AN EXAMINATION OF THE ENVIRONMENTAL SUSTAINABILITY DISCLOSURE, LOGISTICS AND SUPPLY CHAIN OPERATIONS IN NORTHERN NIGERIA: EMPIRICAL EVIDENCE FROM KADUNA STATE

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Abstract

The objective of the study is to examine the extent to which the supply chain, logistics and overhead operations in the north sustains the environment. Specifically, the research focused on Kaduna state. The research relied on a quantitative approach and used a pragmatic paradigm by combining 2 different data from the same primary source. The unilateral exploratory sequential research design was adopted, and the research method was an interpretive case study. Exploitation was used as a technique to analyse the unstructured primary data and multinomial regression was used to analyse the structured primary data. One of the findings revealed that low rate in fuel and paper consumption in the overhead operations of Kaduna state significantly influences environmental sustainability, however there are no carbon emission disclosure records to verify that. The implication of this finding on practice is that using fuel economy engine vehicles in logistic operations does less harm to the environment. The research concludes that the north is environmentally sustainable in its overhead operations, but it has no record of environmental sustainability disclosure. Kaduna state should sustain its efforts in lesser rate fuel and paper consumption in its overhead operations and then outline indicators on how it off set carbon by recording such activities and the amount incurred and saved.

Keywords: Environment, Disclosure, Sustainability, Logistics, Supply, Chain, Operations

1. Introduction

Being environmentally friendly by promoting its sustainability while conducting business operations has come to be accepted as a principle in the business world. Identifying environmental objectives and training staff on how to protect the environment and disclose sustainability activities are some of the ways in achieving environmental sustainability (Worika, and Etemire, 2020; Leke, & Leke, 2019; Oyebanji et al., 2017; Yang et al., 2015; Piecyk; & Mckinnon, 2015) and its disclosure. Logistics and supply chain that engage green or ecofriendly operations have been evidenced to sustain the environment (Björklund Forslund, & Isaksson, 2016; Beske, & Seuring, 2014). More so, the overhead expenditure incurred on meetings, reports, receipts, selecting suppliers, distribution of consumables in achieving the goals of logistics and supply chain operations impacts the environment. Unfortunately, in northern Nigeria the

focus is more on the publicity of distribution without commiserating such distribution with more of environmental sustainability information. This is not encouraging as this goes to show that the extent to which the north sustains its environment when it comes to using vehicles to make distribution is not documented. It is from this context that the following questions are raised: Do green supply chain operations promote environmental sustainability disclosure? Do green logistic operations enhance environmental sustainability disclosure? Do green overhead operations enhance environmental sustainability disclosure? Based on this question the following objectives is identified to establish whether green operations in logistic, supply chain and overhead operations influence environmental sustainability disclosure.

The finding is beneficial to northern state government including other state governments in Nigeria that have agencies identified for executing government procurement supplies and distribution. Management of such agencies will see the dire need to initiate and formalize green initiatives and green documentation regarding carbon emission offset and green gas reduction and disclosures.

Studies on green logistics and supply chain practices are well documented in the literature, some of them includes (Jum'a, Zimon, & Ikram, 2021; Anders´en, 2021; Aslam, Rehman, & Asad, 2020; Ikegwuru, & Henshaw, 2020; Habib, Bao, & Ilmudeen, 2020; Jazairy, & Haartman, 2020; Agyabeng-Mensah, Ahenkorah, Afum, Dacosta, & Tian, 2020; Fayezi, Stekelorum, El Baz, & Laguir, 2019; Alhamali, 2019; Channa, & Asim, 2019). To the best of the researchers' knowledge there exists a dearth or no studies on green overhead expenditure as a standalone variable. Secondly, most green studies are focused on profit making organisations, which makes the current study different because it examined government agency with logistics and supply chain mandate by providing empirical finding on green overhead practices. The study is in five sections; section one includes this paragraph, and it is the introduction of the research. Section two, review of literature is presented while section three shows the methodology and section four presents and discusses the findings including their implication on practice and theory. Section five concludes and provides recommendations on the findings.

2. Literature Review and Hypotheses Development

In this section, the operational definition, some empirical studies, and theories on the research concepts are presented including the hypotheses formulated for the study.

2.2.1 Environmental Sustainability Disclosure ESD: Bateman et al, (2017) defines it as the various means used by business to reveal their environmental mitigation activities to stakeholders. It is seen as maintaining the environment by reducing the impact of carbon emission, waste and using renewable sources of energy in business operations (Ahmed & Najmi, 2018; Tachizawa, Gimenez, & Sierra, 2015) and revealing the operation. It is also using environmental specification, echo friendly procedures to run business operations (Voinea et al., 2020; Maleki Minbashrazgah & Shabani, 2019; Zhu et al., 2008). It is the consistency and dedication of all levels of a business management to reduce negative operational impact on the environment (Yang et al., 2019; Longoni, Luzzini, & Guerci, 2018; Vanalle & Lucato, 2017). We see it as the efforts put in by business to maintain the environment during its operations and reporting such efforts to interested party.

2.2.2 Green supply chain operations GSCO: It is defined as the echo friendly procedures used to carry out inbound and outbound operations which includes integrating supplier and customer into the supply chain design, production, recovery after delivery (Saeed et al, 2018; Masudin et al., 2018; Kaur et al, 2017; Sarkis, Zhu, & Lai, 2011) in order to continuously improve procedures to achieve compliance in sustaining the environment (Alhamali, 2019; Mumtaz, Ali & Petrillo, 2018; Chu et al, 2017). We see it as collaboration between the business, its customers, and suppliers on conducting operations that continuously have less impact on the environment.

2.2.2.1 Environmental Sustainability Disclosure and Green supply chain operations

On green manufacturing Ikegwuru, and Henshaw, (2020) sampled 90 restaurants and questioned 490 employees. They used regression as a technique. On eco design Alhamali, (2019) questioned 278 employees of a food processing enterprise and Fayezi et al., (2019) questioned 108 employees of a manufacturing firm, these studies used SEM as technique to evidence that green manufacturing, eco design significantly influence environmental sustainability. On supplier relationship, green product innovation and customer cooperation Anders´en, (2021); Channa, and Asim, (2019) relied on survey as a method to collect primary data and used SEM as a technique of data analysis to show that supplier relationship supports green product innovation and customer cooperation significantly relates to sustainability of the environment. While these studies did not factor in the disclosure of sustainability, the current study is different by evidencing that green supply chain operation and practices can influence environmental sustainability disclosure.

From another perspective, studies that relied on secondary data include Shi, et al (2022); using Thomson Reuters suppliers' environmental ratings and financial statement data to examine 717 firms across 23 countries for the period 2013-2017. Acar and Temiz, (2020) used Clarkson et al (2008) disclosure index and extracted data from financial statements of the sampled 133 firms for 12 month period. Kalash, 2020 extracted data from financial statements of 66 firms for the period 2014-2018; Longoni, and Cagliano, (2018) surveyed 134 respondents and used secondary data and hierarchical regression to evidence that green supply chain operations significantly influence disclosure while Shi, et al; Kalash; Acar and Temiz used regression as a technique to establish that larger firms and environmental performance significantly influence environmental sustainability disclosure. This study differently examined a government agency using qualitative and quantified data from the same primary source. This study hypothesizes that:

$H0_1$ Environmental sustainability disclosure ESD is not significantly influenced by green supply chain operations.

2.2.3 Green Logistics Operation GLO: It is seen as the flow of products, semi-finished products or raw materials in and out of the supply chain that can be used or reused (Hervani & Helms, 2005), procured, stored, packaged, distributed, circulated, marketed, recovered and reversed (Foo, Kanapathy, Zailani, & Shaharudin, 2019; Green, Inman, Sower and Zelbst 2019; Björklund, Forslund, & Isaksson, 2016; Zhu et al., 2015). We see it as supply chain inflow and outflow of inventory that is raw, semi-finished or finished product that can be reused, recycled, recovered, packaged, stored, marketed, transported, and distributed.

2.2.3.1 Environmental Sustainability Disclosure and Green logistics operations

Greenan, et al (2020) used secondary data by adopting the global reporting index GRI and logistic performance index LPI to examine 117 countries for the period 2007- 2016 and found that green logistic performance significantly influences environmental sustainability reporting. On green procurement practices Oyewobi, Ija, and Jimoh, (2017) collected primary data from 116 respondents from the construction sector; principal component analysis was used as technique of data analysis to reveal that environmental sustainability is influenced by green purchases. On green transportation, distribution and warehousing Jazairy, and Haartman, (2020) examined 20 logistics experts from 3 shippers and 5 logistic service companies, Shibin et al., (2020) surveyed 205 senior automotive SMEs managers, Agyabeng-Mensah et al, (2020) examined 200 managers on warehousing and optimisation. These studies used PLS as a technique of data analysis to show that green transport, optimization, warehousing, and distribution significantly influence environmental sustainability. Except for the study of Karaman, who

evidenced disclosure is determined by green logistic operation Shibin et al; Jazairy, and Haartman, Oyewobi, Ija, and Jimoh only focused on sustainability not disclosure. This makes our study different because it provided findings on disclosure by examining a government agency unlike these studies that examined companies with profit objectives. This research hypothesizes that:

$H0_2$ Environmental sustainability disclosure ESD is not significantly influenced by green logistics operations.

2.2.4 Green Overhead Operations GOO: Corporate, (2021) defines it as a reoccurring supporting expenses for generating revenue. It is the expenditure incurred daily or frequently on fuelling organisation vehicles which are scope 1 emission source for transport and distribution. Scope 3 indirect emission source not controlled by an organisation like stationery and paper used for taking minutes, vouchers, and receipts are considered overhead. Daily consumption of utility like power and water are considered overhead. We define GOO as the daily distribution and transportation of consumables using fuel economy and efficient engine vehicles, monitoring and reporting transactions using electronic means powered by renewable energy sources. This study provides findings on green overhead expenditure by hypothesizing that:

$H0_3$ Environmental sustainability disclosure ESD is not significantly influenced by green overhead expenditure.

2.3 Theoretical Framework

The natural resource-based view theory underpins the study variables. This is because ESD is influenced by pollution prevention. The theory was propounded by Hart, (1995) who demonstrated that natural resource simply meant business strategies that include environmental sustainability policies at the core of competitive organisational objectives depending on three main practices; prevent pollution, product stewardship and sustainable development. Studies of Olatunji et al., (2019); Alhamali, (2019) have used this theory to examine carbon efficiency objectives in automobile and product design aligned with competitive advantage of an organisation.

3. Methodology

3.1 Research Approach, Paradigm, Data Source and Method: The study uses a mixed approach influenced by a pragmatic paradigm because it combined two different data from primary sources. The research method adopted is an interpretive single case study of Kaduna state health supplies management agency KADHSMA. The choice of the method is influenced by the fact that the study is a

multiple reality research that directs its research questions to documents and participants who have experienced the problem investigated.

3.2 Research Design: The research design for the study is a unilateral exploratory sequential design (Kwanbo et al, 2022; Creswell, et al, 2003). The design was chosen because the study uses 2 types of data; qualitative (collected from participants using unstructured interview) which was analysed and structured questions were created therefrom and used to collect the second type of data which is quantified data to make clear the relationships established in the qualitative data. Also, the design allows for the integration of the findings from the 2 data.

3.2.1 Population and Sample Size and Technique of Data Analysis: The data collection was done at different times making it possible to make a sample for collecting the unstructured and afterwards the structured data. For the unstructured data collection, we took 10% of 48 employees of KADSMA and arrived at 4.8 which is approximately 5. The choice of selecting 10% is influenced by the positions of Creswell (1998), and Boyd (2001), recommendation of 2 to 10 participants as acceptable for an unstructured data collection. For the structured or quantified data collection we took an error of margin of 0.7% of the total population 303 (which includes KADHSMA's 213 health facilities, 48 employees, 42 suppliers and distributors) using Smith,(1983) formula $1 + N (b)^2$ where: N = population; b = error of margin, substituting we have $1 + 303(0.7)^2 = 1 + 303(0.49) = 1 + 148.47 = 149.47$= sample size of 150 participants for the structured interview. We chose 0.7% as the error of margin because we envisioned not all the participants will be willing to participate. The research discreetly analysed the unstructured data using reduction, classification, and interpretation as techniques. For the structured data analysis multinomial regression technique was used because the study has a dependent variable with more than 2 categories of responses.

3.2.2 Construct Measurement and Model Specification: It is important to note here that unstructured data are not a basis for measuring constructs or variables, responses are reported as findings the way they were collected but the structured data are scaled on 1 to 5 and these figures are used to measure the construct ESD, GSO, GLO and GOO. ESD is a function of GSO, GLO and GOO mathematically presented as *ESD= f (GSO) + (GLO) + (GOO).* The following model is specified:

$$P_t E(y = 1/GSCO_t, GLO_t, GOO_t) = \frac{1}{1 + e^{-ESDt}}$$

Where: P_t = Probability of being green by the agency; E(Y) = cumulative probability function that take values between 1, 2, 3, 4, and 5; e = exponent and

$$ESD_t = \beta_0 + \beta_1 GSCO_t + \beta_2 GLO_t + \beta_3 GOO_t + \mu_t$$

Where:

β_0 = Constant; β_1-β_3 = Coefficients of parameters; ESD = Environmental Sustainability Disclosure; GSCO = Green Supply Chain Operations; GLO = Green Logistics Operations; GOO = Green Overhead Operations; μ = error term

Questions were structured with predetermined responses on a scale of 1 to 5. These questions emanated from the main questions asked on how GSCO, GLO and GOO explain ESD as follows: Do green supply chain operations promote environmental sustainability disclosure? Do green logistic operations enhance environmental sustainability disclosure? Do green overhead operations enhance environmental sustainability disclosure?

4. Results and Discussion

This section presents the results and discussion. Firstly, the analysis of the unstructured or qualitative data results are presented in Tables 1 and 2 and then the quantified data results in Table 3 afterwards an integration discussion of both the unstructured and structured findings leading to addressing the research questions and hypotheses testing are presented.

4.1 Reliability and Validity of Data

On reliability of the collected unstructured data, care full and exhaustive steps were taken to capture and record responses for ease of recovery and uniformity in reporting responses as captured. More so document review and observation were engaged as combined techniques of data collection. On validity and reliability of the structured or quantified data, the collection instrument was subjected to a test that confirmed a Cronbach's alpha value of 0.84 see table 3. Also, the internal reliability consistency of the constructs of the variables ES, GSCO, GLO and GOO have alpha value above 0.90 signifying that they are closely related as a group to establish findings. The goodness of fit Pearson value was 0.34; this is not significant, which proves that the data collected fits the model. The parameter estimate indicates, the standardized errors of GSCO as 0.37, GLO as 0.47 and GOO as 0.94, except for GOO the values of GSCO and GLO are less than 0.5 this shows that Multicollinearity is not a problem.

4.2 Qualitative Data Results

Table 1 shows the interviewees section, experience and qualification.

Table 1

Interviewees	Section Head	Work Experience	Highest Qualification
1	Admin	8 years	B. Pharm
2	Finance	7 years	BSc
3	Distribution	6 years	B. Pharm
4	Warehousing	4 years	B. Pharm

5	Procurement	5 years	B. Pharm

Source: Field work, 2021

Tables 2 show the theme and findings from the interview. Columns one and two of the tables show the emerging themes and findings. Columns three to seven shows the participant numbers indicated in table 1. The columns are used to reveal which participant the theme emanates from and is indicated with an **x**. In explaining the absence of formal objectives in achieving environmental sustainability objectives, **interviewee 1** said that *'Green objectives not in existence in a formal sense, we do not have an SOP on environmental sustainability, but we are environmentally concerned because we engage in online meetings, project meetings we do not consume paper we encourage online submission of tenders to reduce more vehicles used for physical submission'*. Also, **interviewee 2** revealed that *'fuel consumption records exist but not emission records and so the only information we can truly disclose is having efficient vehicles for distribution'*. **Interviewee 5** expressed that' *supplier relationship is more with NAFDAC who certify the suppliers the agency selects to procure drugs* in this regard, **Interviewee 4** revealed that '*they have a green relationship with customer when they return cartons to the agency for repackaging of drugs*.

Table 2 Interviewees

Green supply chain, logistics and overhead operations

Theme: green objectives not formally documented to achieve environmental sustainability disclosure		**Interviewees from table 2**				
Themes	**Findings**	**1**	**2**	**3**	**4**	**5**
Green objectives not formalised	We are green inclined; our operations are most times conducted on green principles, but we do not have them written as SOP not even in our mission and vision statement.	**x**		**X**	**x**	**x**
Supplier relationship and customer cooperation	The agency partner with NAFDAC and NESREA for the certification of our green suppliers and destruction of expired drugs and with KEPA for waste management and cleanliness, we do not share green information with our suppliers, we are yet to start manufacturing drugs.	**x**		**X**	**x**	**x**
Green Distribution and warehousing	Our customers who are the health facilities return carton to us for repackaging of drugs.					
	Vehicles with efficient engines that emit less greenhouse gases due to low fuel consumption are used for distribution. Consumption data is used to make shipment which reduces wastages and expiry rate. The warehouse location is environmentally friendly and of pharmaceutical grading built to emit less heat into the environment.	**x**	**x**	**x**	**x**	**x**
Emission management and records	Fuel consumption records are available, but emission records are not let alone disclosing such information.	**x**	**x**	**X**	**x**	**x**

Green maintenance	Routing optimising is used for distribution of drugs using new vehicles with efficient engine, this reduces maintenance cost. We engage online meetings and encourage online application and submission of tenders.	**x**	**x**	**X**	**x**	**x**

Source: Excerpt from Interview Transcription, 2021

4.3 Quantified Data Results

In table 3, the entire mean is higher than the standard deviation, this shows that the explanatory constructs can explain ESD. Nagelkerke R square has the highest prediction, this shows that it is better, and the model explains .99% of the variance in ESD which is correctly classified at 77.3%. The overall fit of the Nagelkerke model is indicated by the Pearson statistics significance which is at 0.347 which is not statistically significant. This shows that the data collected fit the model. The chi-square significance of green supply chain operations and green logistics operation are 0.52 and 0.80 respectively, this is not significant but that of overhead operation is 0.04 which is significant. This implies that we fail to reject hypotheses 1 and 2 but rejected hypothesis 3.

Table 3 Descriptive and Inferential Statistics (Multinomial regression technique see 3.2.1)

Construct	Mean Range	Std. Dev Range	Std. Errors	Alpha	Likelihood Ratio Test sig.
ESD	4.68-4.74	0.46-0.53		0.97	
GSCO	1.34-1.39	0.69-0.79	0.37	0.94	0.525
GLO	1.30-1.41	0.62-0.68	0.47	0.93	0.801
GOO	1.26-1.31	0.57-0.61	0.94	0.92	0.044
Pseudo R^2:					
Cox and Snell	0.068				
Nagelkerke	0.099				
McFadden	0.061				
Pearson Sig	0.347				
Overall: % classification	77.3%				
Cron-bach Alfa	0.87				

Source: SPSS output listing, 2022

4.4 Addressing Questions and Hypotheses Testing

On the research question 1: Do green supply chain operations promote environmental sustainability disclosure? No, the study's findings on table 2 indicate that the examined agency does not have formal principles on green supply chain operations as a result green relationship with their suppliers does not exist because they are yet to start manufacturing drugs. Though they have a green relationship of cooperation with their customers who are Kaduna state health facilities that return cartons for repackaging drugs, there are no records indicating disclosure of environmental sustainability. Secondly in table 3, the significance level of the likelihood ratio test revealed a non-significance value of 0.525 which directed the

failure to reject the null hypothesis 1. This finding does not support Shi, et al (2022); Acar and Temiz, (2020); Longoni, and Cagliano, (2018).

On the research question 2: Do green logistic operations enhance environmental sustainability disclosure? No, the study's findings on table 2 indicate that the examined agency does not have formal principles on green logistics operations. Though they have a warehouse that is built to emit less heat and use optimization and efficient vehicle engine to engage distribution, there are no records indicating disclosure of environmental sustainability. Secondly table 3 significance level of the likelihood ratio test revealed a non-significance value of 0.801 which directed the failure to reject the null hypothesis 2. This finding does not support Karaman, et al (2020); Longoni, and Cagliano, (2018).

On the research question 3: Do green operations enhance environmental sustainability disclosure? Yes, the study's findings on table 2 indicate that the examined agency does have vehicles with efficient engines that consume less fuel with low maintenance rate for distribution. Furthermore, the agency consumes less paper in conducting meetings and rely more on electronic platforms to send invite for tenders and submissions and keep fuel consumption records. Secondly table 3 significance level of the likelihood ratio test revealed a significance value of 0.044 which directed the rejection of the null hypothesis 3. This finding generally supports studies that have evidenced any green operations influence ESD Acar and Temiz, (2020); Shi, et al (2022); Agyabeng-Mensah, et al. (2020); Karaman, et al (2020); Ikegwuru, and Henshaw, (2020); Jazairy, and Haartman, (2020); Shibin, et al. (2020); Longoni, and Cagliano, (2018); Oyewobi, Ija, and Jimoh, (2017).

4.5 Implication of Findings

On practice, the findings of GSCO and GLO implies that the absence of a formal green principles that is captured in the mission and vision statement as well as the overall objective of the agency that encourages proper record keeping of emission management and disclosure cannot yield environmental sustainability disclosure. However, the findings on GOO implies that using efficient engine and optimization in distribution, using consumption data to reduce waste and expiry rate and having a warehouse that emit less heat to the environment and the reliance on electronic procedures than consuming many papers to conduct meetings are good practices of green operations.

On policy, the findings of GSCO and GLO on considering or selecting a supplier with National Agency for Food and Drugs Administration and Control NAFDAC certification by Kaduna state health supplies management agency KADHSMA implies that the policy is not adequate, because it did not consider National Environmental Standards and Regulation Agency NESREA certification as a criterion for

selection. Having these two regulatory certifications as criteria for selecting suppliers will make the policy adequate and in the right direction because such certification includes customer consumption safety and environmental protection during manufacturing which are components of eco-design of products in a supply chain. Also the finding implies that the policy of the agency to partner with Kaduna State Environmental Protection Agency KEPA and NAFDAC to destroy expired drugs is in the right direction.

Theoretically, the findings provided another perspective to the natural resource-based view NRBV theory that in practice service-based organisations of government engage pollution prevention practices without making such practices the core of their organisational objectives. This study validates the theory by revealing that pollution prevention practices of using efficient engines vehicles and consumption data for distribution, less fuel and paper consumption, online meetings, and submissions, optimizing of delivery routes and housing a warehouse that is built to emit less heat to the environment, keeping emission management records influence significantly environmental sustainability disclosure.

5. Conclusions and Recommendation

The study is a mixed approach research that relied on a pragmatic paradigm to examine whether green operations in logistic, supply chain and overhead expenditure influence environmental sustainability disclosure. Findings reveal GOO influence ESD while GSCO and GLO do not. Based on these findings the study concludes that the absence of formalized green principles inhibits the disclosure of environmental sustainability information while green overhead operational practices can promote ESD. In other words, we conclude that the north is environmentally sustainable in its overhead operations, but it has no record of environmental sustainability disclosure. The study recommends that the National Environmental Standards and Regulation Agency NESREA certification should be included as one of the criteria used in selecting suppliers. Green practices should be formalized as principles and presented as SOP for the conduct of green operations that will promote green disclosures. More so, Kaduna state should sustain its efforts in lesser rate fuel and paper consumption in its overhead operations and then outline indicators on how it off set carbon by recording such activities and the amount incurred and saved. The limitation of this study lies in its ability to examine a single agency and its customers and suppliers. Further studies should engage a multiple case study research by going beyond Northern Nigeria.

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