

GREEN LOGISTICS AND ENVIRONMENTAL SUSTAINABILITY

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Abstract

This study examined green logistics and environmental sustainability of bottled water factories in Delta state, Nigeria. The objectives of the study were to: examine the relationship between green warehousing and improved services and determine the effect of green labelling on enhanced brand image. The population of the study was 1167 owners and distributors of bottled water in the area under review. However, a sample of 298 was determined using the Taro Yamane sample size determination formula. The descriptive mean and standard deviation statistics were applied to answer the research questions. The hypotheses formulated were tested using Single-sample T-test inferential statistics. Findings revealed that there is a significant relationship between green warehousing and improved services; there is significant effect of green labelling and enhanced brand image. It was concluded that green warehousing and green labelling are significant in bringing about environmental sustainability to bottled water factories in Delta state. It was therefore recommended that Green warehousing should be encouraged among bottled water factories to reduce environmental pollution and greenhouse gas emission and to save energy while Green labeling should be positioned to do less harm to the environment through consumer awareness and education, regulation and policy support, market incentives, environmental impact assessment, standardization, transparency and accountability, collaborations, amongst others which will help reduce environmentally unfriendly products

Keywords: Green Logistics, Warehousing, Environmental Sustainability.

1. INTRODUCTION

Green marketing is an organization's efforts at designing, promoting, pricing and distributing products that are not harmful to the environment (Biswas, 2008; Stibbe, 2010). It is the process of selling products and services that are based on the idea of environmental protection or produced in an environmentally friendly way (Abdul & Alauddin, 2016). Green logistics, a component of the green marketing mixes according to Resul (2020) and Dahlstrom (2011), refers to the use of environmentally friendly practices in the transportation and delivery of goods and services. Green logistics is a comprehensive approach to reducing the environmental impact of distribution activities. By adopting practices such as optimizing warehousing operations, good labeling

procedures, alternative transportation systems, using sustainable packaging materials and implementing effective waste management process and companies including bottled water factories can contribute to a greener future while also reaping the benefits of cost savings and improved brand reputation.

The evolving world brings to bear the impact of global warming in the society. According to Zimmermann, (2016) there are deforestation, ocean acidification, depletion of the ozone layer, biodiversity loss and pollution etc. To conform to a sustainable environment, green practices have emerged in various scientific fields of endeavors including marketing over growing concern for sustainability. Mishra & Sharma (2010) asserts that the trend has changed as logistics must conform to global best practices of sustainability, thus, distributing environmentally friendly products, services and initiatives. Conserving resources is one of the highest priorities of bottled water factories in alignment with environmental sustainability (Jill, 2020). This makes many bottled water factories continuously develop innovative and efficient ways to conserve resources in both production and distribution to attain access to safe drinking water to improve customers' health and wellbeing (WHO, 2004).

According to Semerjian (2011) bottled water is water that is intended for human consumption, and that is sealed in bottles with no added ingredients except that it may optionally contain safe and suitable antimicrobial agents. Abugu and Nwafor (2018) affirm that the need to ensure the purity of water for drinking greatly contributes to the emergence of the various forms of production and distribution activities. Therefore, effective practices of green logistics activities by firms especially bottled water factories can help attain the balanced triple bottom line of economic, social and environmental benefits. The driving idea is to conduct green logistics towards environmentally responsible practice through its activities of green warehousing and green labeling to meet the needs of environmentally conscious consumers without violations of green standards and ensuring satisfaction of stakeholders needs, safety of products and processes, social acceptability of the firm, and sustainability of its activities hence this study seeks to look into green logistics and environmental sustainability of bottled water factories in Delta State, Nigeria.

1.1 Statement of the Problem

Trends in the current market and environment are shifting, and people are focusing more on using green marketing to help businesses create products and services that are safe for the environment and for consumers (Alhamad, Junoh, Ahmad, & Eneizan, 2019). These marketing initiatives are all intended to increase consumer pleasure and support a sustainable environment by creating, manufacturing, packaging, selling, and recycling eco-friendly items will help accomplish these goals. There has been notable increase in the world's average temperature due to human activities and naturally occurring greenhouse gases (Arora, 2018; Hugo & Bhanye, 2022). The Inter-governmental Panel on Climate Change IPCC (2021) opines that some greenhouse gases are naturally occurring, but human activities are directly responsible for their accumulation in the

atmosphere with variety of negative effects with the most harmful gases being carbon dioxide, methane, nitrous oxide, fluorinated chemicals, and water vapor climate action (Vare & Blewitt, 2010). Numerous factors contribute to environmental problems, including the over-exploitation, depletion, and degradation of the environment caused by profit-driven entrepreneurs, as well as the production of greenhouse gases that have unimaginably negative effects on humankind (ICCG, 2016; Opukri & Ibaba, 2008; Oteh & Eze, 2012; UNEP, 2021; Mba, 2000).

Green logistics compliance is saddled with challenges, especially in bottled water factories in Delta state where it is a new concept to many producers and consumers as a result of low sustainability education and lack of eco-industrial parks initiatives. Various researches carried out in this field bridges different gap of knowledge but none had robustly examined the relationship between green logistics and environmental sustainability. More so, significant differences in socio-cultural, technological and economic paradigms of development among bottled water factories, difference in management and objectives, plants and machinery, and technology pose a huge threat. Many bottled water factories' do not disclose their green logistics activities through their annual corporate sustainability reports in developing states as required by global best practices (Akeel, Bell, & Mitchell, 2019). Furthermore, green warehousing, green labeling of some bottled water factories is not in full compliance with conventional environmental sustainability pattern. In Delta state, many bottled water factories do not use good green labeling materials and do not store their products in green warehouse, their mode of delivery of goods and services including warehousing facilities such as heating and cooling processes, lighting and warehouse location, waste space, photovoltaic roof panels and painting roof are scanty and ineffectively managed. Most worrisome, is the fact that government efforts in green alliances, standardization, regulations, policies and legislations on environmental matters licensing and certification have not paid off, making bottled water factories pay all forms of environmental taxes and levies including sustainability compliance without impacts.

Several scholars have carried out research similar to this study in different environments revolving around the triple bottle line of social, economic and environmental sustainability in line with global best practices. For example, Amrinder and Puja, (2017), Helen, (2015), Chandra and Reeta, (2021), Chukwuka & Eboh (2018), Mohammad and Kamran, (2016), Mangan and Lalwani (2016), Kirunga and Kihara, (2018), Panya, Ochiri, Achuora and Gakure, (2021). However, most of these studies were discussed on the light of developed economies and majority of them focuses on green distribution performance, green distribution strategies and green distribution management. Meanwhile, those in green logistics were limited in scope due to the organization used, and important concepts such as green warehousing and green labeling were either omitted or not given in-depth meaning as it is examined relation to green distribution or green chain supply management. Hence this research work aims at addressing the gaps in green logistics and environmental sustainability by expanding its analysis to include the relationship

between green warehousing and improved services and the influence of green labeling on enhanced brand image of bottled water factories in Delta state, Nigeria.

1.2 Objectives of the Study

The broad objective of the study is to establish the relationship that exists between green distribution practices and environmental sustainability. The specific objectives are;

- i. To examine the relationship between green warehousing and improved services
- ii. To determine the influence of green labeling (design) and enhanced brand image

1.3 Research Questions

In line with the specific objectives stated above, the following research questions were raised for the study.

- i. What is the relationship between green warehousing and improved services?
- ii. What is the relationship between green labeling (design) and enhanced brand image?

1.4 Statement of Research Hypotheses

The following null hypotheses were advanced in order to provide answers to the research questions:

- H1: No significant relationship exists between green warehousing and improved services
- H2: Green labeling (design) has no significant relationship with enhanced brand image

2. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Green Logistics

Green logistics according to Resul (2020) and Dahlstrom (2011) refers to the use of environmentally friendly practices in the transportation and delivery of goods and services. It aims to minimize the negative impact of distribution activities on the environment by reducing carbon emissions, optimizing energy efficiency, and promoting sustainability. It is a comprehensive approach to reducing the environmental impact of distribution activities by adopting practices such as optimizing warehousing operations, and implementing effective labeling procedures, companies including bottled water factories can contribute to a greener future while also reaping the benefits of cost savings and improved brand reputation. Ogbo, Eneh, Agbaeze, Chukwu & Isijola (2017) posits the triple bottom-line which involves the balancing of economic, social, and environmental goals with a company's primary distribution activity. It is referred to as a balance between commercial operations (profit), environmental practices (planet) and social concerns (people), Adeyemi & Odesola (2021), Fisk (2010), and Sanders & Wood (2015).

Valentine and Rosa (2023), states that as green logistics is perfect for companies looking to reduce their carbon footprint to reap the benefits of a triple bottom line, bringing to bear the clear and growing interest in and support for ethical business practices and initiatives that take into account social, economic, and environmental issues (Benn, Dunphy, & Griffiths, 2006; Ahi & Searcy, 2013). Sustainable logistics enable companies take action and implement changes that are important to them and their customers (Ashby, Leat, & Hudson-Smith, 2012). It also helps decrease waste and maximize resources to enhance the health of the world and create a brighter future thereby reducing carbon dioxide (CO₂) a greenhouse gas that contributes to global warming. Gibson (2006) sees sustainable logistics activities as improved services, improved brand image, having competitive edge, increased efficiency, lower costs and better risk management. Nollman (2023) asserts that adopting green logistics may have a beneficial influence on an organization by reducing staff sick days, and operating expenses, and raising employee happiness and productivity. He maintains that one-third of sick leave might be linked to the workplace and that using green logistics techniques would improve the atmosphere and welfare at work while reducing the detrimental effects of corporate operations on the environment.

Nigeria has experienced high levels of carbon, greenhouse gas, nitrogen oxide, and methane emissions. These emissions have a variety of effects on the environment that manufacturing companies, such as those that produce bottled water, have not been able to fully quantify in terms of their effects on the ecosystem. Organizations that produce products and services, the industrial sector, and chemical manufacturing companies have failed to consider their environmental performance as part of their overall performance (UNEP, 2021). Problems associated to air and water pollution claims numerous lives (WHO, 2015) and instances involving fines against different organizations accused of causing environmental distortions are prevalent in Nigeria (Adeyemi & Odesola, 2021). A growing number of organizations, particularly those in the production and manufacturing sectors (which include companies that sell bottled water), are adopting sustainable or green logistics techniques as a result of growing environmental consciousness and the consequences of not doing so. Green logistics involve efficient logistics management that lowers emissions from the movement of raw materials to finished goods.

2.1.2 Environmental Sustainability

Globally, the relevance of environmental challenges in business and public life has grown (Prakash, 2002; Polonsky, 2021). Sustainability is a development that satisfies current demands without compromising the capacity of future generations to satisfy their own requirements According to Boudreau and Ramstad (2005) it is about achieving corporate objectives or success in the present but not at the expense of future needs (IISD, 2019). Thus, sustainability is development that satisfies current requirements without jeopardising or neglecting future generations.

Nowadays, businesses are adopting the idea of sustainability as a strategy, which makes it more important for manufacturers and customers to switch to ecologically friendly goods. Businesses have been establishing environmental sustainability strategies and

taking responsibility for their part in preventing environmental damage in greater numbers in recent years. Chukwuka & Eboh (2018) states that the practices in their eco-matrix model include ecological sustainability, eco-commitment, eco-opportunity, eco-innovation, and green business initiative. These are green initiatives or practices that minimize adverse environmental effects throughout the entire product life-cycle, eliminate or reduce waste before it is created, and develop new sets of environmental abilities and skills. However, in this study improved services and enhanced brand image were used to achieve environmental sustainability.

2.1.3 Green Warehousing and Improved Services

Green warehousing is building facilities or storing goods and services with low environmental impact (Zhang & Zhang, 2010). Green warehousing is a concept of introducing sustainable practices in warehouse operations that can ensure reduction in carbon emissions, for example making use of natural lighting, use of solar panels to conserve energy, installing insulating doors to maintain temperature, use of recyclable packaging materials to reduce wastage and save cost, automation to help optimal use of space, use of electric lift for warehouse operations, and going paperless (Bortolini, Ferrari, Gamberi, Pilati, & Faccio, 2017). Businesses can adopt sustainable practices in powering their warehouse facilities (Siti, Nazura, & Azimah, 2019). Instead of using electricity to power the warehouse, firms can use hydro, wind or solar power to optimize resources (Smith & Perks, 2010). The design and construction of warehouse facilities must meet the requirement of a non-polluted environment and maintain good humidity, corrosion, waterproofing in addition to other factors (Zhang & Zhang, 2010). Improved services refer to improvement or enhancement of already existing offerings to customers thereby, satisfying the customers. Smith (2012) asserts that green warehousing helps businesses improve their services by lower energy costs and usage, increase consumer brand loyalty, improve company profile, increase employee satisfaction, save natural resources, and help manage space, and health benefits which help in achieving the sustainable development goals.

2.1.4 Green Labeling and Enhanced Brand Image

The International Organization for Standardization (ISO) defines "green labeling" as the use of symbols written on goods or their packaging to promote environmental safety (ISO, 2019). The term green label refers to a certificate or labeling system that identifies products or services as being environmentally friendly (Rahbar & Abdul, 2011). These labels are often placed on products that are made with sustainable materials, have a reduced impact on the environment or contribute to the overall well-being of the planet. According to Vanessa, Alfaro, & Mejia (2016), green labels are essential for encouraging sustainable behaviors, transforming the market towards a sustainable environment, and making businesses responsible for their environmental actions. Abugu and Orogun (2022) opine that firms have resorted to innovations in product labeling to stimulate consumers buying choices. Labels help consumers make informed decisions by enabling them to compare products and services within a category and effectively make choice for

the product they prefer. They also assist consumers in determining which product has the least environmental impact; green labels promote sustainable living and general improvements in environmental performance, even for unlabeled products (Azizan & Suki, 2014). A variety of environmental factors are covered by eco-labels, such as packaging, other industrial concerns, health concerns, and atmospheric effects. A positive phrase, symbol, or mark known as "eco-labeling" designates a product or service as having less environmental impact than comparable goods or services. Green labels can be single-attribute, that is focusing on a single lifecycle stage and also be multi-attribute, meaning focusing on the entire lifecycle and addressing many environmental issues. In communicating the environmentally friendly attributes of a product, producers must be mindful of the Federal Trade Commission (FTC) Green Guide which prohibits deceptive marketing. These guidelines help marketers avoid making environmental claims that are unfair, deceptive or unsubstantiated. Governmental bodies, private sector companies, and nonprofit environmental advocacy groups may own or run eco-labels. Thus, in any eco-labeling programme, various stakeholders are involved such as government, programme management authority, industry and commercial association, consumers, targeted public and international communities (GELN, 2013). Brand image therefore refers to the perception and emotional response that consumers have towards a brand. Enhancing a brand image is very important as it help build customer loyalty, improve market share, and foster good relationship between the organization and her offerings to the various publics (Kotler & Keller, 2013). Enhancing brand image help promote environmentally friendly product against environmentally unfriendly products. Olawale & Garwe (2018) define environmental unfriendly products as products which have negative effect in the environment during production, use and disposal. Sarkis and Talluri (2002) assert that environmental unfriendly products contribute to pollution waste of resources and degradation of the environment. Therefore, green literacy is important for consumers to make informed decisions on environmental impact of products and this can be achieved through green labeling that certify product as environmentally friendly. This will help environmental conscious consumers and their behavior towards green products and services.

2.2 Theoretical Review

2.2.1 Institutional Theory

Di Maggio and Powell created the institutional theory in 1983. External reasons that compel any firm to start or adopt new practices are often explained by institutional theory. Institutional theory is helpful in the environmental area to comprehend how ecological sustainability definitions are created, adopted, and disseminated throughout organizations. According to this hypothesis, businesses embrace green practices as a means of gaining legitimacy when they are widely used and seen as socially beneficial inside the institutional setting. According to Di Maggio & Powell (1983), organizations adopt commercial procedures since doing so increases their credibility. According to Chien & Shih (2007), corporations undertake initiatives or practices to obtain legitimacy

or acceptability with society, which is central to the institutional theory. Zhu, Sarkis & Lai (2007) propose that external pressures influence organizations to adopt certain practices; these pressures are normative, coercive, and mimetic. Maignram & Mcalister(2003) contends that firms that fail to gain acceptance from the relevant stakeholders and society due to negative externalities are likely to perform poorly compared to those that gain acceptance as a result of deliberate implementation of green logistics. This theory provides useful guidance on distribution methods and practices that can reduce the carbon footprint of industrial companies, particularly those that produce bottled water.

2.2.2 Study Model

This study is aimed to establish the relationship that exists between green logistics and environmental sustainability of bottled water factories in Delta state, Nigeria. This is shown in the frame work below.

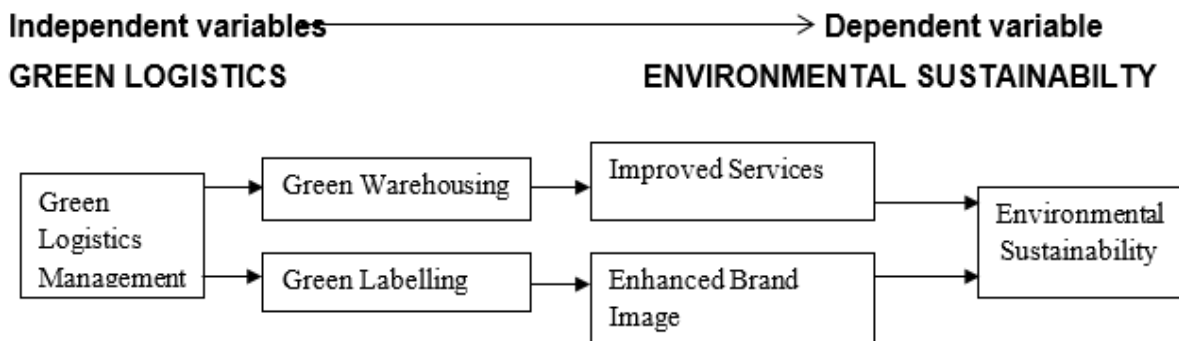


Figure 1: The model that guide the research work

Source: Researcher's Conceptualization, 2025

The model in fig. 1 links independent variables with the dependent variables as shown above. This independent variable was considered because Mckinnon, Browne, Whiteing & Piecyk (2015) opine that many firms are towing the path of greenness and are adopting various practices such as adopting technological process to reduce environmental impacts, using more environmentally friendly raw materials at production and distribution stages, exploring possibilities of recycling used products, embracing green education to various stakeholders, and energy saving technologies. Similarly, Polonsky (2021) asserts that most firms now adopt and accept green marketing to produce green products for reasons such as government pressure in aligning to climate change, following the environmental trend, and to be green competitive. In this study, the measures to achieve environmental sustainability are: improved services and enhanced brand image.

3. RESEARCH METHODOLOGY

The survey method was used to establish the relationship that exists between green distribution practices and environmental sustainability through the use of a questionnaire.

The population of this study consists of 1167 owners/distributors of bottled water in Delta state.

The data for this study was analyzed using descriptive statistics and correlation analysis with the help of IBM SPSS statistics 27.0.1, inferential statistics of the single sample t-test technique was used to test the relationship between the independent and dependent variables in the hypotheses formulated.

4. DATA PRESENTATION AND RESULTS

4.1 Research Question One:

What is the relationship between green warehousing and improved services?

Table 1: Mean responses of bottled water firms' owners/distributors to green warehousing and improved services (n=298)

	Items	$\bar{X}$	SD	RMK
1	The green warehousing strategy used in my firm helped increase pollution and greenhouse gas emission	11.0067	.81647	Disagreed
2	I do not use sustainable practices in powering the storage facilities	12.3289	1.70735	Disagreed
3	I adopt green warehousing practices which provide value-added services and reduce cost of energy	30.5470	7.09670	Agreed
4	Eco-warehousing practices adopted in my firm helped to increase carbon footprint	30.8523	6.80299	Agreed
5	I consider warehouse layout, inventory management, warehouse staff, warehouse operation, onsite facility, mechanical handling and warehouse management system in my bottled water firm.	30.6107	7.03068	Agreed
6	The design and construction of storage facility in my firm meet the prerequisites of non-polluted environment	31.3523	7.20821	Agreed
7	I engage the internal and external stakeholders involved in achieving the goals of green warehousing	29.8322	7.22174	Agreed
8	The warehouses are in the right location to reduce environmental impact	31.3188	6.26430	Agreed
9	I use higher polluting properties in building my warehouse and there is no teamwork on facility usage	12.4866	.52044	Disagreed
10	I use natural light and energy efficient lighting	29.9899	7.23975	Agreed

Source: Researcher's computation (2025)

Table 1 highlights the mean responses from bottled water firms' owners/distributors to green warehousing and improved services, with a sample size of 298 respondents.

The computations revealed all items having means above 29.8 except for items 1, 2 and 9 which were negatively skewed.

The standard deviations stood at 6.26 and above, except for items 1, 2, and 9 which recorded 1.70 and below. This implies that, green warehousing has positive relationship with improved services.

4.2 Research Question Two

Is any relationship between green labelling (design) and enhanced brand image?

Table 2: Mean responses of bottled water firms' owners/distributors to green labelling (design) and enhanced brand image (n=298)

s/n	Items	X	SD	RMK
1	Your firm's products are certified by international organization standardization	23.9564	11.42866	Agreed
2	The firm's labels address environmental problems	24.2886	9.96681	Agreed
3	The firm's labels raise and build awareness about environmental sustainability	30.6174	7.07925	Agreed
4	Your labels carry information about overall environmental benefits	30.9664	7.81580	Agreed
5	Your labels do not promote environmentally green consumer consciousness	12.4027	.68085	Disagreed
6	The eco-labelling programme of your firm involves various stakeholders such as: government, programme managers, industries, commercial associations, consuming public and international communities and is profitable	30.6409	7.06740	Agreed
7	Your labels help to create good public image and have competitive advantage	29.8792	7.21336	Agreed
8	The eco-labels use by your firm do not help consumers to use environmentally friendly products	12.9765	1.27157	Disagreed
9	The eco-label s used in the firm has single-attribute	11.5235	.55281	Disagreed
10	The eco-labels used in the firm has multi-attributes and is consumer educative	29.9396	7.09363	Agreed
	Valid N (listwise)			

Source: Researcher's computation (2025)

Table 2 highlighted the mean responses from bottled water firms' owners/distributors to green labelling (design) and enhanced brand image, with a sample size of 298 respondents.

The computations revealed all items having means above 23.95 above except for items 5, 8 and 9 which were negatively skewed, and have means of 11.52 and below.

The standard deviations stood at 7.06 and above, except for items 5, 8, and 9 which recorded 1.27 and below. This implies that, green labelling (design) has strong relationship with enhanced brand image.

4.3 Data Analysis

In examining the relationship between the variables, the study employed the Pearson Product Moment Correlation Coefficient, to report the correlation results of the dependent variable of Environmental Sustainability (ENSUS) and the independent variables of Green Warehousing (GRWH) and Green Labelling (GRLB).

The results are presented below:

Table 3: Correlation Results of Green Logistics and Environmental Sustainability

		GRWH	GRLB
GRWH	Pearson Correlation	1	.997**
	Sig. (2-tailed)		.003
	Sum of Squares and Cross-products	20003.000	21409.000
	Covariance	6667.667	7136.333
	N	4	4
GRLB	Pearson Correlation	.997**	1
	Sig. (2-tailed)	.003	
	Sum of Squares and Cross-products	21409.000	23033.000
	Covariance	7136.333	7677.667
	N	4	4
*. Correlation is significant at the 0.05 level (2-tailed).			
**. Correlation is significant at the 0.01 level (2-tailed).			

Source: Researcher's computation (2025)

In table 3 Pearson Product Moment Correlation Coefficient (PPMCC) was used to measure the direction and size of the association between the dependent and the independent variables and between the independent variable. Specifically, there are strong negative relationships between Environmental Sustainability (ENSUS) and the independent variables with correlation coefficient values of -.984 and -.993, respectively. Also, all p values (.016 and .007) for GRWH and GRLB respectively are lesser than the alpha value of 0.05 level (2-tailed). This implies that, these variables have strong negative impact on environmental sustainability if they are lacking.

On the other hand, the results show strong positive correlations among the independent variables. Green Warehousing (GRWH) shows a strong positive relationship (.002) which implies a substantial association between the variables. Furthermore, Green Labelling, on the other hand is positively related with Green Warehousing (GRWH) (.003). These positive associations indicate that, Green Labelling are generally in alignment with other green logistics, suggesting that, firms with robust (GRLB) are likely to engage more extensively in green warehousing and labelling.

The results indicate that, all the associations between the variables are strong, suggesting that, while these green logistics and environmental sustainability are related, the correlations are still very strong. The absence of weak correlations implies that, these are the major factors influencing environmental sustainability.

4.5 Test of Hypotheses

4.5.1 Hypothesis One

Ho: There is no significant relationship between green warehousing and improved services. Responses from table 1 were used to test this hypothesis. (Other results pertaining to this computation are found in Appendix I).

Table 4: One-Sample Statistics on the relationship between Green Warehousing and Improved Services

	N	Mean	Std. Deviation	Std. Error Mean
Green Warehousing and Improved Services	298	30.6174	7.07925	.41009

Source: Researcher's computations, 2025.

Table 5: One-Sample T-test Coefficient Computation on the relationship between Green Warehousing and Improved Services

	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Green Warehousing and Improved Services	74.660	297	.000	30.61745	29.8104	31.4245

Source: Researcher's computations, 2025.

From table 4 the number of cases (298), the mean (30.6174), the standard deviation (7.07925) and the standard error mean (.41009).

Table 8 contains the computed t value (74.660) degrees of freedom (297) p value of for 2-tailed test (.000) mean difference (30.61745) lower and upper confidence intervals are (29.8104) and (31.4245) while the interval limits stood at 95% of confidence.

The computed t value of 74.660 is statistically significant because $X = 30.6174$, $SD = 7.07925$, $t (74.660)$, $p < .05$.

Therefore, the null hypothesis of 'no significant relationship between green warehousing and improved services is rejected. The conclusion drawn is that green warehousing can significantly influence improved services.

4.5.2 Hypothesis Two

Ho: There is no significant relationship between green labeling and enhanced brand image.

Responses from table 2 were used to test this hypothesis. (Other results pertaining to this computation are found in Appendix II).

Table 6: One-Sample Statistics on the relationship between Green Labeling and Enhanced Brand Image

	N	Mean	Std. Deviation	Std. Error Mean
Green Labeling and Enhanced Brand Image	298	29.5235	7.55281	.43752

Source: Researcher's computations, 2025

Table 7: One-Sample T-test Coefficient Computation on the relationship between Green Labeling and Environmental Sustainability

	Test Value = 0					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Green Labeling and Enhanced Brand Image	67.479	297	.000	29.52349	28.6625	30.3845

Source: Researcher's computations, 2025.

From table 6 the number of cases were 298, the mean was 29.5235, the standard deviation was 7.55281 and the standard error mean (.43752). Table 9 contains the computed t value of 64.479, degrees of freedom (297), p value of for 2-tailed test (.000) mean difference (29.52349) lower and upper confidence intervals (28.52349) and (30.3845) respectively, while the interval limits stood at 95% of confidence.

The computed t value of 64.479 is statistically significant because $X = 29.5235$, $SD = 7.55281$, $t (64.479)$, $p < .05$. Therefore, the null hypothesis of 'no significant relationship between green labeling and enhanced brand image is rejected. The conclusion drawn is that green labeling will enhance brand image.

4.5.3 Discussion of Findings

The results of the study are hereby discussed below:

From hypothesis one, it was discovered that there is significant relationship between green warehousing and improved services. This relationship is statistically significant as $X = 30.6174$, $SD = 7.07925$, $t (74.660)$, $p < .05$, two-tailed. The finding agrees with the works of Mangan, and Lalwani (2016) who examined green supply chain management case studies from the United Kingdom logistic sector that highlight the implementation of green supply chain practices including warehousing. The study reveals the different green initiatives such as turning off lights in unoccupied warehouse areas which gave a significant reduction in electricity expenses between 60-80%, amongst others. The findings also agree with the research carried out by Panya, Ochiri, Achura and Gakure (2021) to determine effects of green distribution variables on the organization performance of sugar sub-sector in Kenya. Their study revealed that green distribution is an important factor in cost reduction and performance improvement in the sugar sub-sector.

In hypothesis two it was unveiled that there is significant relationship between green labeling and enhanced brand image. This relationship is statistically significant as $X = 29.5235$, $SD = 7.55281$, $t (64.479)$, $p < .05$, two-tailed. The finding agrees with the works of the work of Francis and Allan (2018) who undertook a study on the impact of green distribution practices on environmental performance of chemical manufacturing firms in Kenya. The findings also agree with works of Chukwuka and Eboh (2018) who investigated the effect of green business practices on organizational performance of

selected manufacturing firms in Nigeria. Their study revealed that, green business initiatives such as green labeling had significant and positive effect on the selected manufacturing firm's productivity, amongst others.

4.5.4 Summary of Findings

Below are the summaries of findings as revealed by the various hypotheses tested:

- i. Hypothesis one indicated that, there is significant relationship between green warehousing and improved services in Bottled Water Factories in Delta State because $X = 30.6174$, $SD = 7.07925$, $t(74.660)$, $p < .05$.
- ii. Hypothesis two, pointed out that, there is significant relationship between green labeling and enhanced brand image in Bottled Water Factories in Delta State because $X = 29.5235$, $SD = 7.55281$, $t(64.479)$, $p < .05$.

5. CONCLUSIONS

The followings conclusions were drawn from the study:

- i. Green warehousing has direct positive relationship with improved services of Bottled Water Factories in Delta State.
- ii. Green labeling significantly enhanced brand image of Bottled Water Factories in Delta State

5.1 Implications of the Study

The findings of this study have several implications for environmental sustainability in Bottled Water Factories in Delta State, these include:

- i. Green warehousing concern green logistics and supply chain management which is a bridge between vendors and customers. This implies that, lack of green warehousing practices will bring about increase in energy consumption, energy cost, greenhouse gas emission, increase in waste generation, increase in hazard situations, increase in carbon emissions, inefficient transportation, amongst others.
- ii. Green labeling represents a labeling system that identifies products or services as being environmentally friendly. The implication of this is that, if these labels are not made of environmentally sustainable materials, they will have negative impact and contribute to the overall degradation of the environment and the well-being of the planet as a whole

5.2 Recommendations

Based on the above findings, the following recommendations were made:

- i. Green warehousing should be encouraged among bottled water factories to reduce environmental pollution and greenhouse gas emission and to save energy.

- ii. Green labeling should be positioned to do less harm to the environment through consumer awareness and education, regulation and policy support, market incentives, environmental impact assessment, standardization, transparency and accountability, collaborations, amongst others as this will help reduce environmentally unfriendly products.

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APPENDIX I

Descriptive Statistics for Research Question One					
	N	Minimum	Maximum	Mean	Std. Deviation
The green warehousing strategy used in my firm help increase pollution and greenhouse gas emission	298	10.00	12.00	11.0067	.81647
I do not use sustainable practices in powering the storage facilities	298	10.00	14.00	12.3289	1.70735
I adopt green warehousing practices which provide value-added services and reduce cost of energy	298	10.00	40.00	30.5470	7.09670
Eco-warehousing practices adopted in my firm help to increase carbon footprint	298	10.00	40.00	30.8523	6.80299
I consider warehouse layout, inventory management, warehouse staff, warehouse operation, onsite facility, mechanical handling and warehouse management system in my bottled water firm.	298	10.00	40.00	30.6107	7.03068
The design and construction of storage facility in my firm meet the prerequisites of non-polluted environment	298	10.00	40.00	31.3523	7.20821
I engage the internal and external stakeholders involved in achieving the goals of green warehousing	298	10.00	40.00	29.8322	7.22174
The warehouses are in the right location to reduce environmental impact	298	14.00	40.00	31.3188	6.26430
I use higher polluting properties in building my warehouse and there is teamwork on facility usage	298	10.00	13.00	12.4866	.52044
I use natural light and energy efficient lighting	298	10.00	40.00	29.9899	7.23975
Valid N (listwise)	298				

APPENDIX II

Descriptive Statistics for Research Question Two

	N	Minimum	Maximum	Mean	Std. Deviation
Your firm's products are certified by international organization standardization	298	10.00	40.00	23.9564	11.42866
The firm's labels address environmental problems	298	10.00	40.00	24.2886	9.96681
The firm's labels raise and build awareness about environmental sustainability	298	10.00	40.00	30.6174	7.07925
Your labels carry information about overall environmental benefits	298	10.00	12.00	30.9664	7.81580
Your labels do not promote environmentally green consumer consciousness	298	10.00	40.00	30.6409	7.06740
The eco-labelling programme of your firm involves various stakeholders such as: government, programme managers, industries, commercial associations, consuming public and international communities and is profitable	298	10.00	13.00	12.4027	.68085
Your labels help to create good public image and have competitive advantage	298	10.00	40.00	29.8792	7.21336
The eco-labels use by your firm do not help consumers to use environmentally friendly products	298	10.00	39.00	12.9765	3.27157
The eco-label s used in the firm has single-attribute	298	10.00	40.00	11.5235	.55281
The eco-labels used in the firm has multi-attributes and is consumer educative	298	10.00	40.00	29.9396	7.09363
Valid N (listwise)	298				

APPENDIX III

PEARSON PRODUCT CORRELATION COEFFICIENT COMPUTATIONS FOR THE VARIABLES

Correlations				
		ENSUS	GRWH	GRLB
ENSUS	Pearson Correlation	1	-.984*	-.993**
	Sig. (2-tailed)		.016	.007
	Sum of Squares and Cross-products	.750	-120.500	-130.500
	Covariance	.250	-40.167	-43.500
	N	4	4	4
GRWH	Pearson Correlation	-.984*	1	.997**
	Sig. (2-tailed)	.016		.003
	Sum of Squares and Cross-products	-120.500	20003.000	21409.000
	Covariance	-40.167	6667.667	7136.333
	N	4	4	4
GRLB	Pearson Correlation	-.993**	.997**	1
	Sig. (2-tailed)	.007	.003	
	Sum of Squares and Cross-products	-130.500	21409.000	23033.000
	Covariance	-43.500	7136.333	7677.667
	N	4	4	4
*. Correlation is significant at the 0.05 level (2-tailed).				
**. Correlation is significant at the 0.01 level (2-tailed).				

APPENDIX IV

Further Results on Hypothesis One tested on the Relationship between Green Warehousing and Improved Services

T-TEST

/TESTVAL=0

/MISSING=ANALYSIS

/VARIABLES=GRWH

/ES DISPLAY(TRUE)

/CRITERIA=CI (.95).

One-Sample Effect Sizes					
		Standardizer ^a	Point Estimate	95% Confidence Interval	
				Lower	Upper
Green Warehousing and Improved Services	Cohen's d	7.07925	4.325	3.959	4.690
	Hedges' correction	7.09719	4.314	3.949	4.678
a. The denominator used in estimating the effect sizes. Cohen's d uses the sample standard deviation. Hedges' correction uses the sample standard deviation, plus a correction factor.					

APPENDIX V

Further Results on Hypothesis Two tested on the Relationship between Green Labeling and Enhanced Brand Image

One-Sample Effect Sizes					
		Standardizer ^a	Point Estimate	95% Confidence Interval	
				Lower	Upper
Green Labeling and Enhanced Brand Image	Cohen's d	7.55281	3.909	3.574	4.242
	Hedges' correction	7.57195	3.899	3.565	4.232
a. The denominator used in estimating the effect sizes. Cohen's d uses the sample standard deviation. Hedges' correction uses the sample standard deviation, plus a correction factor.					