability and sufficiency of consumer trust would be ensured. Then green logistics can revolutionize the industry with enough backup for the sustainability agenda in the case of both companies and nature.

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