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Dr. JIMOH, Abdulrazaq Taiye
Dr. ATTAH, John Adeyi
SANNI, Ibrahim
YUNUS, Abdulrasheed Bolaji

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Islamic Green Finance and Solid Waste Management in Nigeria

By: JIMOH, Abdulrazaq Taiye (PhD) [1], ATTAH, John Adeyi (PhD) [2], SANNI, Ibrahim [3] and YUNUS, Abdulrasheed Bolaji [4]

Abstract

The growing population and urbanization have increased the amount of solid waste generation in Nigeria, leading to environmental degradation. The management of such waste has however become a challenge due to inadequate funding. As government financing is insufficient for effective waste management, Islamic green finance seems to be a viable alternative due to its environmentally friendly shariah principles. Although, some Islamic green financial products have been identified, empirical research is lacking in this regard. This study therefore assessed the potential impact of Islamic green finance on solid waste management in Nigeria. Data were collected from staff of waste collection services firms which are registered with Environmental Health Council of Nigeria (EHCON). Questionnaire was administered to the respondents through the contact of the companies. Descriptive statistics and logistic regression were used to analyze the data. The study found that green murabaha ($p<0.05$), green mudharaba ($p<0.05$), green musharaka ($p<0.01$) and green ijarah ($p<0.1$) were positively and significantly correlated the turnover growth of solid waste management firms. The study however, found that green musharaka wa mutanaqisah ($p >0.1$) had insignificant, positive relationship while green sukuk ($p>0.1$) had insignificant, negative relationship with turnover of solid waste management firms in Nigeria. The study concluded that Islamic green financial services are needed for improving solid waste management in Nigeria. Based on the findings and conclusion therefrom, it recommended that Islamic banks in Nigeria should adopt shariah-compliant green financial products and channel their funding to green investment including solid waste industry.

Keywords: *Environmental degradation, green finance, Islamic banks, Nigeria, Solid waste*

1. Introduction

The growing population and urbanization, no doubt, have increased the amount of waste generation in many African countries including Nigeria. Aliyu and Amadu (2017) claim that the fast population growth puts strain on cities and towns worldwide and this has led to a significant amount of urban waste production. According to Saghir and Santoro (2018), the substantial waste deposit contributed to air and water pollution, which is dangerous for human health.

[1]*Department of Finance, University of Ilorin, Nigeria, Email: jimoh.at1@unilorin.edu.ng*
[2]*Department of Accounting, Nassarawa State University, Keffi., Nigeria, Email: attahjohnadeyimorandy@gmail.com*
[3]*Department of Accountancy, Federal Polytechnic Offa, Nigeria*
[4]*Department of Accounting, University of Ilorin. Email:yunus.ab@unilorin.edu.ng*

In Nigeria, specifically, urbanization, industrialization, and population increase have made solid waste generation and management extremely difficult. According to reports, approximately 20–30% of Nigeria's estimated yearly production of over 32 million tons of solid waste is appropriately collected and treated (Nwosu, 2020; Bakare, 2020). Additionally, it has been noted that the majority of solid waste produced in Nigeria comes from homes, businesses, and industry. These wastes often consist of a mixture of metals, glass, paper, plastics, and organic waste. Natural resource degradation, health hazards, and environmental pollution have resulted from improper disposal of these solid wastes. Effective waste management is essential to maintain a safe and secure environment and shield people from the damaging consequences of climate change, local environmental damage, and the depletion of natural resources.

With little infrastructure and resources for collection, transportation, recycling, and disposal, Nigeria's solid waste management is severely deficient. The majority of waste is disposed of in rivers, open landfills, and other unapproved disposal locations, polluting the air, water, and soil. People were forced to burn or bury their solid wastes because many locations lacked public waste disposal (Bakare, 2020).

Over the years, Nigeria's government has established environmental protection agencies to manage waste and safeguard the environment in an effort to reduce the environmental risks associated with inadequate waste management. Additionally, the government and other interested parties have been working to enhance the nation's solid waste management. Policies, rules, and investments in technology and infrastructure are being used to accomplish these. Initiatives to encourage recycling, composting, and waste-to-energy projects are also being undertaken in an effort to increase waste reduction and lessen environmental effects (Nwosu & Emeka, 2020).

However, issues like a lack of public knowledge, poor waste management techniques, and insufficient finance still make it difficult for Nigeria to handle solid waste effectively. While there are many obstacles to overcome, insufficient finance appears to be the most significant one because other obstacles can be readily removed with adjustments in mindset and perspective. Regarding the issue of insufficient finance, it was noted that Nigeria's solid waste management system receives relatively little support. In the face of steadily rising solid waste deposits across the nation,

government funding for environmental protection organizations through budgetary allocations and other grants or financial subsidies proved to be insufficient. Insufficient resources for appropriate trash collection, transportation, recycling, and disposal resulted from the underfunding problem. This has led to ineffective waste management techniques and fuels the growth of waste in the environment (Agbesola, 2013; Nwosu & Emeka, 2020).

The problem of insufficient funding for trash disposal still exists, despite the Nigerian government's best efforts. For efficient management, this necessitates the use of alternate funding sources and projects. One important step is for businesspeople in the private sector to collaborate with the government to combat the threat. Private entrepreneurs have a lot of options when it comes to waste management. There is already a market because of the expanding population and the substantial waste deposits. Numerous jobs might be created by the waste recycling industry, and recycling can bring in a significant amount of money for companies. There are typically several options for funding, including bank loans, venture capital, government grants and subsidies, crowdfunding, angel investors, and microfinance.

However, it should be highlighted that some of the identified sources may be put off by the risk attributable to new businesses, particularly in an uncertain and unstable business environment as Nigeria. In addition to other strict requirements, some others could impose exorbitant interest rates as payment for the high degree of risk. Many private entrepreneurs may be deterred from obtaining funding for their new waste management ventures by such financing structures. However, since there is a good and feasible alternative source of funding in form of Islamic green financing, the entrepreneurs should thus maintain their composure and hold onto hope.

A new idea that blends the ideas of Islamic finance and environmental sustainability is called Islamic green finance, sometimes referred to as Islamic environmental finance or Islamic sustainability financing. It is a cutting-edge financial strategy that supports moral and ecologically conscious investment practices consistent with Islamic ideals. When it comes to solid waste management, disposal and recycling, Islamic green finance can serve as an alternative source of funding that aligns with the principles of sustainability, social responsibility and ethical behavior.

Islamic green finance is better appreciated when it comes to preserving the environment as shariah lays emphasis on the rights of future generations (Sunarya & Rusydiana, 2022).

It is anticipated that Islamic banks in Nigeria will create and implement various eco-friendly financial products to meet the demands of prospective customers, wishing to engage in the waste management sector. Such clients may be eligible for green financial products such as green mudharaba, green murabaha, green musharaka, and green musharaka wa mutanaqisah from Islamic financial institutions (Musari, 2022). In general, Islamic green finance provides a distinctive and moral method of funding recycling, waste management, and disposal initiatives that put social responsibility and environmental sustainability first. Stakeholders in waste management in Muslim-majority nations like Nigeria might explore alternative funding and support sources for environmentally and socially beneficial waste management projects by utilizing Islamic finance concepts and channels.

Summarily, solid waste management is a major problem in Nigeria due to a lack of financing and infrastructure, which puts many communities at risk and degrades the environment. The sector's needs have not been adequately met by traditional financing methods, which has led to an increasing funding deficit for important waste management initiatives. The potential of Islamic green finance to fill this financing gap has not been sufficiently explored in the Nigerian context. There is also a dearth of research on how Islamic green finance can be effectively utilized to support solid waste management in Nigeria. This study was therefore conducted to assess the potential impact of Islamic green finance on solid waste management in Nigeria. The study specifically analyzed how Islamic green finance products affect the growth of solid waste management industry in Nigeria.

2. Literature Review

2.1 Theoretical Review

2.1.1 Theory of Sustainable Development

The basis for green finance's efforts to combat poverty is the philosophy of sustainable development. The theory gives equal weight to long-term, stable economic growth and social and environmental balance. After the UN introduced the sustainable development theory to the world,

many development experts and commentators accepted the concept and sought to promote and popularize it (Zahedi, 2019).Development that meets everyone's fundamental requirements while preserving, protecting, and mending the integrity and health of the ecosystem is known as sustainable development. This is accomplished without going beyond the ecosystem's long-term capacity limit or jeopardizing the planet's ability to support the requirements of future generations (Pawłowski, 2011). Another aspect of sustainable development has to do with restructuring of the value system that underpins human societies (Konstańczak, 2014).

The theory of sustainable development has however been criticized as being founded on weak theoretical foundation. Zahedi (2019) identified placing too much emphasis on generational needs rather than human rights, lack of precision on the actual needs of future generation, inability to justify the neglect given to the needs of present generation as some of the major weaknesses of the theory. The theory has also been criticized for being one-dimensional and disproportionate when it comes to the needs of developing countries (Vaezzadeh, 2014). However, the criticism laid on the theory does not invalidate the theory and its applicability is still valid. It is on that premise that Paya (2015) argued that whatever the criticism directed to theory is not meant to destroy or damage such a theory but to improve it.

Despite the criticisms, the theory of sustainable development still remains relevant in researches on green finance. The foundation of green finance could be traced to sustainable development whose main goal is poverty reduction. Sustainable development theory highlights the significance of long-term, steady economic development as well social and environmental harmony. By encouraging green sectors' expansion, reducing poverty by boosting income, raising standards of living, and creating new job opportunities, green finance plays critical role in achieving sustainable development. In line with the theory of sustainable development, Islamic green finance has the potentials to improve green industries, create more jobs and increase income levels in the society. Sustainable development theory, which highlights the importance of social welfare, balanced economic growth, and environmental conservation, forms the theoretical foundation of green finance's efforts to get rid of society of environmental hazards (Tang, *et al*., 2023); hence the theory upon which this study is hinged.

2.2 Conceptual Review

Concepts of solid waste, solid waste management, and Islamic green finance are clarified in this section.

2.2.1 Concepts of Solid Waste and Solid Waste Management

According to Dumlao-Tan and Halog (2017), solid waste is anything that has lost its original use for the consumer and is disposed of in the environment, typically in accordance with legal requirements. Solid waste can also be defined as the accumulation of materials, substances, or items that eventually pollute the air, soil, and water (Brunner, 2013). They are metals and other harmful substances that are continuously released and contaminate soil, groundwater, and surface water (Das et al., 2019). In general, solid wastes are regarded as undesirable substances that need to be promptly removed from the environment. Such a concept is relative rather than absolute, though, as waste for one person can become riches for another. According to Dumlao-Tan and Halog (2017), solid waste can be a resource, a contaminant, or both, requiring efficient management.

Solid waste management refers to the process of managing solid waste by means of waste generation, storage, collection, transportation, treatment, and disposal. It discusses how solid trash is stored and disposed of, and it offers recyclable waste solutions (Choudhary, 2019).

Waste management strategies include source reduction, which involves preventing the production of solid waste, recycling, which involves repurposing solid waste, combustion, which involves lowering the amount of waste and occasionally directing it toward the production of energy, and land filling, which involves burying the solid waste (Suardi et al., 2018).

2.2.2 Islamic Green Finance

Islamic green finance is the use of sharia principles to create environmentally friendly and halal financial solutions that allocate monies for beneficial uses (Rohman, 2017). Waste management, ecosystem management, agriculture, biogas generators, wind farms, and other small enterprises that preserve the environment or lessen the risk of global warming could all benefit from shariah-compliant green financing (Alam et al., 2023; Dervi, 2021; Karina, 2019).

Islamic green finance, according to Liu and Lai (2021), places a strong emphasis on meeting people's needs while staying within the bounds of an effective and sustainable economic system. According to Obaidullah (2017), Islamic green finance discourages funding activities that lead to ecological chaos and environmental degradation. When climate change is followed by environmental degradation, Islamic financing is required to strengthen climate action and preserve the environment. This is because the whole health of the ecology is emphasized by shariah maqasid (Obaidullah, 2017).

One major means by which Islamic finance contributes to environmental conservation and improves climate action, is the development of green sukuk as financial instrument. According to the Shariah Standard of the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), sukuk is a certificate of ownership that is equal in value and signifies an undivided portion of ownership of a tangible asset, usufruct value (benefits of the asset), and service (services), or ownership of assets from a specific project or investment activity. Green sukuk attracts both Shariah-compliant and green investors, and it includes investments that address environmental issues (Abdullah & Azrul Nayan, 2020). Green sukuk is issued in order to meet the requirements for protecting against risks associated with the environment and climate change. Obaidullah (2017) states that green sukuk financing is accessible for waste management, infrastructure projects, renewable transmission, and ambitious energy efficiency.

The need for cleaner energy and growing environmental consciousness have raised concerns about how to finance clean energy sources. According to Dey, Hussain, and Hauman (2016), green sukuk is regarded as a financing mechanism for green ventures, much like green bonds. Green Sukuk has actually become more well-known both domestically and abroad (Liu & Lai, 2021). Apart from sukuk, other green financial products like are green *mudharaba*, green murabaha, green *musharaka*, green *musharaka wa mutanaqisah* could be made available by Islamic financial institutions (Musari, 2022).

Under a *mudharaba* contract, the bank, acting as a fund provider (*rabbulma*l), offers the financial resources, while the client, the entrepreneur, contributes the expertise and experience needed to run the company or investment project. A predefined profit-sharing ratio is used to share profit, if

any. The customer only loses time and effort in the event of a loss, but the bank loses its investment (Sapuan, 2016).

According to Bilal and Rahim (2014), *musharakah* is a joint venture in which two or more individuals or organizations conduct business jointly and divide profits and losses in line with the venture's terms and conditions. Hussain, Shahmorandi, and Turk (2015) view *musharakah* contract is also a partnership arrangement in which the partners contribute money, have the authority to run the company, divide earnings as decided, and bear losses proportionate to their equity ownership. A declining partnership known as *musharaka wa mutanaqisah* is another contract that is executed in such a way that the custoemr eventually owns the project or product. According to Smolo and Hassan (2011), it is a combination of a sale and sharing contract where ownership is transferred via the sale and profit-sharing arrangement. Another name for it is musharakah tantahı bi al tamlık, which means collaboration that results in one side gaining ownership. These products can be incorporated into green financing of Islamic financial institutions.

Another Islamic financial product that can feature in green finance is *murabaha*. It is a cost-plus transaction between a consumer and an Islamic bank in which the bank buys a commodity that the customer needs and the commodity is subsequently sold to the customer by the bank at cost plus markup. Abdul-Khaliq (2014) claims that *murabaha* is a sale agreement rather than a loan, in which a bank purchases a product at the request of the customer and resells it to them on a cost-plus-profit basis. The products could be developed to suit the environmental protection goal of waste management.

2.3 Empirical Review

Empirical studies are scanty on financing of waste management, especially in the area of green finance. Some of the few existing studies were reviewed in this study. Wang and Liu (2020) analyzed financial support for industrial solid waste treatment in China. The study found that financing of waste management comes mainly from government investment, financial industry support and financial market securities. Similarly, Wang (2021) studied the relationship between green finance and solid waste disposal in China. Grey correlation model was used to analyze the data collected. It was reported that strong correlation between the green finance and disposal of

solid waste. In the aspect of Islamic sustainable finance, Hariyani and Kusuma (2020) found that Green Sukuk could be a viable Islamic finance instrument for financing municipal substantial waste management in Indonesia.

In Nigeria, even though inadequate funding has been recognized as a bane of effective waste management (Nwosu & Emeka, 2020; Agbesola, 2013; Onu et al, 2012), empirical evidence is lacking on the relationship between green finance and solid waste management. This study fills this research gap and contributes to literature on green finance in Nigeria. This study specifically contributes to research efforts on Islamic finance by examining the potentials of Islamic green financial services and their impacts on solid waste management services in Nigeria.

3 Research Methodology

The model was specified to examine influence of Islamic green financial products on performance of solid waste management firms in Nigeria and it is expressed mathematically as:
Solid Waste Management Performance = f (Islamic green financial products)

The performance of the solid waste management firms was measured by the growth in the firms' turnover (TOG) while Islamic green finance was indicated by Islamic financial services that could be developed and tailored towards environmental sustainability. The services as identified by Musari (2022) include green mudharaba, green murabaha, green musharaka, green musharaka wa mutanaqisah, green Ijarah.

The model was expressed econometrically as follows:

$$TOG_i = \beta 0 + \beta_1 gmud_{i1} + \beta_2 gmur_{i2} + \beta_3 gmush_{i3} + \beta_4 gmum_{i4} + \beta 5 gijr_{i5} + \beta_6 gsuk_6 + \mu i \ldots\ldots 1$$

Table 1: Descriptions of Independent Variables and the Expected Effect on Solid performance of solid waste management firms

Variables	Descriptions	Expected sign (+/-)
gmud	green mudharaba	+ve
gmur	green murabah	+ve
gmush	green musharaka	+ve
gmum	green musharaka wa mutanaqisah	+ve
gijr	green Ijarah	+ve
gsuk	Green sukuk	+ve

Survey design was employed and the study was restricted to Solid Waste firms that are registered with Environmental Health Council of Nigeria (EHCON). The list of the firms was obtained from the Council's Website. As at the time of this study, there are 154 companies registered with EHCON. Data were collected registered waste collection services providers through a google form Questionnaire. The Questionnaire was sent to the contact of each company and the retrieved copies were analysed. 1540 copies of questionnaire were administered but 1342 were duly completed and returned. The returned copies of 1342 were used for data analysis. Descriptive statistics and logistic regression were used to analyse the data obtained from the respondents. Results of data analysis were presented and discussed in section 4.

4 Results and Discussions

4.1 Preliminary Analysis

The section details questionnaire retrieval analysis, validity and reliabilit tests.Results were presented in Table 2 through 4.

Table 2: Questionnaire Retrieval Analysis

Questionnaire	**Frequency**	**Percentage (%)**
Returned copies	1342	87
Wrongly filed/unreturned copies	198	13
Copies administered	1540	100

One thousand five hundred and forty (1540) copies of questionnaire were administered, out of which one thousand three hundred and forty two (1,342) copies, representing 87% were returned and used for the analysis. The remaining 198 copies were unreturned.

Table 3: Validity Tests

Variables	KMO	Bartlett's Test of Sphericity		
		Chi-square	Df	P-value
Operational Questions	.710	962.029	186	0.001

Confirmatory factor analysis was done in order to assess construct validity in terms of convergent validity. Bartlett's and Kaiser-Meyer-Olkin (KMO) tests were conducted. The KMO, which goes from 0 to 1, is a metric for sample adequacy. The sphericity value of the Barlett's test should be significant, meaning that the Sig. value should be.05 or less. Table 3 displays the test's results. This demonstrates that, according to the Barlett's test of sphericity, every measurement item in every sample is significant at level 0.01. Each construct's KMO value is 0.710. This finding implies the validity of the measurement scales.

Table 4: Reliability Statistics

Variables	Cronbach's Alpha	No. of Items
Green mudharaba	0.87	2
Green murabah	0.79	2
Green musharaka	0.73	2
Green musharaka wa mutanaqisah	0.85	2
Green ijarah	0.80	2
Green sukuk	0.82	2

The instrument is steady and consistent in measuring the effect of Islamic green finance on solid waste management, according to the reliability analysis results in Table 4. The Cronbach's alpha

test of each variable affecting waste management firm turnover shows satisfactory levels of reliability, as seen by Cronbach's alpha values over the minimal threshold (Cronbach's alpha >.70).

4.2 Regression Result

Table 5: Estimates of Ordered Logit Regression and the Marginal Effect

	Dependent variable is turnover growth	
INDEPENDENT VARIABLES	coefficients of ordered logit (1)	Marginal effect after ordered logit (2)
Gmud	0.44**	0.10**
	(0.01)	(0.03)
Gmur	0.21**	0.50**
	(0.08)	(0.03)
Gmus	1.81*	0.43*
	(0.23)	(0.11)
Gmum	0.19	0.28
	(0.14)	(0.50)
Gijr	0.55***	0.083***
	(0.16)	(0.03)
Gsuk	-0.32	-0.20
	(0.21)	(0.17)
Constant cut1	-0.007	-0.004
	(0.001)	(0.003)
Constant cut2	3.6308	
	(2.9172)	
Constant cut3	5.3401**	
	(1.3395)	
Observations	1342	1342
Fitness statistics	71.33	
Probability of fitness statistics	0.0000	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 denotes 1%, 5% , 10% level of significance respectively.

Results of an ordered logit regression evaluation of the impact of Islamic green financing factors on the turnover of solid waste management companies in Nigeria are shown in Table 5. The ordered logistic regression and its marginal impact are shown in Columns 1 and 2, respectively. The coefficients were used to estimate the relevance and type of the link between the independent variables. The impact of the explanatory factors (Islamic green financial services) on the

dependent variable (solid waste management enterprises' turnover) was assessed using the marginal effect.

The result of the ordered logit regression in Columns 1 and 2 revealed that green murabaha (gmur), green mudharaba (gmud), green musharaka (gmus) and green ijarah (gijr) were positively related to the turnover growth (TOG). The results indicated that it is possible for turnover of the waste management firms to increase with increased funding in form of green financial products from Islamic financial institutions. The relationship between Islamic green finance variables (gmur, gmud, gmus, gijr)) were found to statistically significant. The variables were significant at 5% and 10%. This is indicated by the standard errors of the coefficients of the variables which are less than half of the coefficients. However, green musharaka wa mutanaqisah (gmum) had insignificant positive relationship on turnover while green sukuk (gsuk) was found to have had insignificant negative relationship with turnover of solid waste management firms in Nigeria. The relationship between turnover and each of gsuk and gmum was not significant statistically at any of 10%, 5% and 1% level of significance.

The response categories of strongly agreed, agreed, uncertain disagreed, and strongly disagreed were all analyzed by the coefficients of the cut parameters. The categories are kept in the interpretation if the cut values are statistically significant; if not, the insignificant categories are compacted to create a category. With the exception of cut 3, every constant cut value in Table 5 is statistically insignificant. Consequently, every other category is compressed, with the exception of categories 3 and 4. This indicates that although highly agreed and agreed are well defined, respondents are not differentiating between indecisive disagreed and strongly disagreed.

The model's log likelihood chi-square statistics are presented in order to assess the model's goodness of fit. The ordered logit has a fitness statistic of 71.33 (p-value = 0.0000). Because the fitness statistics' p-value is below the 5% level of significance. The fit of the model is good. Therefore, the model's output is trustworthy for drawing conclusions and offering sound recommendations.

Discussing the findings of this study, solid waste management was found to be possibly related with Islamic green financial instruments except green sukuk. The implication of this finding is that

funding opportunities from Islamic financial institutions (banks) tend to improve activities of solid waste services providers (firms) in the country. This is because, the firms will now have access to more funds to financing equipment and other waste management infrastructures.

The finding of this study is in tandem with Wang (2021) which reported a strong correlation between green finance and solid waste disposal. However, the relationship between green sukuk and solid waste management in terms of turnover growth of the firms, was negative. The insignificance of the finding could be an indication that the respondents did not see green sukuk as an ideal instrument for the size of their businesses. Since sukuk is a capital market instrument, it might not suit the short-term financial needs of the firms. This finding contradicted Hariyani and Kusuma (2020) which found Green Sukuk to be viable Islamic finance instrument for financing municipal substantial waste management.

5 Conclusions and Recommendations

The purpose of this study was to evaluate the possibilities of Islamic green finance and how it can affect Nigeria's solid waste management. It is thought that financing solid waste services providers could increase the efficacy of solid waste management in Nigeria since Islamic green finance can act as an alternate source of funding that is consistent with the values of sustainability, social responsibility, and moral conduct. In line with the findings of this study, the study concluded that Islamic green financial services are needed for improving solid waste management in Nigeria. Based on the findings and the conclusion drawn therefrom, the study recommended that Islamic banks in Nigeria should adopt shariah-compliant green financial products by channeling their funding to green investment including solid waste industry. This will go a long way in improving solid waste management and in Nigeria, and ensuring a quick transition to a green or circular economy.

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