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# Sustainable waste management and organizational performance of food and beverage firms

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**Abstract**
**Purpose:** Evidence shows that Numerous sustainability measures have been put in place to mitigate the huge impact of uncontrollable solid waste disposal. This study was conducted to investigate the impact of waste management on the performance of food and beverage firms.
**Research Methodology:** The study surveyed nine (9) food and beverage firms, and data were collected with the use of questionnaire from a sample population of one hundred and fifty-one (151) respondents, through a simple random technique. The multiple regression analysis contained in the Statistical Package for Social Sciences (SPSS) IBM version 23 was used to analyze the data obtained from the field of study.
**Results:** The findings from this study revealed a positive significant impact of recycling on resource conservation, while the second finding showed a negative impact of waste incineration on employee health and safety.
**Limitations:** Waste includes solid, liquid, and gas components. However, prior studies have focused on other forms of waste and industrial goods manufacturing firms, specifically solid waste, as the interest area covered only food and beverage manufacturing firms.
**Contribution:** This study addresses one of the major issues related to global warming that occurs as a result of waste dumping and excessive burning. This study has helped curb these challenges by recycling waste and conserving untapped resources for sustainable performance and the healthy coexistence of humans.
**Keywords:** *Recycling, Incineration, Resources Conservation, Health and Safety Sustainable performance*
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## 1. Introduction

In the olden times of our forefathers in Africa, trading was done on a small scale; perishable and non-perishable items were mostly packaged with plantain and cocoa yam leaves; in some cases, they were even rapped with fibers made from palm fronds to enable easy carriage and portability by their customers who must have traveled from distant places. As time progressed into civilization, the need to package perishable items became a top priority for buyers and sellers. Hence, the mass production of several solid packaging containers has evolved with the development of standardized technology (Amasuomo & Baird, 2016). Over time, these solid packaging items used by the food, beverage, and brewery industries have constituted nuisance to the human environment and have become hazardous to ecosystems, water animals, and wildlife (Brunner & Rechberger, 2015).

The global population around the world is increasing, and protecting public health and the environment has become a matter of concern (Berkun, Aras, & Anılan, 2011). An increasing population also means increasing garbage, which is technically referred to as "solid waste" or only as "waste." Semi-solid food waste and municipal sludge may also be included in solid waste. According to (Amasuomo & Baird, 2016) liquid wastes such as lavatory and bathroom wastes are called "greywater" or "waste water," which should also be collected and removed from the public life through sewer system. The main challenges facing waste management include inadequate financing, poor infrastructure and technology, a lack of public awareness of good sanitary practices, and inadequate legal and regulatory(Scanlon, 2007).

Human activities generate most of the waste in society, which is hazardous to the natural well-being of humans and the atmosphere (Brunner & Rechberger, 2015). Despite this, waste production remains a major source of concern, as it has always been since the pre-historic period (Chandler *et al.*, 1997). In the present days, the rate at which waste are generated have been so alarming. As the volume of waste increases, so also does the variety of waste also increases (Vergara & Tchobanoglous, 2012). Unlike in the pre-historic period, where waste was merely a nuisance that needed to be disposed of.

Proper management was not a major issue as the population was within the control range of society, and a vast amount of land was available to the population at that time for land fillings. The environment can easily absorb the volume of waste produced without degradation (Tchobanoglous, Theisen, & Vigil, 1993). Landfills are considered the last resort in the waste hierarchy, releasing methane, a powerful greenhouse gas linked to climate change (Ngoc & Schnitzer, 2009). It is against these developed assertions that this study was carried out to investigate the impact of waste management on organizational performance of food and beverage firms in Onitsha, Anambra state, Nigeria.

### *1.2 Statement of the problem*

When we talk about waste in the context of dangerous items that constitute problems to societal well-being, many will direct their assumptions to solid waste alone, forgetting that there are other forms of waste generated during production processes, which may serve as a basic resource for another organization. (Scanlon, 2007) stated that poor waste management contributes to climate change and air pollution, and directly affects many ecosystems and species. According to Scanlon, this type of waste comprises carbon emissions, which are released into the atmosphere during production activities. In most developing countries, such as Nigeria, laws, policies, statutes, and regulations on waste management are less prioritized, and even existing ones are poorly implemented (Ogunmakinde, Sher, & Maund, 2019).

According to Aboyeji (2019), "Plastic is not just a litter problem; it is a pernicious pollution problem that starts as soon as the plastic is made. Nigeria's use of plastic in virtually every life activity today is deeply interwoven with many of the problems facing our country. Adogame asserts that out of a total of 2,166 plastic materials gathered, 1247 (58%) were from 171 known brands. Of the known brands, five had almost a third share of the total pollution from known brands. These include Bigi, Pepsi, Nova Plastics, C-way Table Water, and Coca-Cola companies. The materials gathered were mostly for food packaging, while a high proportion (94%) of the materials collected were PET. Although the report from IPEN (2019), also revealed other top coastal polluters as Action Bitters, 7-up, Eva water, Pepsi, Viju water, Maltina, Mirinda, Fan milk juice, La Casera, Fanta, Aquafina, Nestle water, Dana plastics, Orijin bitters, Sabrina bitters, and Adonko bitters etc. Almost all of the materials found were locally recyclable.

### *1.3 Objective of the Study*

The major objective of this study is to investigate the impact of waste management on the organizational performance of food and beverage firms in Onitsha, Anambra State, Nigeria. The other specific objectives were as follows:

1. Investigate the impact of waste recycling on the Resource Conservation of food and beverage firms in Onitsha, Anambra State, Nigeria.

2. Investigate the impact of waste incineration on Employee Health and safety of food and beverage firms in Onitsha, Anambra State, Nigeria.

### *1.4. Research Questions*

2. To what extent does waste recycling impact the resource conservation of food and beverage firms in Onitsha, Anambra State, Nigeria?
3. To what degree does incineration of waste affect Employee Health and Safety in food and beverage firms in Onitsha, Anambra State, Nigeria?

### *1.5 Hypotheses*

1. Recycling has no significant impact on the resource conservation of food and beverage firms in Onitsha, Anambra State, Nigeria.
2. There is no significant impact of waste incineration on Employee Health and safety of food and beverage firms in Onitsha, Anambra State, Nigeria.

## 2. Literature Review

### *2.1 Conceptual Review*

#### *2.1.1 Waste Management*

Waste management involves the collection, transportation, processing, recycling or disposal, and monitoring of waste materials (Ding *et al.*, 2021). The term usually relates to materials produced by human activity and is generally used to reduce their effect on human health, the environment, or aesthetics. Waste management is intended to reduce adverse effects of waste on human health, the environment, planetary resources and aesthetics(Gollakota, Gautam, & Shu, 2020).

Waste arises in many different forms, and its characterization can be expressed in several forms. Some common characteristics used in the classification of waste include physical states, physical properties, reusable potentials, biodegradable potentials, source of production, and degree of environmental impact (Demirbas, 2011; Dixon & Jones, 2005). Waste management practices differ across nations, depending on waste sources, types, and characteristics. It plays a vital role in nature's ability to sustain life within its capability (Afolalu *et al.*, 2019). In many developing nations, this has become a recurrent challenge, especially in urban areas (Abdoli, 2009). Waste generation in Nigeria is on the rise because of the rise in population resulting from techno-economic development in cities and the pattern of production and consumption of materials (Ahmed & Ahmaruzzaman, 2016).

The current waste management practices in the nation are fast becoming a national issue of unsustainable development (Afolalu *et al.*, 2019), leading to apparent environmental risk (Demirbas, 2011).(Atif, Liu, & Nadarajah, 2022)Buttdoonottmanagett. Waste management is very important for a company's profitability because if a company can manage its waste properly, a reduction in waste can help the company to reduce costs. Cost control is a basic element of performance management. The elimination of waste provides an increase in productivity and quality with a simultaneous reduction in cost and delivery time to the customer (Benjamin, Regasa, Wellalage, & M Marathamuthu, 2020).

#### *2.1.2 Organizational Performance*

Organizational performance refers to the degree to which the organization, with some informational, financial, and human resources, positions itself effectively on the business market(Upadhaya, Munir, & Blount, 2014).Organizational performance comprises the actual output or results of an organization as measured against its intended outputs (or goals and objectives). (Mahmoudi & Javed, 2022) stipulated that organizational performance is also the success or fulfillment of an organization at the end of a program or project, as intended. According to (Richard, Devinney, Yip, & Johnson, 2009) organizational performance encompasses three specific areas of firm outcome: (a) financial performance (profits, return on assets, return on investment, etc.), (b) product market performance (sales, market share, etc.), and (c) shareholder return (total shareholder return, economic value added, etc.).

Organizational performance depends on leaders' mastery of creating a cooperative working climate and their ability to lead a team (Conţu, 2020). Achieving organizational performance depends largely on how an organization adapts to changes in its external environment. Agbo and Egbunike (2024) added that the financial performance of organization is greatly dependant on climate change of distinct countries. Hence, performance is "the degree to which an organization, as a social system, with certain resources and means, achieves its objectives (Richter, Schmidt, Ladwig, & Wulhorst, 2017). Erik Sveiby (2007) stated that Business enterprise wishes to develop continuously, and it is very pertinent to note that organizational performance works in a great consonance with the individual performance of the members of the team working at the organization level. According to Upadhaya et al. (2014), performance within an organizational setting includes integrating a pleasant work environment that is safe and secure for employees to bring out their best qualities, positive relationships, and communication within organizations, and highlighting a significant positive sense of work (Horga, 2012).

### *2.1.3 Recycling of Waste*

Recycling is a resource recovery practice that refers to the collection and reuse of waste materials, such as empty beverage containers, which can be in plastic or aluminum forms (Walker, 2018). However, this process involves breaking down and reusing materials that are otherwise discarded as waste or trash. There are several benefits of recycling, and with so many new technologies making even more materials more recyclable, it is possible to clean up the Earth surface through the invention of recyling (Chen, Yin, Wang, & He, 2014). According to Abdoli (2009), recycling not only benefits the environment but also positively affects the economy of a nation. The materials from which items are made can be converted into new products. Materials for recycling may be collected separately from general waste using dedicated bins and collection vehicles in a procedure called kerbside collection.

In some communities in recent days, the owner of the waste is required to separate the materials into different bins; such waste can include paper, plastics, metals, and prior to its collection. In other communities, all recyclable materials are placed in a single bin for collection, and sorting is performed later at a central facility (Czajczyńska *et al.,* 2017). The latter method is known as "single-stream recycling. The most common consumer products recycled include aluminum, such as beverage cans, copper, such as wire, steel from food and aerosol cans, old steel furnishings or equipment, rubber tyres, polyethylene and PET bottles, glass bottles and jars, paperboard cartons, newspapers, magazines and light paper, and corrugated fiberboard boxes.PVC, LDPE, PP, and PS are also recyclable (Sperling, 2007). These items are usually composed of a single type of material, making them relatively easy to recycle into new products. Recycling of complex products, such as computers and electronic equipment, is more difficult because of the additional dismantling and separation required.

The type of materials accepted for recycling varies by city and country. Each city and country has different recycling programs that can handle various types of recyclable materials (Carroll, Thurnau, & Donald J. Fournier, 2012). However, certain variations in acceptance are reflected in the resale value of the material after it is reprocessed (Davidson, 2011). Recycling includes waste paper and cardboard, plastic recycling, metal recycling, electronic devices, wood recycling, glass recycling, cloth, and textiles and so many more. In July 2017, the Chinese government announced an import ban on 24 categories of recyclables and solid waste, including plastic, textiles, and mixed paper, which had a tremendous impact on developed countries globally, which exported directly or indirectly to China (Kabongo, 2013).

### *2.1.4 Incineration of Waste*

Incineration is a disposal method in which solid organic wastes are subjected to combustion to convert them into residues and gaseous products (Jing *et al.,* 2020). This method is useful for the disposal of municipal solid waste and solid residues from wastewater treatment(Bergsma, 2018).This process reduces the volume of solid waste by 80–95 percent(Koelemeijer & Leeuw, 2022). Incineration and other high-temperature waste treatment systems are sometimes described as "thermal treatments ". Incinerators convert waste materials into heat, gas, steam, and ash (Lu, Zhang, Hai, & Lei, 2017).

According to (Makarichi, Jutidamrongphan, & Techato, 2018), incineration is carried out on a small scale by individuals and on a large scale by industry. It is used to dispose of solid, liquid, and gaseous wastes. It is recognized as a practical method for the disposal of hazardous waste materials such as biological medical waste (Schnell, Horst, & Quicker, 2020). Incineration is a controversial method of waste disposal, due to issues such as emission of gaseous pollutants including substantial quantities of carbon dioxide (Poblete, Ofélia de Queiroz, & de Medeiros, 2022).(Wienchol, Szlęk, & Ditaranto, 2020) emphasized that Incineration is common in countries such as Japan where land is scarce, as the facilities generally do not require as much area as landfills. Waste-to-energy (WtE) or energy-from-waste (EfW) are broad terms used for facilities that burn waste in a furnace or boiler to generate heat, steam, or electricity (Tang & You, 2018). (Rollinson & Oladejo, 2019) lamented that combustion as an incinerator is not always perfect, and there have been concerns regarding pollutants in gaseous emissions from incinerator stacks. Particular concern has focused on some very persistent organic compounds such as dioxins, furans, and PAHs, which may be created and which may have serious environmental consequences and some heavy metals such as mercury and lead which can be volatilized in the combustion process (Roussanaly, 2019).

### *2.1.5 Resource Conservation*

Resource Conservation means that the resources on which sustainability depends are conserved and enhanced by agronomic management (Robertson & Harwood, 2013). According to an argument by the Master Class in 2021, reducing humanity's collective carbon footprint and conserving our natural resources to fight climate change will help leave our planet habitable for future generations. Natural resources are resources that occur in nature without any manmade assistance (Nairobi, Ambya, Afif, & Pratikno, 2022). Naturally occurring substances, including animals, plants, water, oil, coal, minerals, timber, land, light, soil, and energy, qualify as natural resources. Natural resources can be either renewable or non-renewable. Conservation refers to the usage, improvement, and protection of human and natural resources in a wise manner. It is also the restoration of cultural heritage, protection, and restoration of cultural heritage, including works of art and architecture, as well as archaeological and historical tutorial spoint stutorial spointtutorialspoint (n.d.). As the global population increases at an alarming rate, the consumption of natural resources is also increasing. Hence, these resources should be conserved to maintain an ecological balance and save them for future generations. The proper management of a resource to prevent its destruction or exploitation is known as conservation. We argue that nature provides us with essentials for our daily needs. Owing to overpopulation and human negligence, we started to overexploit our resources. If this continues, no resources will be left for future generations. The needs to conserve the resources are

1. To support life by supporting ecological balance
2. To ensure that the future generations will be able to access the resources
3. To preserve the biodiversity
4. To ensure that the human race survives.

According to Gould (2022), single-use plastics have often made international headlines and for good reason. According to the United Nations, the world and its oceans are overrun by plastics. Thus, the Ellen MacArthur Foundation (Foundation, 2017)reported that by 2050, there will be more plastic in oceans than in fish. Although plastic stream oceans have received the most attention, the UN Food and Agricultural Organization (FAO) points out that plastics in soil threaten human health and food security. Last December, the FAO published a striking report, Assessment of Agricultural Plastics and their Sustainability: a call for action, which described in detail how a multitude of agricultural plastics, especially microplastics, find their way into the food chain.

By 2020, the exponential growth in plastic production is expected to increase to approximately 400 MT. At this rate, plastic production is expected to double by 2040 and increase by 2.5 times by 2050 (Bernardo, Simões, & Pinto, 2016). Unless we change how we make and manage plastics, the problem of plastic pollution will keep on growing (Geyer, Jambeck, & Law, 2017).In theory, plastics should be readily recycled or at least reused (Van Ewijk, Stegemann, & Ekins, 2018). However, according to the Organization for Economic Co-operation and Development (OECD), less than 20% of all plastics are

recycled, leaving more than 80% of the plastics in the environment. The OECD has characterized the global market for plastics as dysfunctional because of the growing amount of plastic waste and very low rates of recovery, reuse, and recycling.

### *2.1.6 Employee Health and Safety*

A safe and healthy work environment is vital for overall sustainability, because it counteracts opportunities for economic and social development (Nordin, Rizal, Rashid, Che Omar, & Priyadi, 2021). However, according to the International Labour Organization (ILO, 2018), despite the international commitment to Occupational Safety and Health (OSH) via the 2030s Sustainable Development Goals (SDGs), work-related accidents and diseases are still far too common. Specifically, according to the ILO, OSH directly impacts the SDG, which aims to secure healthy lives and promote the well-being of people of all ages.

Kavouras, Vardopoulos, Mitoula, Zorpas, and Kaldis (2022) posited that an accident, in its most often used definition, is defined as "any unplanned event that resulted in injury or ill health of people, or damage or loss to property, plant, materials or the environment or a loss of business opportunity" (Maalouf, Hasle, Vang, & Hamja, 2021). Historically, in the early days, work-related accidents have been regarded as a natural aspect of life. Accidents occur at work, and work feeds in the life cycle (Olcay, Temur, & Sakalli, 2021). However, owing to insufficient proof or biased witnesses, early thinking about how an accident occurred was that these were random Acts of God (Vaquero-Álvarez *et al.,* 2020). Later on, in very early modern times, the most controversial theory of accident causation was the 'accident proneness theory' (Xu *et al.,* 2020). This theory assumes that a small proportion of people are much more likely to be involved in accidents than are others (Browning & Rigolon, 2019).

Many studies have found that effective management of occupational safety and health plays a pivotal role in running a successful business (Garetti & Taisch, 2012). The global issue for the sustainable development of citizens is the health and safety of working groups in their workplaces (Shahzalal & Hassan, 2019). To achieve this, organizations must inculcate and adhere to the development of sustainable occupational safety and health environments (Abubakar *et al.,* 2022; Pierobon, 2019). (Jilcha, Kitaw, & Beshah, 2016) are of the opinion that the dynamism of socio-economic development has brought change to all aspects of the expansion. Dynamic changes in workplace health and safety innovation, the high prevalence of occupational diseases, and accident registration are the initial factors of sustainable development (Mardiyanti, 2021).

## *2.2 Theoretical Review*

Waste Management Theory (WMT) has been introduced to channel environmental sciences into engineering design (Pongrácz, Phillips, & Keiski, 2004). The WMT is a unified body of knowledge about waste and its effective management. This is an effort to organize the diverse variables of the waste management system. The WMT is considered within the paradigm of Industrial Ecology and is built hands-in-glove with other relevant theories. The functional elements of Municipal Solid Waste are waste generation, which encompasses activities in which materials are no longer of value and are either thrown away or gathered together for disposal, waste handling, separation, storage, and processing at the source. Waste handling and separation involve activities associated with waste management until the waste is placed in storage containers for collection. This theory is relevant to this study because it provides management of organizations with the core relevance of waste control, and how maximum waste measures can help protect the human environment and ecosystem from global warming, land degradation, and excessive burning.

## *2.3 Empirical Review*

(Onamade, Alagbe, Dare-Abel, & Daramola, 2022) from Nigeria embarked on an empirical study on domestic solid waste collection and management systems in public housing estates to discover strategies for effective solid waste management. A mixed-approach research method involving a systematic review of the literature was conducted. However, primary data were collected using a structured questionnaire that was randomly administered to residents of selected public housing estates in Lagos

Metropolis. The findings from this study showed a significant positive relationship between Solid Waste Collection and Management Systems, and therefore recommended that food waste and plastic waste be given priority in waste management systems, and policies to reduce food and plastic waste should be implemented.

(Rozhdestvenskaya, Cherednichenko, Malchugova, & Korotenko, 2021) from Russia conducted research on the concept of waste management during the upcoming World Junior Ice Hockey Championship in 2023 in Novosibirsk. Their work also discusses the types of waste generated in the functional areas of the competition grounds and studied the practice of handling solid waste: possible technologies for utilization and collection. Based on the results of this study, the main methods and recommendations for effective waste management at WJC-2023 were identified.

(Abubakar et al., 2022) from Saudi Arabia assessed the human and environmental health impacts of SWM practices in Global South cities, which are the future of global urbanization. This study employs a desktop research methodology based on an in-depth analysis of secondary data and literature, including official documents and published articles. The findings reveal that commonplace SWM practices include mixing household and commercial garbage with hazardous waste during storage and handling. While waste storage is largely in old or poorly managed facilities, such as storage containers, the transportation system is often deficient and informal. Disposal methods are predominantly uncontrolled dumping, open-air incinerators, and landfills. The study concludes with recommendations for mitigating the public and environmental health risks associated with existing SWM practices in the Global South.

## 3. Methodology

The study adopted a descriptive survey research design method that allowed for the collection of primary data through questionnaires from the field of study. The population of the study comprised hundred and eighty-one employees in three (3) departments which included Quality Assurance, Production and Safety Department of nine (9) food and beverage companies in Onitsha, Anambra State, which included the International Brewery Plc Onitsha, Eastern Distilleries & Food Industries ltd Onitsha, G & C Special Foods Onitsha, Zobo Cola ltd, Nigerian Bottling Company ltd Onitsha, Zephyhills Foods & Beverages Onitsha, Tiger Foods ltd Onitsha, Aliban De Great Industries ltd, and DD Soy-Foods ltd, as displayed in the table below. Simple random sampling techniques were used to ensure that the study population was adequately represented. However, the independent variable, sustainable waste management, was measured using recycling and incineration, whereas the dependent variable, organizational performance, was measured using resource conservation and employee health and safety. The validity of the research instrument was assessed using the test-retest method, while the reliability of the research instrument was assessed using Cronbach's alpha, which gave a coefficient of 0.81, indicating a positive coefficient. Multiple regression analysis was used to test the impact of the independent variable (sustainable waste management) on the dependent variable (organizational performance).

## 4. Result and discussions

Table 1. Population of the study

| s/n | Name of Companies | Number | Percentage% |
|---|---|---|---|
| 1 | International Brewery plc Onitsha | 46 | 25.4 |
| 2 | Eastern Distilleries & food industries ltd Onitsha | 15 | 8.2 |
| 3 | G & C Special foods Onitsha | 14 | 7.7 |
| 4 | Zobo Cola ltd | 17 | 9.3 |
| 5 | Nigerian Bottling Company ltd Onitsha | 51 | 28.1 |
| 6 | Zephyhills foods & Beverages Onitsha | 11 | 6.1 |
| 7 | Tiger foods ltd Onitsha | 9 | 4.9 |
| 8 | Aliban De Great Industries ltd | 8 | 4.4 |
| 9 | DD Soy-Foods ltd. | 10 | 5.5 |
| | **Total** | 181 | 100 |

Source: Field Survey 2024

### *4.2 Distribution of Questionnaire*

Table 2 . Information on Distribution of Questionnaire

| s/n | Options | No of Respondents | Percentage % |
|---|---|---|---|
| **1** | Questionnaire Distributed | 181 | 100% |
| **2** | Questionnaire Returned | 159 | 87.8% |
| **3** | Questionnaire Completed | 151 | 83.4% |
| **4** | Questionnaire Not Duly Completed | 8 | 4.4% |
| **5** | Questionnaire Missing | 22 | 12.2% |

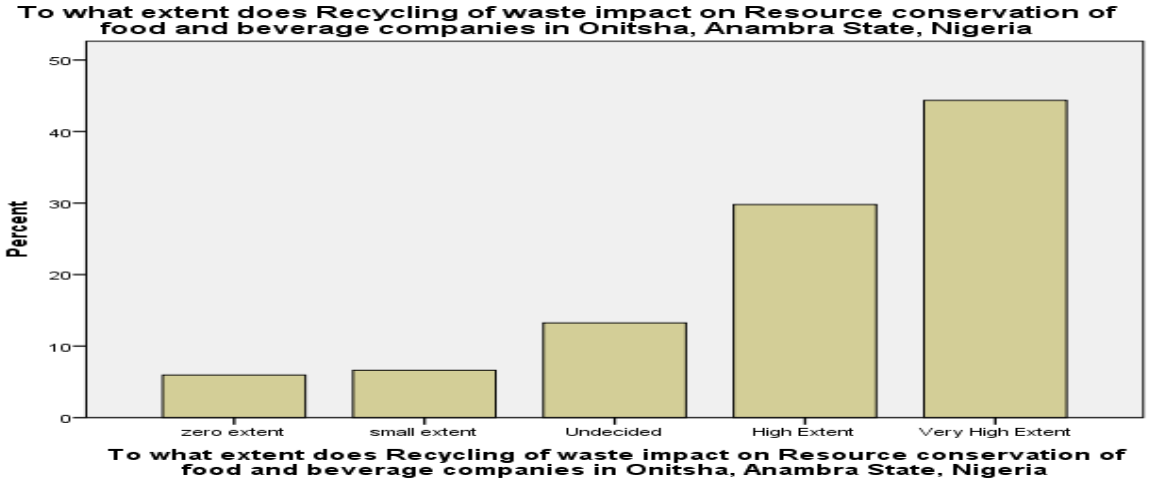
Source: Field Survey, 2024

Table 2 provides a comprehensive analysis of how the questionnaire designed for the study was adequately distributed to the respondents. A total of one hundred and eighty-one (181) questionnaire were distributed, one hundred and fifty-nine (159) representing 87.8% were returned, one hundred and fifty-one (151) representing 83.4% were duly completed; eight (8) representing 4.4% were not duly completed, whereas twenty-two (22) representing 12.2% were missing. However, the study adopted the one hundred and fifty-one (151) questionnaires which were duly completed for analysis.

### *4.3 Analysis of Research Questions*

*4.3.1 Analysis of Research Question One*

To what extent does waste recycling affect the resource conservation of food and beverage firms in Onitsha, Anambra State, Nigeria?




Source: Researchers Analysis using SPSS Version 23

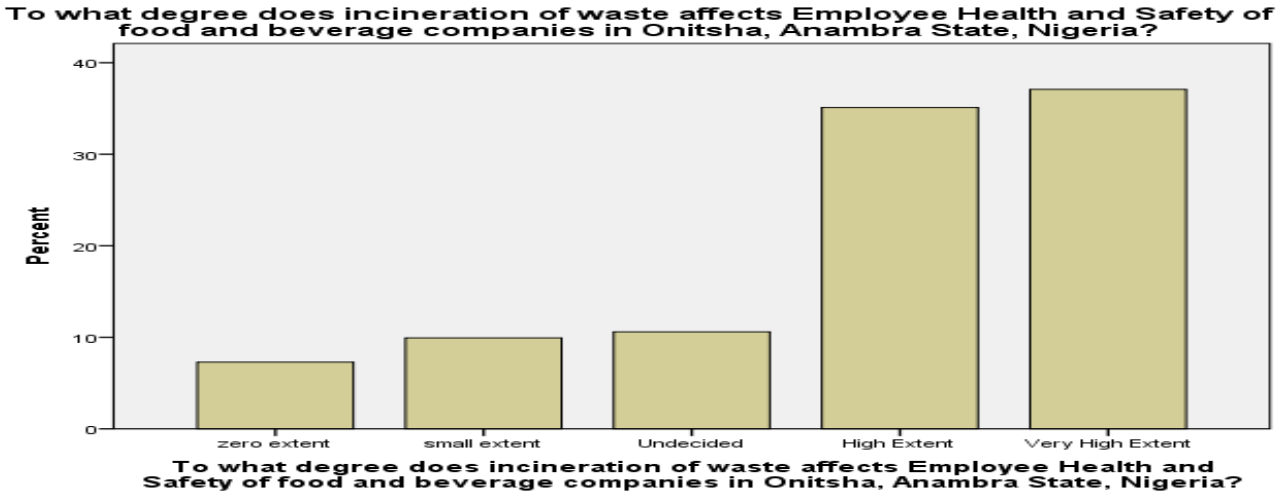
| Table 3 Descriptive Statistic | | | | | |
|---|---|---|---|---|---|
| **RQ:1-**To what extent does Recycling of waste impact on Resource conservation of food and beverage companies in Onitsha, Anambra State, Nigeria | | Frequency | Percent % | Valid Percent % | Cumulative Percent |
| Valid | Zero extent | 9 | 3.4 | 6.0 | 6.0 |
| | Small extent | 10 | 3.7 | 6.6 | 12.6 |
| | Undecided | 20 | 7.5 | 13.2 | 25.8 |
| | High Extent | 45 | 16.9 | 29.8 | 55.6 |
| | Very High Extent | 67 | 25.1 | 44.4 | 100.0 |
| | Total | 151 | 56.6 | 100.0 | |
| Missing | System | 116 | 43.4 | | |
| Total | | 267 | 100.0 | | |

Source: Researchers Analysis using SPSS Version 23

Table 3 indicates the response of respondents to research question one on the extent to which recycling of waste impacts the resource conservation of food and beverage firms in Onitsha, Anambra State, Nigeria. nine (9) respondents (6.0%) responded to zero extent, ten (10) respondents representing 6.6%) to a small extent, twenty (20) respondents representing 13.2%) to undecided, forty-five respondents representing 29.8%) to high levels, while sixty-seven (67) respondents representing 44.4%) to very high levels.

*4.3.1 Analysis of Research Question Two*

To what degree does incineration of waste affect Employee Health and Safety in food and beverage firms in Onitsha, Anambra State, Nigeria?




Source: Researchers Analysis using SPSS Version 23

Table 4 Descriptive Statistics

| **RQ:2-**To what degree does incineration of waste affects Employee Health and Safety of food and beverage companies in Onitsha, Anambra State, Nigeria? | | Frequency | Percent % | Valid Percent% | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Zero extent | 11 | 4.1 | 7.3 | 7.3 |
| | Small extent | 15 | 5.6 | 9.9 | 17.2 |
| | Undecided | 16 | 6.0 | 10.6 | 27.8 |
| | High Extent | 53 | 19.9 | 35.1 | 62.9 |
| | Very High Extent | 56 | 21.0 | 37.1 | 100.0 |
| | Total | 151 | 56.6 | 100.0 | |
| Missing | System | 116 | 43.4 | | |
| Total | | 267 | 100.0 | | |

Source: Researchers Analysis using SPSS Version 23

Table 4 indicates the response of respondents to research question two on the degree to which incineration of waste affects Employee Health and Safety of food and beverage firms in Onitsha, Anambra State, Nigeria. eleven (11) respondents representing 7.3%) responded to the zero extent, 15 respondents (9.9%) responded to a small extent, 16 respondents (10.6%) responded undecided, 53 respondents (35.1%) responded to high levels, while fifty-six (56) respondents representing 37.1%) responded to very high levels.

***4.4 Test of Hypotheses***

*4.4.1 Test of Hypothesis One*

**$H0_1$:** Recycling has no significant impact on the resource conservation of food and beverage firms in Onitsha, Anambra State, Nigeria.

**Table 5 ANOVA[a]**

| Recycling < Resource Conservation | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Multi Regression | 14.831 | 1 | 14.831 | 31.645 | .000"" |
| | Residual | 69.362 | 148 | .469 | | |
| | Total | 84.193 | 149 | | | |

a. Dependent Variable: Resource Conservation
b. Predictors: (Constant).RCY

Source: Researchers Analysis using SPSS Version 23

Table 5shows the impact of the independent variable Recycling (RCY) and dependent variable Resource Conservation (RC). At a significance level of 0.05, the sum of squares of 84,193, mean square of 14831, and frequency of 31645. Therefore, the multi-regression residual value is given as0.000**.

**Decision Rule:** Accept the null hypothesis if the p-value is greater than 0.05; otherwise, reject it.

**Decision:** Since the P-value is 0.000**, which is less than the critical value of 0.05, this study reveals that recycling has a significant impact on Resource Conservation of food and beverage firms in Onitsha, Anambra State, Nigeria.

*4.4.2 Test of Hypothesis Two*

**$H0_2$:** There is no significant impact of waste incineration on Employee Health and safety of food and beverage companies in Onitsha, Anambra State, Nigeria.

**Table 6 ANOVA[a]**

| Incineration < Employee Health & Safety | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Multi Regression | 15.943 | 1 | 15.943 | 34.571 | .000"" |
| | Residual | 68.251 | 148 | .461 | | |
| | Total | 84.193 | 149 | | | |

a. Dependent Variable: Employee Health & Safety
b. Predictors: (Constant), INC

Source: Researchers Analysis using SPSS Version 23

Table 5 shows the impact of the independent variable Incineration (INC) and the dependent variable Employee Health and Safety (EHS). At a significance level of 0.05, the sum of squares was 84,193, the mean square was 15943, and the frequency was 34571. Therefore, the multi-regression residual value is given as0.000**.

**Decision Rule:** Accept the null hypothesis if the P-value is greater than 0.05; otherwise, reject it.

**Decision:** Since the P-value is 0.000**, which is less than the critical value of 0.05, this study reveals that incineration of waste has a significant negative impact on Employee Health and safety of food and beverage firms in Onitsha, Anambra State, Nigeria.

***4.5 Discussions of Findings***

Based on the tested hypothesis, the first finding of this study indicates that recycling has a positive significant impact on the Resource Conservation of food and beverage companies in Onitsha, Anambra State, Nigeria. The findings from the first hypothesis confirm the findings of Abdoli (2009), who argued that recycling does not only benefit the environment, but also positively affects the organizations that practice it and the economy of a nation at large. Moreover, it has been empirically proven by (Onamade et al., 2022) that recycling reduces the use of natural resources by reusing materials; 94% of the natural

resources used by Americans are non-renewable. The use of non-renewable natural resources increased from 59% in 1900 to 88% in 1945. Recycling saves non-renewable resources.

The second finding of the study indicates that incineration of waste has a significant negative impact on Employee Health and safety. It was revealed by Allsopp, Costner, and Johnston (2001) that due to the increasing quantities of waste sent for incineration, incinerators will emit more toxins and pollutants that harm local air quality. However, Incineration makes a more significant negative contribution to local air quality than landfill. Afrin, Sehreen, Polas, and Sharin (2020) had observed that such effects include cancer among both children and adults, adverse impacts on the respiratory system, heart disease, immune system effects, increased allergies and congenital abnormalities. Some studies, particularly those on cancer, have focused on old rather than modern incinerators.

## 5. Conclusion

This study revealed that waste management is crucial to the performance of food and beverage organizations by ensuring that waste materials are adequately recycled into useful resources, paving the way for the conservation of untapped natural resources. The study concludes that food and beverage firms should endeavor to queue into the technology of recycling waste, and also avoid the waste management method of incineration of waste because it has a greater negative impact on the environment and humans.

### *5.3 Recommendations*

Based on these findings, the study recommends the following:

1. Solid waste in the form of leftover raw materials should be gathered during production processes in food and beverage firms and adequately utilized for new production, instead of throwing away. In addition, other solid waste materials in the form of beverage cans, bottles, and tins after usage should be landfilled and sent to parent companies for recycling.
2. The health and safety of employees and their communities is vital, so the idea of reducing solid waste by combusting it in incinerators should be totally avoided to eradicate its negative health consequences.

### *5.4 Limitations*

The waste includes solid, liquid, and gas components. However, prior studies have focused on other forms of waste and industrial goods manufacturing firms, specifically solid waste, as the interest area covered only food and beverage manufacturing firms.

### *5.5 Suggestions*

Keeping our environment safe is a matter of concern for individuals, corporate organizations, and the government. This study advocates for the healthy environment and sustainable development of Nigeria, as sustainable measures of waste management should be taught at school from grade level 1 up to the university, because lessons taught to children at tender age will become their policy and guide as they continue to grow. People should be educated on the importance of safeguarding our environment, and the adverse effects of waste dumps and excessive combustion of solid waste materials should be considered.

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