Green Transportation and Environmental Sustainability in Selected Manufacturing Entities in Kampala District, Uganda

Rugasira Jack[1], Agaba Moses[2], Jotham Mbiito Byarugaba[3], Rita Makumbi[4], Kyatuheire Jill[5] and Asiimwe Jane[6]

[1,2]Kabale University, Department of Management Science
[3,4] Ndejje University, Department of Procurement and Logistics Management
[3]USAID Freedom House
[4]United Nations High Commission for Refugees

Abstract: The purpose of this study was to empirically establish the relationship between green Transportation and environmental sustainability in the Kampala district. The hypothesis of the study stated that there is a significant relationship between green transportation and environmental sustainability in selected manufacturing entities in the Kampala district. The study employed a cross-sectional design. The study also used quantitative approaches in collecting and analysing the data both descriptively and inferentially. The study population was 675 manufacturing entities. Using the purposive sampling technique, the study took a sample of 248. Data were obtained from 186 usable questionnaires. The researcher applied Statistical Package for Social Scientists (SPSS) to test all four hypotheses. The results are presented in terms of descriptive statistics and inferential statistics in terms of correlation analysis, simple regression and multiple regression analysis models. The findings show that there was a very low but positive correlation (r= 0.297, sig .000, p< .01) between Green Transportation and Environmental Sustainability. This implies that any improvements made in green transportation can be associated positively with environmental sustainability in Kampala. Green Transportation reflects a small F-statistic of 17.841 indicating the statistical significance of each of the regression coefficients. Green Transportation reflects a small F-statistic of 17.841 indicating the statistical significance of each of the regression coefficients. The findings further confirm that Green Transportation has little effect on Environmental Sustainability. It is therefore recommended that the education department of the National Environment Management Authority approaches the non-compliant firms and educates them on the best ways of cost-effectively adopting green transportation to offset their fears about costs involved in adopting Green Transportation; many of which are groundless.

Keywords: Green Manufacturing Environmental Sustainability, Manufacturing Entities, Kampala district

1. INTRODUCTION

Green transportation is the movement of goods, people and service delivery items from one place to another in a manner that protects the environment from degradation, avoidance of acts like the use of fossil fuels, wastage or high oil usage and congestion (Mingxuan, et al., 2019). Green transportation is another aspect of green supply chain practices, it means the movement of goods and services from points of acquisition, through points of further processing to the final consumers using environmentally safe means like low fuel consumption vehicles, electric cars, and other means that don't pollute the environment or reduce the level of pollution

Green transportation is also critical to the contribution of a sustainable environment, if we can adopt transportation means that don't pollute the environment by using clean fuels like natural gas, electric vehicles, hybrid vehicles, low fuel consumption vehicles, bicycling and walkways, this could lead to prevention of air and water pollution (Mingxuan, et al., 2019). The more we reduce pollution by vehicles, the more air and water pollution will be improved, this manifested during the national lockdown which was compelled by the COVID-19 pandemic in 2020. The air quality was checked after most vehicles had been stopped from moving for over four months and it was found to have improved tremendously (AirQo, 2020).

Uganda for example is focusing on a green economy by 2030 (National Environmental Management Authority, 2018). This is way too far and something must be done now since pollution from manufacturing entities is causing

environmental sustainability problems. Coca-Cola Uganda and a few other businesses a reverse logistics specifically to collect and recycle plastic waste. The business seems lucrative and much as it is growing, the plastic waste collected is still very little compared to what accesses the environment, leaving the rest to either be taken to landfills or poorly disposed into water bodies and the general environment (Ministry of Water and Environment, 2018). Most of the green manufacturing activities aren't being practised in Uganda, this leaves a big gap in line with educating supply chain manufacturers on what to do and how to do it. Some manufacturers are using simple systems like back flashing to treat fumes which is a good starting point. That shows that they are willing to go the whole way in improving their systems to much more green but they need more knowledge and better infrastructure to help them achieve that. Efforts must be made by the government to get all plastic waste cleared from the environment.

Sustainability is a wide principle, it means a process of mainly carrying out activities in a manner that upholds the well-being of three aspects, environmental, social, and economic (Cousins, Lawson, Petersen & Fugate, 2019). Environmental sustainability is the effort made by human beings to save the planet from destruction by climate change such that it is a better place for us and future generations to enjoy their stay on. Supply chains have contributed the most to global warming, especially through manufacturing that pollutes the air, water bodies, and land, and the fast depletion of raw materials.

Such occurrences don't support environmental sustainability, which is a critical prerequisite to a life-supporting planet. Just like (Chathurani, 2020), mentions the lack of environmental sustainability has over time become a critical concern in the manufacturing sector globally and an immediate remedy is required if the world is to survive the foreseen ramifications. Protecting the environment may be a costly venture but the dangers of not proactively protecting it are worse with situations like deaths occurring (Seyed, Ahmad, Mohammad, & Vahdat, 2018).

Low environmental sustainability can be influenced naturally or by human activity, but whichever way, it causes devastating effects on supply chains. This includes but is not limited to, suffering by humanity due to long-lasting effects like threats to food security, storms that destroy properties, floods that drown people, and water bodies that serve communities get polluted causing water-borne diseases like cholera which are life-threatening.

In Uganda, evidence of continued events that are directly related to poor environmental sustainability includes increased drought spells, inadequate waste management, and continued flooding incidences, not to mention the multiple loss of human life and food in the regions affected. The effects of poor environmental sustainability have manifested through, inadequate resource use which manifests in the cement industries where manufacturers are in continuous search of the depleting key raw materials. Tendencies that suggest an ecological imbalance are noticeable through drought spells mostly evidenced in the northeastern part of the country. In addition, Uganda has consistent epidemics especially the cholera outbreaks in Kampala which point toward contamination of water. The environment is continually strained through wetlands misuse which is evidenced through human use in addition to poor waste disposal tendencies that have a potent effect on the environment. (National Environment Management Authority, 2017/2018).

Several agencies like the National Environment Management Authority, Ministry of Water and Environment, National Forestry Authority and Kampala Capital City Council have made an effort to counter these negative developments as a way to improve environmental sustainability. However, these do not seem to have made sustainable results as Uganda continues to grapple with the issue at hand. For that matter, this study investigated the relationship between green supply chain practices and environmental sustainability in the Kampala district.

Ministry of water and environment, have educated the country on how to uphold environmental sustainability but all efforts haven't yielded enough (National Environment Management Authority, 2018). They have encouraged green transportation, among others (Ministerial Policy Statement, Ministry of Water and Environment; FY 2020-2021). Despite all these efforts, environmental sustainability has continued to be a challenge in Kampala and this is due to supply chains not operating consistent with environmental sustainability (BMAU briefing paper, 2018). If

environmental sustainability in Kampala is to be improved, certain aspects that negatively impact it must be effectively identified and consequently addressed

As such this study sets out to establish the relationship between green transportation and environmental sustainability in Uganda, focusing on selected manufacturing entities in the Kampala district. Since they are key to environmental sustainability, embracing green supply chain activities, and would allow sustainable solutions to environmental sustainability challenges.

2 Brief Review of Empirical Literature

Relationship between green transportation and environmental sustainability

Several studies are available on green transportation and environmental sustainability. For instance, Han-ru (2016) argues that transportation is the movement of goods and services from the place of production to the place of consumption. For a very long time, goods and services have had to move from point of production to point of consumption and that's how commerce has thrived globally. If goods and services are produced and they are not consumed from where they are produced, they will be moved to places where they are required. Scarcity and demand have necessitated the movement of goods and services from regions to national and global markets where demand is more effective and the growth of the business to greater heights can be realized. Transportation has helped to see supply chains deliver goods and services to local, regional, national and global markets, which has enormously helped to improve business performance for those that have ventured in moving goods from one place to better market places. However, much as transportation of goods and services especially global trade has contributed to the growth and development of markets hence improving business growth and general welfare, this has come with a huge cost which is environmental sustainability (Mona, & Nanis. 2020). Most transportation modes and means use fossil fuels like diesel and petrol (gasoline) which aren't friendly to the environment. Traditional means of transportation contribute to general economic and social development but at a very huge life-threatening cost, that must be countered as early as possible. It is said that in 2017, the transportation sector in the USA contributed a hefty 29 per cent of greenhouse gas emissions which were recorded as the sector that contributed the highest in GHG in the country. Globally, the transportation sector alone contributes 20 per cent of emissions per year, and this is said to be more from motor vehicles which include large trucks, buses, light trucks, mini-buses and small cars. This trend must stop since it is taking the planet down the drain. This has to change now with every stakeholder doing what they can towards reversing the trend. The way forward is for everyone to think globally about how to fight environmental sustainability challenges and act locally by doing what supports environmental sustainability within your geographical area of reach.

Green transportation is the method used to move goods and services from one place to another, bearing in mind the protection of the environment (Chermahini, Mohammadi, Mokhtari & Sharafabad, 2019). Clean air and water availability is a situation where water bodies and the air are evid from impurities, some of which come from vehicle pollution. Green transportation can influence the availability of clean air and water by significantly reducing transportation pollution which is caused by the use of fossil fuels and by replacing the fossil fuels with natural gas and electric vehicles.

Green transportation is also defined as the movement of goods and services with the least possible carbon emission, this means usage of low fuel consumption and electric vehicles (Martins, Anholon & Quelhas, 2019).

For many decades, transporters have had an interest in the financial efficiency of their operations, negating clean air and water availability (Agyemang, et al., 2018). Their biggest concern was transportation which ensures fast mobility and cost efficiency (Martins et al., 2019). However, this shouldn't be the case because the result of it is that even what they were looking for would still be lost, lives inclusive because their actions jeopardize environmental sustainability. Using low fuel consumption and electric vehicles is a better method since it is cost-cutting and also promotes green transportation. The world is rapidly changing and all stakeholders must come up in unison to devise long-lasting solutions to the challenges that await this planet. Both the government and private sector must join efforts each doing something in their capacity to reverse the trend, governments must devise policies, educate the masses and

industrialists on how to go green, provide necessary infrastructure like natural gas filling stations, enforce the transitioning to green transportation methods, prosecuting those that don't heed, influencing markets to trade in green products, etc. while the private sector should, adhere to governments call to go green, have their staff trained in green processes, acquire green systems like machinery whether by debt financing where necessary.

There are many solutions to pollution by transportation means, electric amongst the solutions, hydrogen cells are also being produced to replace the traditional fossil fuels, bicycling, use of low fuel consumption vehicles also significantly reduce the amount of carbon produced, hybrid cars that use both electric systems and fossil fuels but use much less of the fossil fuels hence polluting much less than the traditional vehicles, efficient routing of transportation systems which insist on less travel time and distance to rotations, sharing of vehicles by organization staff instead of each having to drive on their own which pollutes the environment more. The above are all scientifically tested and proven methods that can deliver sustainable low emissions and counter carbon emissions in the transportation sector. There are some radical ways of countering carbon emissions from the transportation sector, the UK for example is considering surcharges for frequent air travelers. This isn't a solution. Indeed, one may not have to travel whenever they have something to do abroad but the aviation sector must continue and thrive. If the UK insists and enforces surcharges on frequent air travelers, they won't have resolved the challenge of carbon emissions by the aircraft, and worst of all, they shall be directly countering business which is directly countering economic sustainability which this study is against. Aircraft can also use eco-friendly fuels and continue flying or even increase the frequency of travel while not polluting the environment at all. The purpose of this study is to create harmony between supply chain activities and environmental sustainability and not discourage supply chain activities from going on because it would then suffocate businesses hence causing economic sustainability challenges.

In a stilted "green transportation and logistics performance, and improved composite index" carried out by Mingxuan Lu, Ruhe Xie, Peirong Chen, Yifeng Zou & Jie Tang (2019). The aim was to construct an environmental logistics performance index (ELPI) for assessing the overall performance of green transportation and logistics practices. The index was measured by the Logistics performance index (LPI). The main findings of the study showed that the environmental logistics performance index has a great positive relationship with the logistics performance index. This is indeed a good development but lacks a critical factor which is how green transportation can be attained in practice. This leaves a gap that needs to be addressed.

Sustainability in transportation has been devised, but most of them aren't oriented toward reducing carbon emissions (Patlins, 2017). Route optimization for reduced distances, partnering with other industrial players, capacity planning, leasing, hiring of vehicles and other transportation means are some of the ways being employed to obtain efficiency in transportation operations (Barzinpour & Taki, 2018). The above-mentioned strategies still fall short of effectively having an environmentally friendly transportation system that ensures clean air and water. Knowledge on how to practically go green in the transport sector and supporting equipment are still lacking and must be introduced to the public by the government and others mandatorily follow (Mona, Abdel, Ahmed & Nanis, 2020).

Production and usage of environmentally unfriendly oils it s still a very big business that changes global market dynamics not only causing price hikes and inflation when tampered with but war as well (Pojani & Stead, 2015). This comes as a blessing and a challenge as well, because when fuel is expensive, all other items like commodities become expensive. But the blessing is that the current fuel price hikes also push the world to think of better alternative fuels that are not only low cost but also environmentally safe. Getting an effective alternative is what remains a big challenge especially because many countries like those in the middle east produce a lot of fossil-based oils and aren't likely to stop it due to the lucrative nature of the business. Most of them do that as a major economic activity upon which their economies survive and thrive (Luan, & Meng. 2018). This is a big global threat and must be addressed expeditiously.

A similar study was carried out in Uganda to establish the effect of education on sustainable development in African Universities. It was established that through thorough education, the learner's knowledge of environmental sustainability is enhanced and many knowledge gaps are bridged (Jafari, Ghomi, Liang, & Kim, 2022). That is in

support of this study's projection that education on green transportation will eliminate ambiguities and make going green simpler on the supply chains hence having clean air, clean water and an environmentally sustainable planet.

The Uganda Green Growth Development Strategy highlights transportation improvement as one of the means of obtaining sustainability in Uganda, but their plan focuses more on financial sustainability and not environmental, it focuses on developing a multi-modal transportation system which focuses on mass transportation for urban areas, and distant area interconnectivity (National Environmental Management Authority, 2018). This won't resolve the problem that is caused by the current transportation system which is full of vehicles emitting gases and polluting air and water sources.

In 2016, global transportation contributed one-fourth of mission and emission sectors that might increase (Mingxuan et al., 2019). Several empirical types of research have been conducted, but they haven't come up with a more suitable approach through which entities can effectively implement green transportation (Kunieda & Gauthier, 2018). In conclusion, transportation is indeed a big global polluter, this calls for all governments like those in the developing world to devise formidable solutions to counter the challenge (Wei, Juan, & Yanlei. 2020). Major gaps are a lack of enough knowledge on how to obtain green transportation, enabling factors like natural gas and other non-fossil fuels and sufficient law enforcement. While the above-related studies added a lot of value to the published literature, several gaps were identified. For instance, all studies didn't address the way green transportation can be practically implemented, and that is a knowledge gap many studies reviewed never mentioned the need to improve green supply chain practices enforcement which is critical to the contribution to environmental sustainability. These are some of the gaps the current study hopes to fill; prompting this study to test the research hypothesis that:

H1: There is a statistically significant relationship between green transportation and environmental sustainability in selected manufacturing entities in the Kampala district

3 Methodology and Ethical Consideration

3.1 Methodology

The study adopted Positivism Philosophical orientation. Positivism is mainly associated with the philosophical stance of the natural scientist, which entails working with an observable social reality to produce law-like generalizations (Saunders, 2019). This philosophy was found to be sufficient for the study because it establishes the truth about what's exactly happening in supply chains thereby helping to develop a scientific model to enforce green supply chain practices (Crowther & Lancaster, 2008).
The study employed both a survey and phenomenological design. The survey encompassed a cross-section approach whereby data was collected at a particular point in time. The study chose only a few illustrative sample essentials of a cross-section of manufacturing entities in Kampala. The researcher was not obliged to have further interactions with the study respondents.

In regard to the nature of the study objectives, a cross-sectional survey design was the most suitable to gather quantitative data and make statistical predictions and correlations of factors associated with green supply chain practices and environmental sustainability.
The phenomenological approach was also adopted for this study, this was applied to establish inner most qualitative data using an open-ended question appended to the survey tool at the end of each objective, this open-ended question sought to establish the respondent's view on how green supply chain practices could be improved in order to have them contribute to environmental sustainability. The use of two methodological designs aimed at detailed information gathering from respondents is highly recommended and supported due to its nature of helping the study to obtain more insight into what is happening in the area (Ntayi, 2005, Mafabi, 2012).

The study area was environmental sustainability in selected manufacturing entities in the Kampala district. This geographical area has many high scale manufacturing facilities, many of them being concentrated in close proximity, making accessibility easy (BMAU Briefing Paper. 2018). The target population was all the manufacturing entities in the Kampala district. Kampala has 675 manufacturing entities (www.Uma.or.ug).

The unit of analysis was the manufacturing entities and units of inquiry included top management like managing directors, general managers, operations managers, production managers, and procurement managers of these entities because they were well positioned to provide information on green supply chain practices and environmental sustainability in manufacturing entities in Kampala district.

The sample size constituted 248 entities from a population of 675 entities; This was decided upon using Robert V. Krejcie and Daryle W. Morgan's table of sample size determination. The research considered a more targeted way to select units of analysis and units of inquiry from whom to collect primary data. After determining the sample size of 248 manufacturing entities, they were categorized according to their level of activity and those with higher operations that were likely producing more waste were purposively selected. From these manufacturing entities and top management, production and operations managers, and procurement managers were selected. Purposive sampling from the categorized population was chosen as the method was fit for the purpose as only the managers of entities that produced a lot of waste were targeted as study participants. The study collected and analyzed primary data.

Data were collected at a single point in time since the study was a cross-sectional study. The cross-sectional kind of study was used due to its adequacy in fully exhausting the avenues of such a study and this method has been used in many more studies (Walugembe, 2018). Data was collected from one source and that is primary data which was collected through direct interviews with respondents.

3.2 Validity of Research Instrument

The researcher used the judgment of different experts to verify the content validity of the instruments. To assess this, judges were contacted to evaluate the relevance of each item in the instruments in relation to the objectives. The experts rated each item as either relevant or not
Relevant. The questionnaire was developed based on already used questionnaires which makes it appropriate enough for the exercise. Biases and inaccuracies were reduced through the creation of rapport between the interviewer and interviewee, and explanations to make statements and questions well understood were also emphasized. Validity was determined using the Content Validity Index (C.V.I). C.V.I = Items rated relevant by both judges divided by the total number of items in the questionnaire.

$$CVI = \underline{\text{No. of items rated relevant}} \qquad \geq 0.5$$

Total no. of items

In case less than the projected number of respondents had participated due to different reasons that caused failure to participate, a mathematical formula to establish a sufficient number like the one below was provided to ensure that the number of respondents is sufficient.

The CVI for the questionnaire was valid at above 0.5 because the least CVI recommended in a survey study should be 0.5 (Amin, 2005). CVI results were as presented in Table 3.2.

Content Validity Index

Items	Number of Items	Items Deleted	Items Retained	Content Validity Index
Green Sourcing	12	2	10	0.833
Green Manufacturing	7	1	6	0.857
Green Transportation	6	2	4	0.667

Reverse logistics	6	1	5	0.833
Resource use efficiency	7	2	5	0.714
Ecological balance	8	3	5	0.625
Clean air and water	6	1	5	0.833
Wetland Management	7	2	5	0.714
Total Items	59	14	45	0.76 (AVG CVI)

Source: Primary   Data   2021

Instrument Reliability

Reliability is the extent to which a research instrument yields consistent results across the various items when it is administered again at a different point in time (Sekaran, 2016). To establish reliability, the instruments were pilot tested in areas with designated industrial parks in Namanve, Jinja and Gulu industries. Reliability was assessed using an intra-class reliability measure. The intra-class correlation coefficient is computed to measure agreement between two or more raters

Intra-class Correlation Coefficient

	Intraclass Correlation	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.703[b]	.622	.769	5.728	185	185	.000
Average Measures	.825[c]	.767	.869	5.728	185	185	.000

Source: Primary Data

The intra-class correlation coefficient values less than 0.5 are indicative of poor reliability. Values between 0.5 and 0.75 indicate moderate reliability; values between 0.75 and 0.9 indicate good reliability and values greater than 0.9 indicate excellent reliability (Sekaran, 2011). This study scored an intra-class correlation coefficient of 0.825 which is indicative of a tool with good reliability.

3.3 Data Analysis and Presentation

The data collected was analyzed using a computerized analysis application called Statistical Package for Social Scientists (SPSS). This included descriptive and inferential analysis. The descriptive analysis gives data structures in form of frequency tables, standard deviation, and percentages. The inferential analysis gives correlations, Regression and ANOVA tables. These were used to determine the relationship between the independent variables and the dependent variable. The results from the statistical analysis were presented in tables. This kind of analysis was done for each objective in the study.

3.4 Ethical Consideration

The ethics were handled with utmost care since any divergence or neglect of the ethical considerations would lead to a dispute regarding the study outcomes. In this regard, all necessary ethical guidelines were considered. Ethical approval was sought from Mengo Hospital Research Ethics Committee (MHREC) and Uganda National Council for Science and Technology (UNCST) was consulted for guidance on the ethical aspect of the study. Prior consent from the respondents was sought and all data collected from respondents was handled in a way prior agreed upon between the researcher and respondent. Exposing the respondent's identity and publishing sensitive material without permission wasn't and won't be done too. Environmental sustainability is quite a sensitive area which is fast affecting the world and we all have to participate in

Countering the trajectory. In doing so, all of us who decide to make an input in the quest to find a solution should do it with the best of ethics and integrity. Things like reporting falsehoods must at all times be avoided.

4 . RESULTS

Response rate

This study involved 248 respondents to enable the researcher come up with conclusive results about the relationship between green supply chain practices and environmental sustainability in the Kampala district. Only 186 of the respondents that were set for the study or research were able to respond to the study. This reflected a 75 per cent response rate

Table showing Response rate

| Instrument	Distributed	Returned	Response Rate
Questionnaire e	248	186	75 %

Source: Primary data (2021)

Background of the Respondents

This theme handles the background information on the respondents that participated in the study. The study identifies characteristics of the respondents that help judge their aptitude in expressing views about the relationship between supply chain practices and invites the entire environmental sustainability in the Kampala district. These characteristics include gender, age, the highest level of the education job description and tenure in the current docket.

Gender of the respondents

To take into consideration the gender of the respondents, the researcher recorded the results in figure 4.1.

Figure 4.1: Gender of the respondents


25.3

74.7
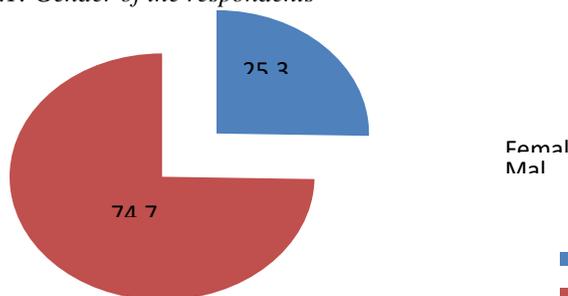
Femal
Mal

Primary Data 2022

From Figure 4.1 above, the study was conducted with mainly male respondents who constituted 74.7%. Female respondents, on the other hand, were 25.3%. The implication of such gender percentages in the study was that all genders were represented and their respective viewpoints on the relationship between green supply chain practices and environmental sustainability in the Kampala district were captured in the study in a legitimate manner. The responses were however male dominated. **Age of the Respondents**

To ascertain their respective age distribution, the respondents were asked to provide the study with their ages. Information presented in figure 4.3 below:

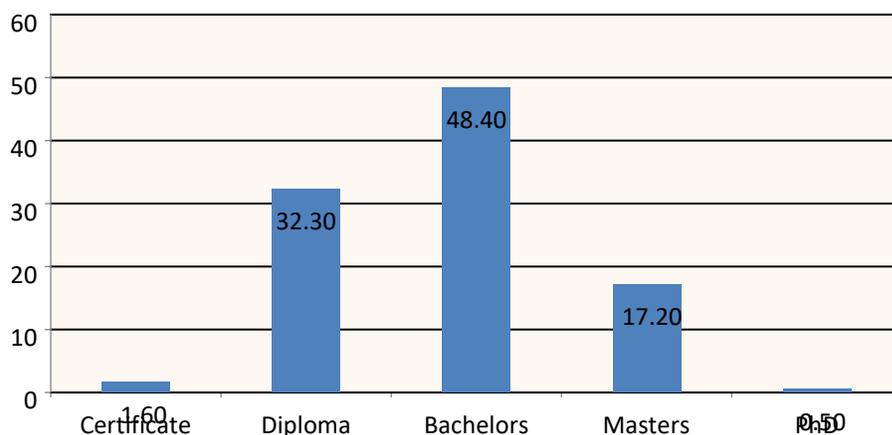*Figure 4.2: Age of the Respondents*
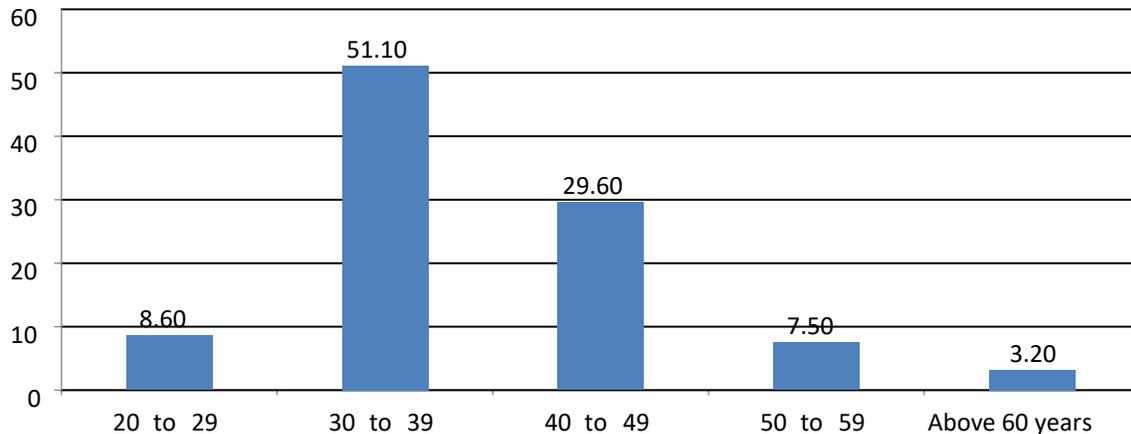
Primary Data 2022

Figure 4.2 above indicated that of the respondents who participated in the study, 8.6%, were in the range of 20 to 29, 51.1% were in the range of 30 to 39, 29.6%, were in the range of 40 to 49 years, 7.5% were in the range of 50 to 59 and 3.2% were Above 60 Years of age respectively.

The above statistics imply that all respondents (100 %) covered by the study were above ≥20 years of age and considered mature enough to give responses that were consistent and legitimate. The statistics also imply that there was fair distribution in terms of respondents' ages, which provided the study with views of respondents from all ranges in terms of age, without bias.

Highest Level of Education of the Respondents

Respondents were also asked to state their level of education and most of them indicated that they had a bachelor's degree as shown in figure 4.4 in detail below.

*Figure 4.3: Level of education of the respondents*

Primary Data 2022

Figure 4.3 depicts the fact that the largest part of the respondents had attained a bachelor's degree which stood at 48.4%. Only 1.6% held certificates. Those who had attained a Diploma constituted 32.3% of the respondents and Master's Degree holders were 17.2% of the respondents. One PhD holder participated in the study. This implied that the respondents who took part in the study were adequately educated and could provide information that was pertinent to the study.

Job description held in Industry.
The research also sought to know the job description of the respondents. The findings are shown in the table below:
Figure Showing Job description held in Industry
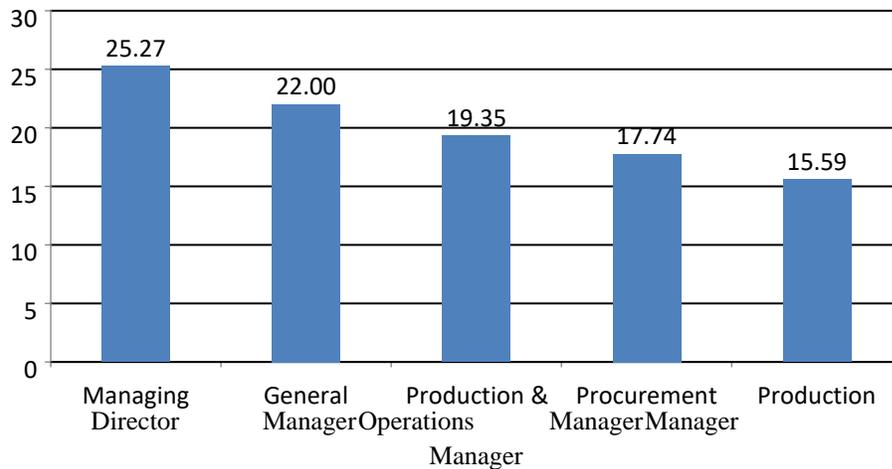
Primary Data 2022

Prominent from figure 4.4 above it is clear that 25.27% of respondents were managing directors, 22.04% were general managers, 19.35% were production and operation managers, 17.74% were procurement managers, and 15.59% were production managers. The implication was that the majority of respondents involved in the running of factories were the right people to give their opinion on the relationship between green supply chain practices and environmental sustainability in the Kampala district and their responses would be considered consistent and legitimate.

Correlation Results
Objective three of the study was to establish the relationship between Green Transportation and Environmental Sustainability in Kampala industries. This section delivers a detailed description of the inferential statistics obtained from the field of study based on the specific objectives. It goes on to present and answer the research questions. These findings were thus obtained on the relationship between green transportation and Environmental Sustainability in Kampala industries in terms of Green Transportation and how it relates to Environmental Sustainability in Kampala industries.

In order to assess the association and direction between Green Transportation and Environmental Sustainability in Kampala industries, the study computed Pearson product-moment correlation (PPMC) between Green Transportation and Environmental Sustainability in Kampala industries. The bivariate Pearson correlation produced a sample correlation coefficient, *r*, which measured the strength, association and direction of linear relationships between pairs of the two continuous variables. The weights of the correlation were interpreted on the following basis: 1.00 perfect

relationship; 0.90 – 0.99 very high; 0.70 to 0.89 high; 0.50 to 0.69 moderate; 0.30 to 0.49 low; 0.01 to 0.29 very low and 0.00 translates to a non-existent relationship. Results can be seen in Table 6.2 below:

Table showing Correlations between Green Transportation and Environmental Sustainability in Kampala industries

		Green Transportation	Environmental Sustainability
Green Transportation	Pearson Correlation	1	.297**
	Sig. (2-tailed)		.000
	N	186	186
Environmental Sustainability	Pearson Correlation	.297**	1
	Sig. (2-tailed)	.000	
	N	186	186

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Primary Data 2022

Results in Table 6.2 above show the results from the correlations computed. The findings show that there was a very low but positive correlation (r= 0.297, sig .000, p< .01) between Green Transportation and Environmental Sustainability. This implies that any improvements made in transportation can be associated positively with environmental sustainability in Kampala.

Regression results in GreenTransportation and Environmental Sustainability in Kampala industries.
In order to derive the coefficient determination and also appreciate the predictive power of Green Transportation on Environmental Sustainability in Kampala, a linear Linear regression Analysis (LRA) was adopted. The findings are presented below.

Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.297a	.088	.083	.34544

a. Predictors: (Constant), Green Transportation

Primary Data 2021

Results in Table 6.3 reveal an Adjusted R Square which indicates the variance in Environmental Sustainability due to changes in Green Transportation and Environmental Sustainability. The Adjusted R square value of 0.083 accounts for the variations noted in Environmental Sustainability in Kampala by 8.3% (at 100% test level). The remaining variations (91.7%) in Environmental Sustainability in Kampala are accounted for by other factors.

Analysis of Variance

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.129	1	2.129	17.841	.000ª
	Residual	21.956	184	.119		
	Total	24.085	185			

a. Predictors: (Constant), Green Transportation

b. Dependent Variable: Environmental Sustainability

Source Primary Data 2021

F-statistic shows variation in sample means/variation within samples. Green Transportation reflects a small F-statistic of 17.841 indicating the statistical significance of each of the regression coefficients. Therefore, Green Transportation as a predictor (independent variable) fairly predicts environmental sustainability.

Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.114	.145		21.501	.000
	Green Transportation	.191	.045	.297	4.224	.000

a. Dependent Variable: Environmental Sustainability

Primary Data 2021

The unstandardized beta value of .297 (sig. 000, $p<.05$); means Green Transportation explains 29.7 % of the variance in the dependent variable, the remaining 70.3% explained by other factors. Therefore, to have improvements in environmental sustainability, one can improve on Green Transportation aspects.

Testing the third Hypothesis H₃

The hypothesis stated that:

> H_1: "There is a statistically significant relationship between Green Transportation and Environmental Sustainability in selected manufacturing entities in Kampala district"

A statistically significant positive relationship between "green transportation" and "environmental sustainability". The Standardized Coefficient (.119) was positive (p = 0.102); (p>.05). H₃ is rejected. Therefore, the null hypothesis is accepted. There is thus sufficient evidence at the 99 percent level of significance to support the null hypothesis.

The model finally suggests that a unit increase in Reverse Logistics results in 20.3% increase in environmental sustainability; while the remaining 79.7% of variations noted in the dependent variable are explained by other factors.

Discussion of the findings

This section provides a detailed discussion reflecting a linkage between the findings and the literature that was reviewed, the environmental legal framework in Uganda as well as the theory which underpinned the study.

This study analyzed green transportation in the following areas: whether organizations are aware of what green transportation is; whether organizations plan their transportation routes well in order to be efficient in their operations; whether manufacturing entities promote sharing of vehicles by staff members in order to reduce fuel consumption; whether the use of alternative transport modes like cycling is encouraged by management; whether the manufacturing entity uses electric vehicles for their transportation.

The study findings on Green Transportation and Environmental Sustainability in Kampala revealed that organizations are aware of what green transportation means. This statement can be supported by numerous submissions from other scholars. This is supported by Kunieda et al (2018) while conducting a study about smart and affordable sustainable transport argued that broad knowledge of the wide-ranging advantages of employing green transportation canons greatly assists in the endeavour the environmental bodies make to move a country to environmental sustainability; while Rai et al. (2018) argued that green transportation can indeed lead to environmental sustainability when there is widespread cognizance. Salehi, Jalalian & Siar (2017), while examining the trade-off between total transportation cost and carbon emission argues that the tradeoff is only feasible after a widespread awareness campaign. However, the study results obtained reveal some consistencies in the adherence to environmental sustainability standards as specified in the general obligation to prevent and mitigate pollution in The National Environment (Standards for Discharge of Effluent into Water or Land) Regulations, 2020; Part II (Standards for effluent) of regarding general obligation to prevent and mitigate the pollution. The study finding partly conforms to the Institutional Theory which specifies organizations have to make efforts to conform to the legislative powers; this is only viable with widespread awareness.

The study established that organizations plan their transportation routes well in order to be efficient their in its operations. These revelations are supported by Ali Mohammadi, et al (2019) who hold the view that sustainable transportation in an approach to environmental sustainability can be best enabled through planning for shorter transport routes. Other scholars like Pojani & Domnic (2015), argue that sustainable urban transport in the developing world is only possible through well-planned routes that will result in lower fuel consumption. De Carvalho et al. (2020), make a strong case for limiting environmental damage by cutting fuel emissions in half over the next 50 years. This can easily be done by planning transportation routes better. However, the study results indicate that organizations plan their transportation routes well in order to be efficient in their operations that uphold environmental sustainability standards as specified in Part II referring to Standards for effluent found in The National Environment (Standards for Discharge of Effluent into Water or Land) Regulations, 2020 regarding environmental standards for effluent. The study finding partly conforms to the Institutional Theory which requires social claims of their environment; which planned routes factor into. Therefore, the deficiency of implementation in this part remains and needs further discussion by all stakeholders.

The study established that organizations promote sharing of vehicles by staff members in order to reduce the use of many cars which leads to high fuel consumption. This finding is in line with studies by Barzinpour & Taki (2018) concerning pricing and transportation mode choice. They recommended sharing of transportation by commuters where possible or non-motorized transport; while Zhang et al (2018) argue strongly that environmental sustainability as a strategy would be greatly enhanced by the sharp reduction in emissions; which sharing of cars would greatly enhance and Diabat, Khodaverdi & Olfat (2013) put forward the view that the Automotive Industry could greatly contribute

to environmental sustainability by turning to electric cars or sharing transportation to and from work by the majority of employees. These study results are in agreement with part II of the general provisions relating to standards for effluent contained in the National Environment (Standards for Discharge of Effluent into Water or Land) Regulations, 2020 regarding Environmental standards for effluent. The study funding partly conforms to the Institutional Theory which specifies that enforcing green transportation can indeed effectively deliver good results. This could come in form of the use of tools like moral suasion to convince factory employees to share transportation to and from work.

The study clarified that the here is the use of other methods of transportation like bicycling. This finding is partly in line with Jambeck et al (2018) who while conducting a study on the dangers of producing plastic recommended the use of non-motorized transportation modes especially those that use heavy fuels and are not vicious in nature; bicycles are an excellent example of such. Other scholars such as Govindan et al. (2014) largely agree. They postulate that given the alarming situation of global warming and the continued pollution situation and big carbon emissions; a switch to cycling to work, for example, will help sustain the environment better. This is partly included in Part II article 6 of standards for effluent contained in the National Environment (Standards for Discharge of Effluent into Water or Land) Regulations, 2020 concerning the discharge of effluent into water or land. The study outcome is not fully synchronized with the Institutional Theory which advocates for legislative powers and social rights to help buttress a safe natural environment for posterity in the coming decades.

The study established the fact that there was a lot of disagreement that organizations encourage the use of electric vehicles. This finding was not in line with Kunieda & Gathier (2018), while conducting a study on smart and affordable sustainable transportation concluded that electric vehicles were the future of a new world that was environmentally aware are this would reduce carbon emissions tremendously. To further reinforce these conclusions are Barzinpour et al (2018), who recommended electric vehicles replacing petroleum products powered cars in the next 50 years while taking into consideration pricing and transportation mode choice and Lu et al. (2019) while discussing green transportation and logistics performance recommended the use of electric vehicles. This finding reveals inconsistencies in the adherence to most aspects of article 2 found in part II of the National Environment (Standards for Discharge of Effluent into Water or Land) Regulations, 2020 regarding the general obligation to prevent and mitigate the pollution. The study funding did not completely conform to the Institutional Theory which stipulates that organizations have to make efforts to conform to the legislative powers and social claims of their environment; adopting electric cars as a measure to enhance environmental sustainability would be the way to go.

CONCLUSION

The hypothesis that there is a significant positive relationship between Green Transportation and Environmental Sustainability was not rejected but with low predictive powers of Green Transportation of the variance in Environmental Sustainability.

The study results concluded that Green Transportation contributed very little to Environmental Sustainability explaining.

The study, therefore, concludes that findings are not supportive of The National Environment Act, 2019; specifically concerning the prohibition of pollution and Trans boundary movement of waste.

The findings further confirm that Green Transportation has little effect on Environmental Sustainability.

RECOMMENDATION

Considering the finding which revealed that Green Transportation had a statistically insignificant relationship with Environmental Sustainability in the Kampala district underscored the fact that Green Transportation remains largely ignored by manufacturing entities that have continued to use heavy fuels in their transportation and have not adopted

strategies of taking shorter routes to reduce carbon emissions; many of the firms erroneously believing that adopting green transportation attracts heavy costs; leading to the conclusion that green transportation when putting under consideration by National Environment Management Authority, has not had the expected effect on supporting environmental sustainability in Kampala district.

It is therefore recommended that the education department of the National Environment Management Authority approaches the non-compliant firms and educates them on the best ways of cost-effectively adopting green transportation to offset their fears about costs involved in adopting Green Transportation; many of which are groundless. The findings show that Green Transportation is not a good predictor of Environmental Sustainability hence more research is needed in order to it contribute significantly to Environmental Sustainability in Kampala.

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