

# Green Innovations and Environmental Performance of Hotels in Kano, Nigeria: Moderating Role of Green Transformational Leadership

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## Abstract

This research aims to examine the influence of green innovation on environmental performance of hotels in Kano, Nigeria. Also, the study further assesses whether such relationship could improve with the existence of green transformational leadership (TFL). The study adopts a quantitative research design, and data from 649 staff of the registered hotels in Kano was collected conveniently with the use of questionnaire. PLS-SEM was used to analyze the data, and the results show that green innovation has positive and significant influence on environmental performance of the hotels operating in Kano. The findings further revealed that green TFL style improves the association between green innovation and environmental performance of the hotels. It was however concluded that, while green innovation has significant influence on environmental performance, green TFL attenuates such influence. These findings imply that the management of the hotels addresses the environmental concerns by focusing more on new product developments, or improving services delivery processes. Also, such innovative atmosphere could be promoted when the leadership of the hotels creates an enabling environment that inspires and encourages the subordinates to act in a manner that minimizes environmental problems. The management may consider investment in new products or more efficient services, and perhaps deploy modern technologies in to their services delivery process to serve customers better, while preserving the natural environment. These imply that the hotels could adopt use of facilities that save the environment from waste, water, air and noise pollutions, by integrating modern technologies in to their service delivery processes, and perhaps develop new tangible offerings that support the services, while improving environmental conditions.

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## Keywords

Environmental Performance, Green Innovation, Green Transformational Leadership, Nigeria

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## 1. Introduction

The importance of tourism and hospitality sector cannot be neglected as it contributes immensely to the economy and society. The hospitality sector recorded about 10.4% of global Gross Domestic Product, 7% of world exports, and 10% of employment (WTTC, 2018). Over a decade the industry has experienced rapid growth on a global scale (Emmanuel et al., 2020). The hotels sector taking greater part of the hospitality industry, employs about 3.85 million people and contributes 7% to the country's GDP (Hadi, 2021). In Nigeria, the sector contributed 4.4% in 2019 and 2.8% in 2020; while Morocco contributed 15.6% in 2019, and 8.3% in 2020 (Statista Report, 2022). Nevertheless, their activities generate about 8% of greenhouse gases (Lenzen et al., 2018), and have left some environmental burden despite these indices as verified by (Kasavan et al., 2019). Similarly, the sector also produced 1% of the world's carbon emissions which made it necessary to improve environmental performance (Sustainable Hospitality Alliance, 2021). Also, waste production, energy use, water use, and food waste were some of the significant environmental problems linked to the hotel industry (Ahmed et al., 2022). Accordingly, Kim et al. (2019) opined that, due to factors such as climate change, pollution, and global warming, every stakeholder in the hospitality industry is expected to participate in actions and programmes that preserve and improve the environment. Further, Ahmad et al. (2021) assert that whereas the majority of industries in the 21st century have embraced environmental impact initiatives, lesser effort has been observed by hotels.

Thus, there is a growing pressure by stakeholders to protect the environment and mandate firms to engage in green activities (Ahmad et al., 2021). Interestingly, Moise et al. (2021) reported that businesses that use green practices are expected to be more environmentally friendly as their activities reduces waste, conserves water and energy, by extension promotes general environmental conditions. Also, Gill et al. (2021) have posited that although engaging in green operational initiatives might be capital intensive for organizations, it is a potential stringboard which firms can deploy to increase market visibility for their products, attain sustainable competitive advantage, and also boost environmental performance. Although there have been a number of studies trying to verify the services offered by the hotels industry (Albayrak & Caber, 2015), but only a few have specifically explored the environmental effect of such services (Moise et al., 2021; Yu et al., 2017). The stakeholders are concerned about environmental problems caused by the hotels, thus it's imperative to embrace green innovative strategies to minimize the environmental issues (Moise et al., 2021). Another study confirmed that customers patronize more those firm that engages in envi-

ronmental programs which reduces greenhouse gas and other toxic wastes that are injurious to the wellbeing of the people (Xie et al., 2022).

Studies have shown that businesses with more innovative green initiatives outperform their competitors on average, offering them a competitive edge (Al-lameh & Khalilakbar, 2018; Rahimizhian & Irani, 2021). In addition, Pham et al. (2020) posits that green technology, products, and processes, as well as other green activities, helps the environment develop. Accordingly, Irani et al. (2022) argued that, it is important for the top management to be involved in identifying the essential elements for creating innovative green activities. On the other hand, leadership is viewed by the organisation as a crucial resource for environmental management (Zhou et al., 2018). One of the various leadership styles is transformational leadership, which encourages innovative atmosphere and aids team members in identifying with or believing in the leader's vision, which influences business innovation and performance (Ng, 2017; Boehm et al., 2015). Organizational innovation may be enhanced by transformative leadership (Zuraik & Kelly, 2019). Similarly, García-Morales et al. (2012) opined that transformational leadership fosters the building of critical competences and capacities through a process of collaborative decision-making to attain a goal, which has a strong effect on creativity. Although research is still required to support this necessity since without it, green transformation leadership is not possible, even if it is crucial for enhancing employee innovation and creativity (Zhang et al., 2020). These policies and practices helps organisation carry out its strategies and visions for achieving green performance. Similarly, Sidney et al. (2022) assert that organisations can considerably benefit from creating environmentally friendly service behaviour by utilising green TFL and promote green innovations.

Past studies have established a favourable relation between GTFL and green innovation (Jia et al., 2018; Singh et al., 2020; Ahmed et al., 2022). According to Ng (2017) who demonstrates that green TFL promotes superior creativity, extra-role task behaviours, and in-role task behaviours and are more productive at the individual, team, and organisational levels. Additionally, stakeholders are under pressure to adopt environmental management (Song & Yu, 2018). The GTFL encourages staff members' commitment to the environment in addition to supporting their innovation, creativity, and career progress (Zhou et al., 2018; Jia et al., 2018). Additionally, Hilton has pledged to reduce its water usage by 50% by 2030, in an effort to improve their environmental performance. However, majority of the hotels have remain adamant on efforts to reduce environmental burden despite the agitations by numerous industry giants (Ahmed et al., 2022). Another research suggested the use of service sector in future studies in different places or contexts (Singh et al., 2020). Similarly, Fazlurrahman et al. (2021) opined that further research should concentrate on green TFL and green innovation, creativity and other green practices. In addition, Shah et al. (2020) whose research focused on Nepal's construction industry, made the case for the necessity to do similar studies in the future in the banking, manufacturing, and hotel industries. This study dwells on that idea and was carried out in the hotel sector

of Kano, Nigeria.

In view of this, it has been observed that there is a scarce research linking green TFL to green innovation in the Nigerian hotels sector despite growing environmental concerns. The few observed were done mostly in the Europe, Asia, some part of Africa, and very few found in Nigeria, were based in the south. This necessitates the need for similar study in the northern Nigeria, and Kano in particular being the commercial hub of the country, using an improved sample as against the few observed in the literature. The study was also based on the assumption of the resource based view theory, and attempts to investigate how leadership of the hotels leverage on their key resources to develop new products or services, and perhaps integrate some unique technologies in to their service delivery processes in order to reduce environmental problems. Hence, the following objectives were targeted:

- 1) To examine the effect of green innovation on environmental performance of hotels in Kano, Nigeria
- 2) To assess whether the relationship between green innovation and environmental performance of hotels in Kano, Nigeria, could be improve with the existence of green TFL style.

## 2. Literature Review

### 2.1. Concept of Environmental Performance

The poor environmental conditions mainly caused by the activities of hotels industry have been greatly argued in the literature. According to [Sobaih et al. \(2022\)](#) environmental performance is the execution of firm's resources in green initiatives aimed at achieving environmental objectives of the firm and environmental sustainability in its operating environment. Also, [Arda et al. \(2019\)](#) viewed environmental performance as an organisational activities that goes beyond simply following the norms and regulations, but also satisfy and even surpass the public's expectations for environmental preservation. The preservation of natural resources while protecting the environment is another perspective on environmental performance ([Roscoe et al., 2019](#)). [Alonso-Almeida et al. \(2019\)](#) posits measures adopted by hotels to reduce negative environmental effects as water savings through towel and sheet reuse programs or the use of low-flow faucets and showers; energy savings through the implementation of light sensors or the replacement of central air conditioning with individual air conditioning, environmental friendly cleaning products or food from local growers and producers, reducing waste emissions through the use of rechargeable soap dispensers or recycling containers, and environmental education promotion.

### 2.2. Concept of Green Innovation

The process of developing products and services that are ecologically friendly is referred to as "green innovation", by taking measures to reduce adverse environmental consequences by substituting conventional processes for more envi-

ronmentally friendly raw materials and renewable energy sources (Agyabeng-Mensah et al., 2020). A key strategic enabler for achieving justified development is green innovation, which uses energy-saving, environmental protection, waste-recycling, and pollution-prevention techniques (Albort-Morant et al., 2018). In another point of view, green innovation is the process of coming up with fresh, worthwhile concepts while considering the environment in mind in order to manufacture new goods or provide businesses with fresh services, procedures, and methods (Zhang et al., 2020). Further, green innovation which aims to develop environmentally friendly products and processes, is embodied by the adoption of organisational practises like the use of greener raw materials, use of fewer materials during product design using eco-design principles and aim to reduce emissions, and reduction of consumption of water, electricity, and other raw materials (Albort-Morant et al., 2017). Similar to this, Ilg (2019) opined that green innovation refers to new or improved services or goods that are less detrimental to the environment than those of their rivals.

In addition, green innovation is divided into subcategories such as “green products”, “green marketing”, “green processes”, and “green management” that are intended to promote an eco-friendly environment, lower energy consumption and increase resource efficiency, control pollution emissions, recycle waste, improve organisational performance, and provide society at large access to a pollution-free environment (Seman et al., 2019). Elzek et al. (2021) perceived green innovation into four categories: organisational, product, process, and technology. Other research claimed that green innovation is made up of distinctive or modified systems, processes, products, and activities that benefit the environment and support businesses’ sustainability (Xie et al., 2019). Green product innovation benefits both the environmental and economic performance facets of sustainability performance (Saudi et al., 2019). Green product innovation strives to design and develop more environmentally friendly products while reducing the negative environmental effects of the product life cycle (Xie et al., 2019). On other hand, green process innovation permeates areas like pollution prevention, waste recycling, and energy conservation (Huang & Li, 2017). This is particularly true for the service sector, which is focused on administrative, physical, chemical, and biological modifications to produce more sustainably innovative technologies (Ramos & Pedroso, 2021). Typically, organisations gain from this green process innovation in two ways: by decreasing waste and lost energy in production and by avoiding pressure and penalties from stakeholders and regulatory bodies (Chiou et al., 2011). These environmentally friendly technologies appear to be both essential for business success and a means for organisations to reduce the detrimental effects of their operations on society and the environment (Kraus et al., 2020).

### 2.3. Concept of Green Transformational Leadership

According to Masri and Jaaron (2017) leadership is crucial in environmental activities, and fostering teamwork, employee innovation, and increased creativity

within organisations is mostly dependent on leadership. As a result, it encourages progress and makes it possible for businesses to keep their competitive edge (Hughes et al., 2018). The objective of transformational leadership is to promote people to put the needs of the organisation ahead of their own while increasing employees' understanding of progressive values like autonomy, fairness, honesty, and humanism (Aboramadan & Karatepe, 2021). People are more driven to help the organisation accomplish its objectives, when a leader inspires them with a desirable vision and high expectations. People become more committed to the company's objective and goals as a result, and they are also more inclined to share suggestions and opinions (Mansoor et al., 2021). Kusi et al. (2021) define a green transformational leadership style as one in which the major purpose of leadership is to give employees a clear vision, inspiration, and motivation while attending to their developmental needs. Green transformational leadership also incorporates appeal, intellectual stimulation, motivation, and individual consideration (Hameed et al., 2022). The capacities of the subordinates may be aided by intellectual stimulation, which also makes it easier for them to come up with feasible solutions to problems, thereby increasing their creativity and innovative capacity (Mansoor et al., 2021). Similar to this, GTFL promotes employee learning and involves them in projects related to the innovation of green products and processes, enabling companies to introduce green products and/or services and improve their environmental performance (Dranev et al., 2020).

#### **2.4. Review of Empirical Studies and Hypotheses Development**

The influence of green TFL, green innovation and environmental performance has been researched in the literature. Some observed that green innovation influence organization's environmental performance (Kraus et al., 2020; Mahto et al., 2020). Elzek et al. (2021) focused on the effects of green innovation and its various manifestations on sustainability performance among 218 managers of travel agencies and hotels in Egypt's tourism, and the outcomes showed that; green product, process, technology, and organisational innovation have a beneficial impact on sustainability performance. Saudi et al. (2019) surveyed Malaysian manufacturing firms, and discovered that developing green products and processes improves both economic and environmental performance. A study on green product and process innovation, as well as their economic performance across 642 Chinese firms was conducted by (Wang et al., 2021), and the results showed that these two types of innovations significantly boost an organization's financial success. In this relationship, market competitiveness and environmental performance serve as effective mediators. Also, Adegbile et al. (2017) observed that use of green technology, which has greater influence on environmental management plan, and significantly improve environmental performance.

Further, Singh et al. (2020) analyzed 309 SMEs, and discovered that green innovation have a direct impact on environmental performance. In a related view, Yusr et al. (2020) carried out a research using 143 Malaysian businesses, and

found firms that adopt green technology, both locally and worldwide, fosters knowledge sharing and increases green innovation abilities, which reduces environmental concerns. Hussain et al. (2022) used the resource-based view theory to survey 226 enterprises in Pakistan, and found that green innovation, green capacity, and green strategy, enhance environmental performance. Another research in Ghana, Frempong et al. (2021) observed that green innovation capabilities indirectly influence the impact of social and economic sustainability on corporate performance. Frare and Beuren (2021) investigates 81 Brazilian agricultural technology companies, and emphasized the significance of green process innovation in promoting green entrepreneurship, proactive sustainability strategy and environmental performance. A survey of 64 South African firms showed that management innovation capability significantly influenced the green process in a positive way, while the relationship with financial performance was negligible (Nsiah et al., 2022). Saudi et al. (2019) researched on SMEs in Malaysia, and found that while green product innovation and green process innovation have a favourable and significant impact on economic and environmental performance. Accordingly, Wang et al. (2021) studied 515 firms in Pakistan, and perceived a strong association between green innovation behaviours and environmental performance. In addition, Xie et al. (2022) evaluated 221 Chinese companies on the effects of various levels of green process innovation on enterprises' performance, and found a U-shaped relationship between different innovations and a company's financial success.

The literature also contains empirical studies examining the relationship between environmental performance, green transformational leadership style and green innovation. Examples include; Cop et al. (2021) who claimed that green TFL has a beneficial impact on green innovative practices, which in turn benefits the environment. In a study conducted in Pakistan, Zafar et al. (2017) discovered that green transformational leadership has a large and advantageous impact on green performance. Shah et al. (2020) used the resources-based perspective theory to investigate the effects of green transformational leadership, green creativity, and green procurement on sustainability in the Nepal construction industry. Using a sample of 305 respondents, results claimed that green transformational leadership, green innovation, and green procurement have direct positive benefits on sustainability. Additionally, it was discovered that green innovation and green procurement may be predicted by green transformational leadership. Employees' voluntary green practices have a strong, direct association with GTFL style that is beneficial (Robertson & Barling, 2017). Li et al. (2022) analyzed the impact of innovation on planned behavior theory, green transformational leadership, organisational environmental culture in the Chinese automobile manufacturing. The results from a 155 participants sample showed that innovative performance is positively impacted by green transformational leadership, and it was discovered that organizational environmental culture and elements related to the theory of planned behavior mediated the link between transformational

leadership and the success of innovation.

Zhou et al. (2018) argued that GTFL have beneficial effects on the performance of green product development. Additionally, the study by Bahzar (2019) found that GTFL significantly and favourably affects eco-innovation. GTFL may motivate staff to create innovative green ideas, put their skills to use, and learn new green technology. Hussain et al. (2022) evaluated 226 respondents of firms in Pakistan, and found that green innovation, green capacity, green strategy, and green TFL are examples of good environmental performance that may mediate the association between CSR and environmental performance. Additionally, it might be claimed that green product performance rise when GTFL's concept of green development aligns with their environmental values (Zhou et al., 2018). In an effort to understand the variation in employees' levels of green creativity (Sidney et al., 2022) examined the connections between four elements (TFL, green innovation strategy, green HRM, and green process engagement) and individual factors that are not related to the organisational context. The analysis of 150 responses reveals that staff green innovation is positively impacted by green TFL. Al-Serhan (2020) investigated how green TFL had an impact on the growth of sustainability of enterprises in Oman and how green innovation technology operated as a mediating factor. The findings highlight the considerable impact green transformative leadership has on the sustainability of the social, economic, and environmental spheres, and sustainability in the economic, social, and environmental spheres is significantly impacted by the mediating role that green technological innovation plays. Utilizing green practices in business operations helps decrease waste, costs, resource consumption, carbon emissions, and time consumption. It also helps increase customer satisfaction, demonstrates an organization's commitment to environmental preservation, and inspires others to adopt green practices for long-term business growth. In light of the aforementioned the following hypotheses described below has been put forth:

*H1: Green innovation have significant effect on environmental performance of hotels in Kano, Nigeria.*

*H2: Green TFL moderate the relationship between green innovation and environmental performance of hotels in Kano, Nigeria.*

## 2.5. Resource Based View Theory

The resource-based view (RBV) theory by Barney (1991) was used to explain how green innovation (products and processes) influence environmental performance of hotels. According to the RBV perspective, performance and competitive advantage largely relied on how well organisations utilise her strategic resources that are expensive, uncommon, and difficult to imitate (Barney, 1991). If those strategic resources are scarce and difficult for rivals to duplicate or replace with alternatives that can perform the same functions, the company also benefits from long-term improved performance and continued competitive edge

(Amit & Schoemaker, 1993). This study considers green TFL, and green innovation as a strategic resource of the organisation that ensures developing a system that inspires and motivate people to develop new products or new service delivery that reduces environmental problems such as water, noise, waste, and air pollution. The research model shown in **Figure 1** illustrates this.

**Figure 1** depicts the research model showing the direct link between green innovation and environmental performance as well as the extent to which green TFL style moderate such relationship.

### 3. Research Methodology

#### 3.1. Research Design

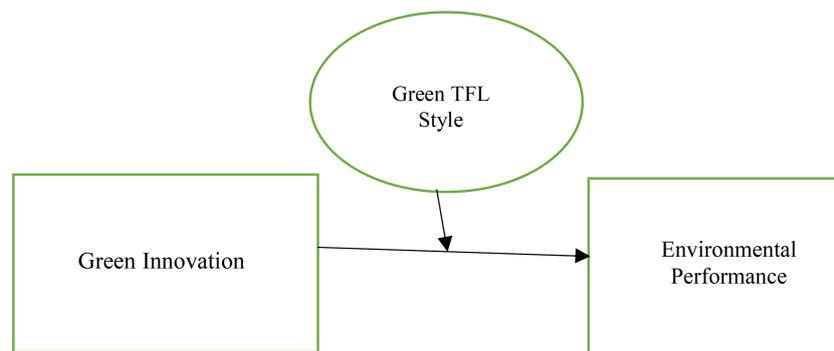
A quantitative research approach has been adopted for this study. This method is considered appropriate since it aims to explain the relationships between independent and dependent variables over a predetermined time period (Kothari & Garg, 2016). The primary goal of this study is aims to examine the moderating impact of green transformational leadership style on the relationship between green innovation, and environmental performance of hotels in Kano, Nigeria. While environmental performance is the dependent variable, green innovation is the independent variable, and green TFL represents the moderator.

#### 3.2. Population and Sample

The population comprises of all the hotels registered in Kano, Nigeria. For the sample size and technique, about 670 copies of questionnaire were conveniently distributed among staff of hotels operating within Kano metropolis, out of which 649 were completed and returned representing about 97% response rate. The 649 participants were conveniently selected, and perceived to have adequate experience and knowledge about their green practices.

#### 3.3. Data Collection and Analysis

Questionnaire was used as the main tool for data collection, and data was analyzed using descriptive, correlation, and regression with the help of SPSS. The specific model for this research is shown below:



**Figure 1.** Research model. Source: Research 2023.

$$EP_{it} = \alpha + \beta_1 GPD_{it} + \beta_2 GPC_{it} + \varepsilon_{it} \quad (1)$$

$$EP_{it} = \alpha + \beta_1 GPD_{it} + \beta_2 GPC_{it} + \beta_3 GTFL_{it} + \beta_4 (GPD_{it} * GTFL_{it}) + \beta_5 (GPC_{it} * GTFL_{it}) + \varepsilon_{it} \quad (2)$$

### 3.4. Measurements

Environmental performance was measured by adapting a scale from (Ahmed et al., 2022) comprising 5 items with a Cronbach alpha of (0.888). In addition, the measurement of green innovation (GI), was done by adapting a scale from (Singh et al., 2020). The scale comprises two (2) dimensions (green product and green process) and a total of seven (7) items. Green innovation in products and processes had Cronbach alpha of 0.884 and 0.842, respectively. All items were measured on a five (5) points Likert scale ranging from 1 strongly disagree to 5 strongly agree.

### 3.5. Pilot Analysis

To reaffirm the construct validity and reliability of the adapted scales for this research, a pilot survey was carried out to determine the reliability and the validity of the measurements. A pilot study is a small-scale research project, which collects data from a small group of respondents of the main study, and the primary purpose of which is to ascertain the validity and reliability of the developed or adapted measures (Sekaran & Bougie, 2016). Accordingly, Whitehead et al. (2016) posited the rule of thumb for estimating sample size for pilot study to use at least thirty (30) respondents or greater. Hence, forty-five (45) copies of questionnaire were administered to randomly selected staff of Karma Hotel Gusau, Zamfara State, Nigeria. Thirty-four (34) copies of the questionnaire were retrieved usable for the pilot study. The reliability and validity of the construct were assessed using the Cronbach alpha (CA) of at least 0.70, and average variance expected (AVE) of at least 0.50 (Hair et al., 2021). The results of the pilot analysis revealed that environmental performance has a reliability coefficient (CA = 0.760) and validity (AVE = 0.569), while green innovation has a reliability coefficient (CA = 0.757) and validity (AVE = 0.620), and green transformational leadership style shows a reliability (CA = 0.717) and validity (AVE = 0.581). These indicate that all the variables adapted for this study were reliable and fit for running the main analysis.

## 4. Results and Discussions

### 4.1. Data Cleaning and Analysis

The study conducted preliminary analysis such as missing values, outliers, normality test, non-response bias and common method bias using Statistical Software for Social Sciences (SPSS version 24). The result of the multivariate outlier showed that no chi-square was less than 0.001 suggesting that the data is free from outliers. In additional, Harman one-factor test was 20% less than 50% value to confirm no common method bias for statistical remedy prior to ensuring

that the necessary procedural remedy was followed such as ensuring confidentiality of respondents, simplicity in wordings, rephrasing of double-barreled questions and psychological separation of constructs. Missing values were replaced using mean substitution since the missing values are less than 5% and are random as recommended by (Tabachnick & Fidell, 2019). Normality of data was assumed based on (Field, 2017) who posited that when a sample is greater than 30 respondents, normality can be assumed. Lastly, to analyze the hypothesized relationship, data were analyzed using the two functional models of structural equation model i.e., measurement and structural models.

## 4.2. Descriptive and Normality Statistics

This research runs for the descriptive statistics and normality test to observe the characteristics of the respondents and the nature of the responses. These could be observed in **Table 1**.

**Table 1** depicts the total observations as 649, the mean of transformational leadership, green product and process innovation approximately 4, with minimum equals 1 and maximum as 5 respectively. In addition the normality tests show that the data is normally distributed, given the skewness and kurtosis values.

## 4.3. Measurement Model

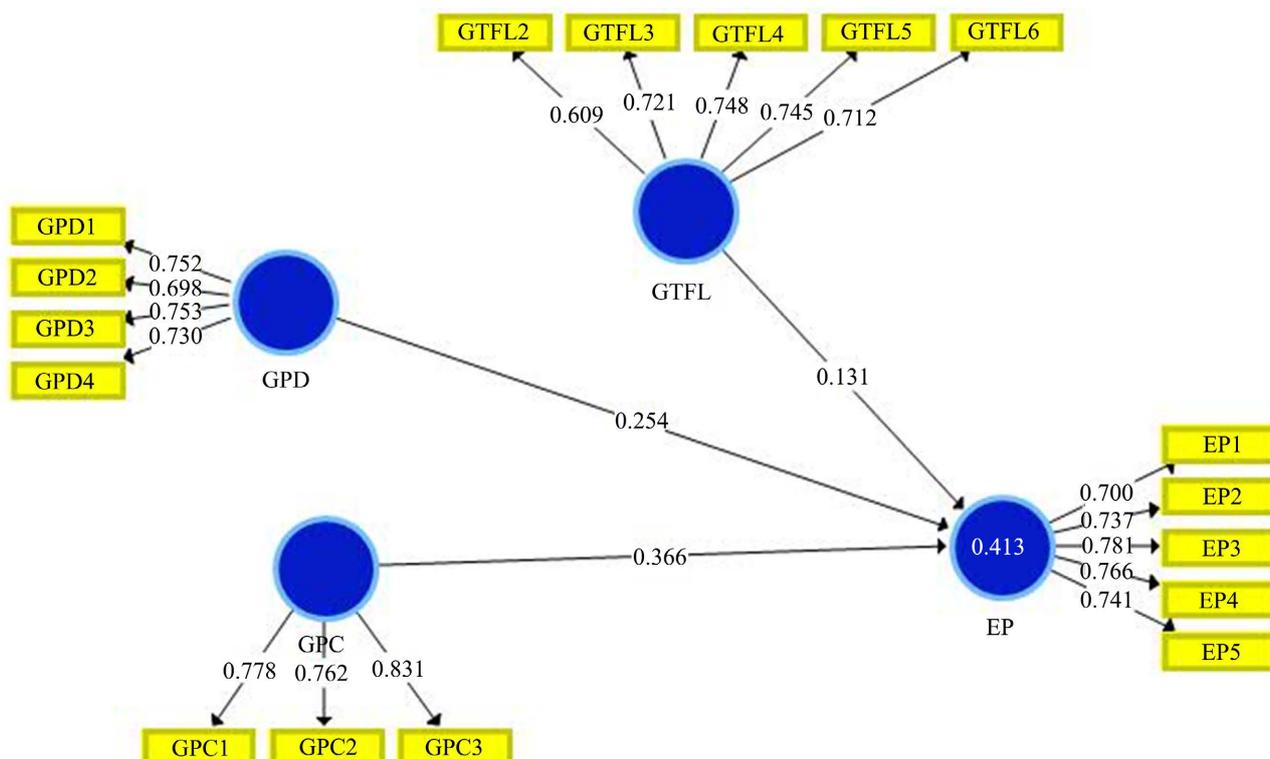
The measurement model consists of individual items measuring each latent construct, the internal consistency reliability, discriminant validity among others were discussed. The study employed a reflective-formative construct higher-order. Firstly, the lower-order construct was assessed and analyzed prior to assessing the higher-order construct. For the lower order the study assessed the item loadings, internal consistency, convergent validity and discriminant validity. According to Hair et al. (2021) an indicator with 0.70 outer loading is reliable and suitable for current or already developed scale. However, the researchers maintained that rather than immediately eliminating an indicator with a loading of less than 0.70, researchers should consider deleting the factor if its removal

**Table 1.** Descriptive statistics and normality test.

Constructs	N	Minimum	Maximum	Mean	Skewness		Kurtosis	
					Statistic	Std. Error	Statistic	Std. Error
GTFL	649	1.33	5.00	4.1917	-1.379	0.096	2.269	0.192
GPD	649	1.75	5.00	4.3043	-1.437	0.096	2.740	0.192
GPC	649	1.67	5.00	4.2732	-1.276	0.096	1.771	0.192
EP	649	1.40	5.00	4.3268	-1.662	0.096	3.795	0.192
Valid N	649							

improves or raises the Average Variance Extracted (AVE) as well as the Composite Reliability (CR). As a result, the loading must be between 0.40 and 0.70 in order for an indication to be kept. Hence, the deletion is subject to the increment or otherwise of the AVE and CR. Meanwhile, [Hulland \(1999\)](#) suggested a loading of 0.5 and above be retained, while a loading below 0.5 be deleted since they add little or no explanatory power to the model. Therefore, in agreement with [Hulland \(1999\)](#) out of 18 items measuring four (4) reflective constructs of this study, one item was deleted. Precisely, (GTFL1). Furthermore, the internal consistency was confirmed using composite reliability. According to [Sekaran and Bougie \(2016\)](#) value  $\geq 0.7$  depicts that the instrument is reliable. Thus, from [Table 1](#) the value of composite reliability ranges between 0.823 and 0.862. In addition, to establish convergent validity, Average Variance Extracted (AVE) was looked at and all the constructs have AVE value greater than 0.5 threshold in line ([Fornell & Larcker, 1981](#)). The value ranges from 0.502 to 0.625 as depicted in [Table 1](#). [Figure 2](#) shows the measurement model for the lower order construct showing the factor loadings of the items under study.

[Figure 2](#) shows the measurement model for the lower order construct. It could be observed that one (1) item (GTFL1) measuring green TFL was deleted due to low or weak item loadings as suggested by ([Hulland, 1999](#)), that any loading less than (0.50) should be removed. However, all the remaining items have loadings above 0.50 and hence their items were retained. [Table 2](#) below shows the details of the items and loadings, composite reliability and AVE.



**Figure 2.** Measurement model for lower-order construct.

**Table 2.** Item loadings, reliability and convergent validity.

Construct	Items	Loadings	CR	AVE
<b>Environmental Performance</b>	EP1	0.700	0.862	0.556
	EP2	0.737		
	EP3	0.781		
	EP4	0.766		
	EP5	0.741		
<b>Green TFL</b>	GTFL2	0.609	0.834	0.502
	GTFL3	0.721		
	GTFL4	0.748		
	GTFL5	0.745		
	GTFL6	0.712		
<b>Green Process</b>	GPC1	0.778	0.833	0.625
	GPC2	0.762		
	GPC3	0.831		
<b>Green Product</b>	GPD1	0.752	0.823	0.538
	GPD2	0.698		
	GPD3	0.753		
	GPD4	0.730		

Note: CA = Cronbach's Alpha, CR = Composite Reliability and AVE = Average Variance Extracted.

Heterotrait-Monotrait (HTMT) ratio of correlation measure was used to investigate the discriminant validity of the reflective constructs, since it is believed to be more relevant and superior than the previous two techniques. According to [Henseler et al. \(2015\)](#) even though the Fornell-Larcker criterion and cross-loadings are the most commonly used methods by researchers for assessing discriminant validity, they do not reliably detect the lack of discriminant validity in common research situations, particularly when correlations range between 0.65 and 0.85. Meanwhile, two HTMT thresholds are recommended to confirm discriminant validity. First, [Kline \(2016\)](#) recommended a conservative value of 0.85 for construct that are conceptually similar while [Henseler et al. \(2015\)](#) suggested a more relax benchmark of 0.90 for construct that conceptually different. Hence, the study chose 0.85 since the study's constructs GPC and GPD are conceptually similar. [Table 3](#) below shows that all the values are below the chosen threshold as such discriminant validity is established.

To assess the collinearity and significance of formative model, the study two conditions were examined for each indicator to enter into the construct as outlined by [Hair et al. \(2014\)](#). First, is to assess the collinearity among the indicators

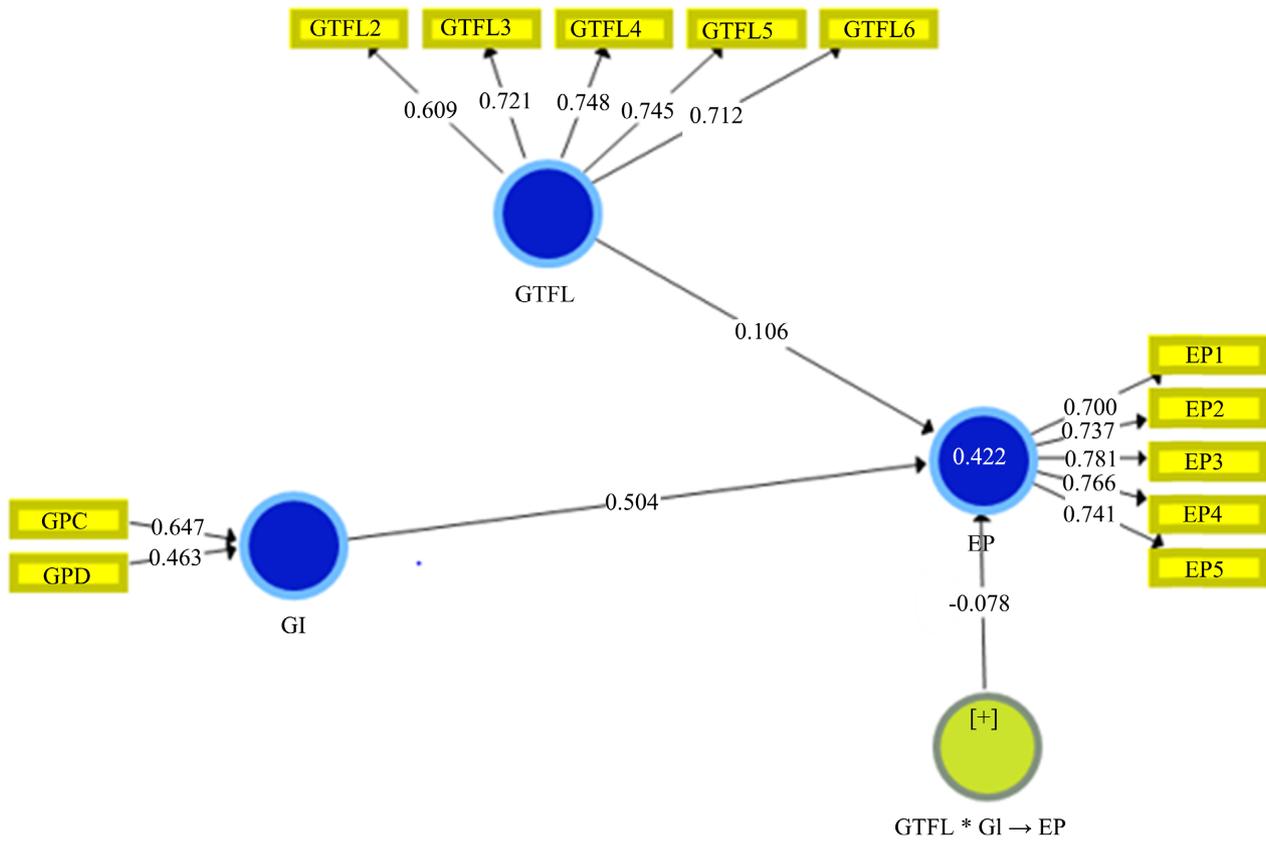
**Table 3.** Measurement model: Discriminant validity (Heterotrait-Monotrait ratio (HTMT)).

Constructs	EP	GPC	GPD	GTFL
EP				
GPC	0.779			
GPD	0.713	0.870		
GTFL	0.567	0.713	0.682	

using variance inflation factor (VIF) values, the value of which should not be greater than five (5). Second, is to assess the significance of statistical contribution (relative and absolute contribution) of each indicator to the construct. Nevertheless, before assessing these conditions, as the construct is reflective-formative type of hierarchical component model (HCM), the disjointed two-step approach had been employed (see **Figure 3**). The first stage was performed by assessing the lower-order components based on the standard model which draws direct relationship between the constructs (Sarstedt et al., 2019). To assess the hierarchical component model (HCM) in the second stage, the latent variable scores from the stage one result allow creating and estimating this model. Consequently, the latent variable scores for Green Process (GPC) and Green Product (GPD) were used to estimate Green Innovation (GI).

**Figure 3** shows the measurement model for the higher order construct using the disjointed two stage approach. **Figure 3** is characterized by the latent variable scores of the dimensions of green innovation, the association between green innovation and environmental performance, as well as the extent to which green TFL attenuate such relationship. **Figure 3** also depicts the Beta values showing the predictive capacity of the variables. It could be observed that green innovation and EP has a Beta value of (0.504), green TFL and EP has a Beta value of (0.106), and lastly the moderator GTFL \* GI and EP depicts a Beta value of (0.078). This simply implies that any change in green innovative practices influence about (50%) variability in the environmental performance. Further, green TFL also moderate the relationship. The importance of the Beta values has been explained elaborately in **Table 4**, alongside their *P*-values and T-values. **Table 4** also presents the outer weights, T-statistics, *P*-values, Outer loadings as well as the VIF:

As observed in **Table 4**, the VIF of the indicators of the formative construct (Green product and process innovation) is below the critical value of five (5). This clearly indicates that there is no multicollinearity problem. On the other hand, the outer weights values of the formative indicators revealed evidence of relative contributions to the main construct. Nevertheless, the outer loadings of the formative indicators have shown an absolute contribution or importance to the construct, as their respective values are all above the threshold of 0.50. Thus, all the two indicators of GI are important to the formative construct (Hair et al., 2014; Sarstedt et al., 2019). In a nutshell, all the variables are reliable and valid for the study.



**Figure 3.** Measurement model for higher-order construct (The Disjoint Two-Stage Approach).

**Table 4.** Collinearity assessment of higher-order constructs validity.

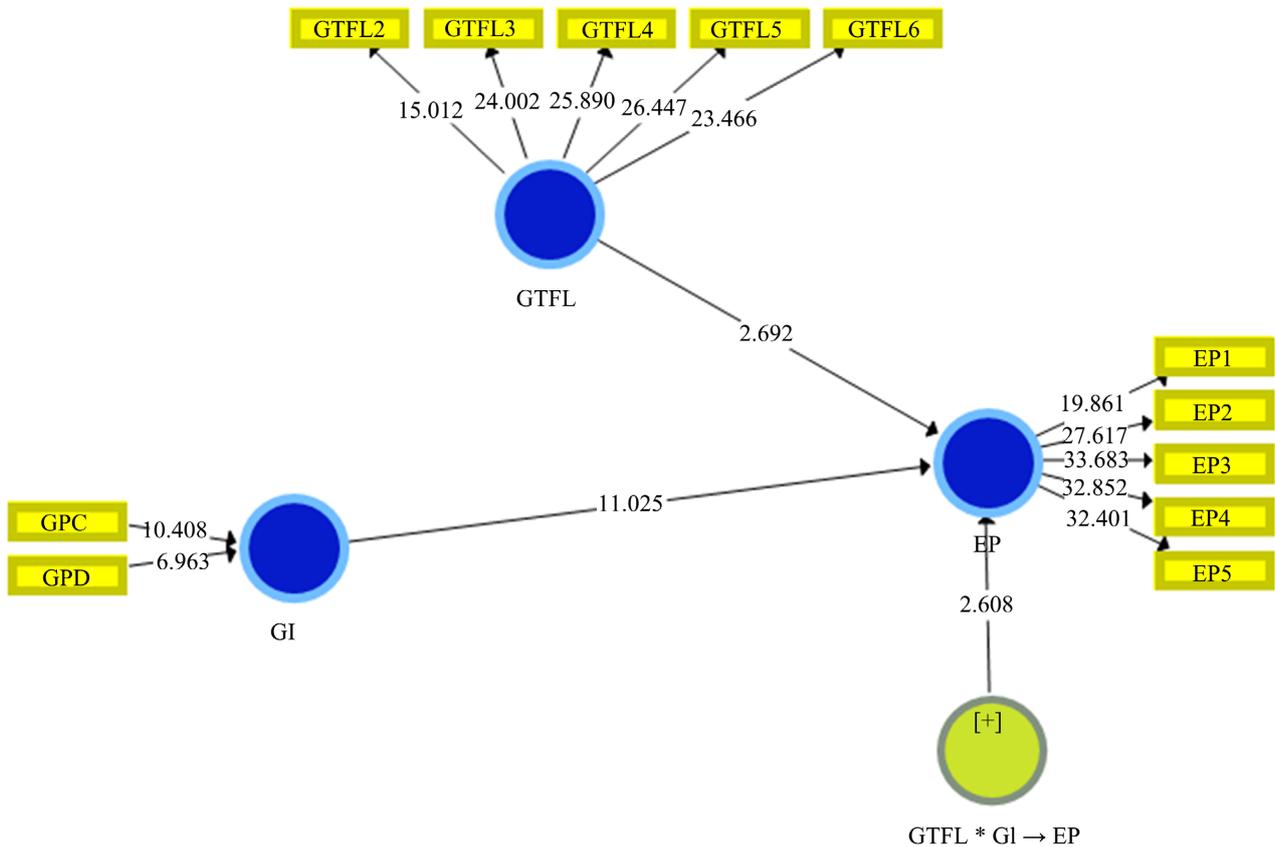
HOC	LOCs	Outer Weight	T-statistics	P-values	Outer Loadings	VIF
GI	GPC	0.647	10.408	0.000	0.931	1.604
	GPD	0.463	6.963	0.000	0.860	1.604

#### 4.4. Structural Model

The structural model was used to ascertain the hypothesized relationship between GI and EP moderating role of GTFL. Furthermore, the co-efficient of determination  $R^2$ , effect size  $f^2$  and predictive relevance  $Q^2$  were assessed in this section.

**Figure 4** shows the structural model for the higher order construct (the disjointed two stage approach), showing the T-values. It could be observed that T-Values for green innovation and EP is (11.025), and green TFL and EP is (2.692), and the moderator GTFL \* GI and EP is (2.638). These results imply that green innovation has significant influence on environmental performance, also green TFL moderate such link significantly. These were vividly shown in **Table 5**.

**Table 5** and **Figure 4** show the model specification analyzing the direct effect of the variables under study. It can be seen that green innovation (GI) has



**Figure 4.** Structural model for higher-order construct (the Disjoint two-stage approach).

**Table 5.** Path coefficient (direct and indirect effect).

Hypotheses	Relationship	Beta	Standard Error	P-Values	Decision
H <sub>1</sub>	GI → EP	0.504	0.046	0.000***	Supported
H <sub>2</sub>	GTFL * GI → EP	0.078	0.030	0.009***	Supported
	<b>R<sup>2</sup></b>	<b>0.422</b>			

Using the coefficients (Beta) of the path relationship, the standard error (SE), and T-value (T Statistics), the hypotheses were tested at 5% level of significance.

a significant and positive effect on environmental performance ( $\beta = 0.504$ ,  $T$ -value = 11.025,  $P$ -value 0.000). This means a unit increase in green innovation leads to 50.4% increase in environmental performance. Thus, the first hypothesis ( $H_1$ ) which states that green innovation has positive and significant effect on environmental performance of hotels in Kano, Nigeria is hereby supported. In the same vein, the moderating result in **Table 5**, showed that green transformational leadership significantly moderate the relationship between green innovation and environmental performance ( $\beta = 0.078$ ;  $T = 2.608$ ;  $P = 0.009$ ). The T-value 2.608 is greater than the threshold of 1.960 threshold to be statistically significant. Hence, hypothesis ( $H_2$ ) which states that green transformational leadership style moderates the relationship between green innovation and environmental per-

formance of hotels in Kano, Nigeria is hereby supported.

The co-efficient of determination ( $R^2 = 0.422$ ) which is the variance in the endogenous variable (EP) that is explained by the exogenous and moderating variables. It therefore, means that 42% of the variation in EP is explained by GI and GTFL (see **Table 5**). According to Chin (1998)  $R^2$  value of 0.4 can be considered moderate. In addition, the effect size ( $f^2$ ) which measure the individual contribution of the exogenous variable (GI & GTFL) to the variance in the endogenous variable (EP). These were presented in **Table 6**.

**Table 6** shows that GI has 0.239 moderate effect size while GTFL has 0.013, and GTFL \* GI has 0.015 effect size. Cohen (1988) opined that  $f^2$  values of 0.02, 0.15, and 0.35, indicate small, medium, and large effects respectively. Thus, the effect size for GI is small, while GTFL and GTFL \* GI has no much effect size, that is the contributions to the EP. Lastly, **Table 7** shows the predictive relevance  $Q^2$  which depicts the practical utility of the model. It assesses whether a model accurately predicts data not used in the estimation of model parameters.

**Table 7** shows that the predictive relevance has predictive relevance ( $Q^2 = 0.217$ ) is greater than zero (0). These implies that the model accurately predicts data not used in the estimation.

#### 4.5. Discussions

The results obtained from regression analysis indicate that green product innovations have positive and significant influence on environmental performance of hotels in Kano. This means that the management of the hotels operating in Kano, Nigeria often develop new products or services to serve customers better, while taking environmental concerns into account. This findings was supported by Wang et al. (2021) who argued that green product innovation influence

**Table 6.** Assessment of effect size ( $f^2$ ).

Construct	$f^2$ (EP)	Effect Size
GI	0.239	Small
GTFL	0.013	Non
GTFL * GI	0.015	Non

**Table 7.** Predictive relevance ( $Q^2$ ).

	SSO	SSE	$Q^2 (=1 - SSE/SSO)$
EP	3245.000	2540.908	0.217
GI	1298.000	1298.000	
GTFL	3245.000	3245.000	
GTFL * GI → EP	649.000	649.000	

organization's environmental performance. On specific notes, the management ensures that the hotel uses materials that produce minimal environmental problems, always search for and adopt materials that consume less energy and resources, use facilities that are easy to recycle, reuse, and decompose, and also uses items that helps to design or deliver environment friendly product or services. These were also supported by Green product, process, technology, and organisational innovation have a beneficial impact on sustainability performance (Elzek et al., 2021; Nsiah et al., 2022).

On the other hand, green process innovation was also discovered to have positive and significant influence on environmental performance of hotels in Kano, Nigeria. This implies that the management of the hotels operating in Kano, Nigeria always explores new or imaginative approaches to the activities connected to the service delivery process, as well as the strategy for accomplishing this goal while taking into cognizance the environmental effects. This is in line with the claim by previous studies who argued that updating green processes could enhance the environmental performance of green hotels (Frare & Beuren, 2021; Irani et al., 2022). Specifically, the service delivery processes of the hotel effectively reduces hazardous substance or waste, they use more efficient means that effectively minimize consumption of energy or water, deploy modern or new technologies in to service delivery processes to ensure efficiency in the use of the hotel facilities. In a similar view, use of green technology, which has greater influence on environmental management plan, can significantly improve environmental performance (Mahto et al., 2020).

Conversely, the outcome of the analysis also revealed that green TFL style improved the relationship between green innovation and environmental performance of the hotels in Kano Nigeria. This result supports the arguments that green TFL style foster environmental performance by inspiring, and encourage people within the organization to imbibe green innovative practices (Bahzar, 2019; Sidney et al., 2022; Al-Serhan, 2020; Zhou et al., 2018). However, organizations like the hotels industry themselves in an effort to minimize environmental burdens, established a green product and process innovative strategies that encourage management and employees of the hotels with green initiatives, to not only pursue environmentally friendly services and products delivery facilities, but also creates an enabling environment that inspire them use their green initiatives to contributes positively to the environment. In a nutshell, the hotels leadership only inspire subordinates with environmental plan, provide subordinates a clear environmental vision, encourage subordinates to work on environmental plan, motivates employees to attain environmental goals, consider environmental beliefs of the subordinates, as well as stimulating the subordinates to think and share their green ideas. These claims were also argued by Al-Serhan (2020) who posited that green TFL have significant link with green innovative practices, and also only create an enabling environment to encourage eco-friendly initiatives and actions in the organization.

## 5. Conclusion

In view of the results, this study concludes that green product innovations have positive and significant influence on environmental performance of hotels in Kano. It implies that the management of the hotels makes extra effort in search for new products or services to serve customers better, while preserving the natural environment. Specifically, the hotels tend to use mostly those facilities that improve the environmental condition, pay special attention on electrical facilities and equipment that consumes less energy, while at the same time give better satisfaction to the customers, uses materials that are easy to recycle, and decompose, as well deploy items that helps to deliver environment friendly services in a better manner that satisfy the customers. Conversely, it was also concluded that green process innovation has positive and significant influence on environmental performance of hotels in Kano, Nigeria. This means that the hotels management operating in Kano, Nigeria make special investment on research and development in order to explore new ways to deliver more efficient and effective services to customers, and at the same time impact on the environment positively. Specifically, the service delivery processes of the hotel effectively reduce hazardous substance or waste, they use more efficient means that effectively minimize consumption of energy or water, deploy modern or new technologies in to service delivery processes to ensure efficiency in the use of the hotel facilities.

## Implications

It was discovered that the management of hotels in Kano, Nigeria spend considerable efforts and investment, searching for more efficient service delivery and processes in order to minimize the negative effect of their operations on the environment. However, the survey shows that the major environmental issues caused by the hotels include; environmental waste disposals, water, noise and air pollution. These environmental issues still persist because the management tends to focus more on making more profits, while paying little attention on the environment within which they operate. Hence, to preserve the environment, it is suggested that the hotels search for new product or facilities that uses less energy and causes minimal air pollution. Things like an alternative solar power plant, energy saving electric gadgets, well organized and structured water channels, well safe refuse disposal system, specifically to be used by the hotel facilities only. This will not only reduce the water, waste, noise and air pollutions caused by the generators and other facilities used by the hotels, but also save the scarce energy for the community to use, and thereby improving the environmental conditions. These would benefits not only the hotels, but also the government, customers and even the immediate community within which the hotels operate, through increased contribution to the GDP, increased employment, patronage, and favourable and healthy atmosphere for the people.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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