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ENVIRONMENTAL AUDIT IN NIGERIA (WHITEFIELD HOTELS LIMITED CASE-IN)

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Abstract.
Whitefield Hotels Limited appointed MESSR Roygbiv Analytical and Environmental Services Nigeria Limited – a NESREA-accredited consultant, for the purpose of this Environmental Audit Report. NESREA (National Environmental Standards and Regulations Enforcement Agency) guidelines and protocols for audit investigation and reporting are employed in preparing this report to evaluate the impact of the activities of Whitefield Hotels Nigeria Limited. An assessment of the location in terms of compatibility and of process and housekeeping of the hotel was undertaken. This initial contact ensured management consent and the selection of an audit team from the hotel. A standard questionnaire was administered to the management and key staff to obtain information that was used in the facility inspection as well as an examination of records and documents of the company. Thus, various strategies for treating wastewater and solid waste have been proffered to minimize generation instead of treatment. Further measures in which the trash can be reused directly, subject to the guidelines of NESREA, were suggested in this report. Similarly, the general welfare and health security, including the prevention of the proliferation of disease-causing organisms that can lead to illness, were addressed in this work.

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Introduction

Adequate monitoring and evaluation of our public facilities using modern technological applications are valuable for health security and the welfare of people using hotels (Abdulhaleem et al., 2013, and Zhan et al., 2021). Whitefield Hotels Nigeria Limited, with a total land area of 15,748.658 m², has its facility building situated at Plot 37 Muslim Pilgrims Road, off Western Reservoir, postal code No. 23403 in Ilorin West Local Government Area of Kwara State, Nigeria, primarily for accommodation, feeding, entertainment, communication, sports, and social engagement, as well as other in-house activities. The project aims to provide the country with the highest quality hospitality according to international standards. In compliance with environmental guidelines that are in operation, Whitefield Hotels Limited decided to conduct an Environmental Audit of its hotel in Ilorin township in Ilorin West Local Government Area of Kwara State to satisfy the requirements of the Federal Ministry of Environment (FMEnv), Federal Ministry of Information and Culture, Department of Domestic and Eco-Tourism Promotion and Control, and National Environmental Standards and Regulations Enforcement Agency (NESREA).

This audit report exercise was carried out from September 2021 to December 2021. The results and findings of the audit exercise are presented in this report; thus, little or no aqueous and gaseous effluents are discharged into the surrounding surface and groundwater in particular and immediate surroundings

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in general. The significant wastes produced are wastewater and waste food (biodegradable); the hotel depends on solar energy, national-grade energy supplied, and diesel oil for its operation. The hotel also has a 3,600-liter capacity diesel oil storage tank. Large tankers do fuel replenishment.

During delivery, some of the AGO (diesel) is spilled as it is discharged into the storage tank using hose connections. Flood and stormwater from rainfall and other liquids spilled within the factory are removed partially. The covered concrete channel leads to a confined waste treatment plant channel located towards the northwestern end of the hotel. The Environmental Audit of the hotel was conducted to ascertain the impact of the hotel's activities on the biological (plants) and physical (soil/water body) environments within and outside the hotel. Of particular interest was the assessment of the effects of storm and floodwaters emanating from within the hotel on the immediate surroundings, mainly as part of the floodwater/stormwater flows into the undeveloped land located at the northern end of the Whitefield Hotels.

The scope of the investigation thus includes the quality assessment of the soils, sediments, flora and fauna, and effluents.

The main operation of Whitefield Hotels Limited is accommodation, feeding, entertainment, communication, sports, and social engagement, which are benchmarked according to seven core EarthCheck™ indicators (Scott et al., 2014):

1. Presence of sustainability policy (yes-no).
2. Energy consumption (MJ/guest-night; all types of energy consumed must be reported).
3. Potable water consumption (kL/guest-night).
4. Solid waste production (m^3 of landfilled waste/guest-night).
5. Social commitment (total number of employees with their primary address within a 20 km distance from the workplace/total number of employees, %).
6. Resource conservation (weight of eco-labelled paper purchased in kg per year/total weight of composition purchased in kilograms per year, %; recognizing varied availability of eco-labelled paper in the world, articles with recycled content are better considered).
7. Chemicals use (total weight of biodegradable active chemicals used in kg per year/total weight of active substances used in kg/year, %; it includes cleaning and land-applied chemicals, and guidelines used to determine biodegradability are provided). Consequently, this audit exercise indicated that the operation of Whitefield Hotels would result in short- and long-term adverse impacts on the environment and non-nuisance to the community, especially from wastewater and solid waste, the most abundant garbage generated. In addition, the suggestion was made in the report that will ensure that resources are used appropriately and efficiently by employing the R6 Hierarchy of waste management, which includes Refuse, Reduce, Reuse, Regenerate, Recycle, and Rebirth, generally referred to as Zero Waste Hierarchy by Ameen et al. (2022) and Ferrari et al. (2016).

The environmental auditor must also be familiar with international treaties and conventions on ecological issues, besides having an excellent grasp of the national policy, strategies, and programs for environmental protection and conservation and climate change control. Since this is an emerging area, the auditor will also have to periodically update themselves with the latest developments on the subject, nationally and internationally.

Therefore, an Environmental Audit comprises a systematic, objective, documented, periodic evaluation of how healthy organizations, management, and equipment perform. The aim is to help safeguard the environment by facilitating management control of environmental practices and assessing compliance with the company's corporate policies, including the Company's effort to meet regulatory requirements.

This audit objectively covers:

Verification whereby audits evaluate compliance with regulations or other set criteria;

Systematic: audits are carried out in a planned and methodical manner;

Periodic: audits are conducted to an established schedule;

Objective: information gained from the audit is reported free of opinions;

Documented: notes are taken during the audit and the findings are recorded and,

Management tool: audits can be integrated into the management system (such as a quality management system or environmental management system).

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The Specific Objectives of the Environmental Audit are as follows:

The audit aims at determining whether the Environmental Management System (EMS) complies with planned arrangements for environmental management policies, procedures, and regulatory requirements to facilitate management control of environmental practices (Roy et al., 2013).

Generation of adequate environmental information assessment of facilities for the potential environmental risks that are likely to be caused by the operations to the facilities and immediate environments, achieving resource optimization and improved process performance. Encouraging organizations to self-regulate their environmental practices, and to increase their responsibilities to stakeholders and society. Ensuring compliance, not only with laws, regulations, and standards but also with company policies, the requirements of the approved NESREA endorsed environmental Management plan of the organization as standard.

Enabling environmental problems and risks to be projected and resources planned. Minimizing human exposure to risk from the environment, health, and safety (Abdulhaleem et al., 2013).

The audit results provide factual feedback on the effectiveness of the existing environmental management System (EMS) and the level of compliance with regulatory requirements. This serves as input to the organization's management review process in addition to providing a platform for planning for continual environmental performance improvement.

Terms of Reference (TOR) of the Audit Project

To determine Noise Level Determination Decibel (dB) and examine operational processes and technology and assess the efficiency of the hotel operations.

Examine sources of waste, existing waste disposal strategy, and waste recycling/minimizing/reduction/prevention options.

Carrying out an environmental assessment of the hotel's facilities to identify the potential environmental risks that are likely to be caused by the operations and the facilities.

Achieving maximum resource utilization, optimization, and improvement of process performance.

Encouraging organizations to self-regulate their environmental practices and increase their responsibility to stakeholders and society and ensuring regulatory requirements.

Recommending appropriate, quantifiable, and cost-effective rehabilitation measures aimed at the restoration of polluted areas to acceptable standards.

Scope of Environmental Audit:

The Scope of Work designed for this project includes, but is not limited to:

Sequel to the objectives of the environments audit, the scope of this audit covers the hotel's policy, organization, action plan, and legal requirements with particular reference to Environmental management of specific activities such as accommodation, Feeding, Entertainment, Communication, sport, and social engagement. Field surveys to determine the status of various environmental components (Air quality, water, soil, noise level, vegetation, etc.). Collection and analysis of water samples for water microbiology and relevant Physico-chemical parameters such as pH, Total Dissolved Solids (TDS), Electrical conductivity (EC), Dissolved Oxygen (DO) and others.

Health, Safety and Environment (HSE) Audit including an audit of the compliance of the hotel's personnel with acceptable health, safety, and environment (HSE) provisions and regulation (Roy, 2002). Benefits of the Environment Audit: There are several benefits to a firm undertaking an environmental audit. Some of the benefits are obvious, while others are less easy to identify. Two of the more easily recognized benefits are increased management effectiveness and Cost savings. These will be discussed in turn, and then some of the other, less obvious, benefits will be covered briefly.

Cost savings

An environmental audit should identify opportunities for improvements in an organization's management, which will often lead to savings in spending. This is particularly common in the case of 'issue' audits, such as the water or waste audit. For example, waste minimization is an area where an organization has many opportunities to save money. Waste requires to be disposed of, and this itself costs money. For instance, companies are charged for disposing of garbage in licensed landfill facilities, or it may be necessary to pay for special treatment of a chemical before disposal. Refusing to use

DOI: 10.26730/2618-7434-2025-1-22-51

biodegradable materials such as paper and cardboard by employing electronic gadgets and reducing the amount of waste produced can lead to savings, as the organization has to dispose of nothing or a smaller quantity. Minimizing inputs is an obvious way of reducing the amount of waste generated. Adopting a more efficient process could mean that fewer raw materials are required and that the overall cost of raw materials is reduced. Reductions in water required can also lead to savings, as organizations are usually charged for their water usage (FEPA, 1991). Recycling not only leads to a reduction in the total amount of waste produced and the associated financial benefits of this but can also lead to direct cost savings. For example, the by-products of one process may have potential uses in another. In addition, the recycling of water, which may involve treating/cleaning/cooling, can also lead to a reduction in wastewater disposal costs. It may be helpful to explore the possibility of waste-exchange schemes, i.e. (Re-use and Re-Birth) that is, selling your waste to other businesses to use as raw material or buying in destruction for your use. The former can lead to reductions in waste disposal costs, with the latter providing the possibility of reduced raw material costs. Ecological management is good business management. The environmental audit makes the administration aware of several problems that would otherwise not have become known and identifies means of gaining financially. As well as reduced costs by minimizing waste, reducing the use of raw materials, and so on, other areas where savings can be made include. The possibility of reduced insurance premiums for good environmental performance (refer to environmental liabilities and insurance costs discussion earlier)

Reduced likelihood of unexpected pollution events, therefore less chance of incurring costly fines. The benefits of environmental auditing described so far are largely financial and can be measured directly. A range of less tangible benefits can also be identified, including Increased awareness of environmental policies and responsibilities among the whole workforce Increased management confidence due to a feeling of security that the compliance (and safety) status of the plant is confirmed and documented.

The cost of the audit can often be recovered by savings made through improvements identified in the audit and several auditing companies peg their fees to the savings made subsequently, or may operate on a 'no gain, small fee' basis. (FEPA, 1991).

Implementation of Audit Programme

The audit was executed by following a structured and methodological investigation procedure, which include the; Audit planning (Pre-Audit);

Document review On-site audit activities; and post-audit activities.

Phase 1: Audit Planning (Pre-Audit)

Pre-audit initiating and executing a formal contract between Whitefield hotels Limited and Roygbiv Analytical & Environmental Services Nigeria Limited. A qualified and experienced Environmental Audit team was set up to execute the study. The audit's objectives, scopes, and focal points were established through communication with Whitefield Hotel's limited representatives. Available documents such as Health, Safety, and Environment Management System manual and policies with associated documents and waste management manuals were collected from their office in Kwara State for review.

Phase 2: Document Review

The audit team carried out a detailed review of all available documents. This was done to understand existing information about the hotel better and review the legal and regulatory requirements, permits, orders of consent, certificates of operations, etc. It referred to the library for complementing information to gain a working knowledge of the hotel site, understand the significance of individual processes and procedures, and determine the category of staff to participate in the audit exercise. This phase also assisted the team members in the preparation of audit checklists. Appropriate documents shall be prepared, reviewed, and approved by relevant authorities.

Phase 3: On-Site Audit Activities

On-site audit activities included: Facility tour and assessment to determine the area that may be affected by the operational activities as well as design sampling/measurement points; Interviewing of

DOI: 10.26730/2618-7434-2025-1-22-51

hotel staff/observation of operational activities on-site; and A sampling of soil, vegetation, air quality, and noise measurement within the hotel environment.

Oral Interview

On-site (in-situ) face-to-face interview and focus Group, ROYGBIV Analytical & Environmental Services Nigeria Limited Conducted Discussion (FGD). Audit team at the instance of all representatives (stakeholders). In doing this, a weekend working period was adopted to ensure balance and that accurate/unbiased results predominate.

Phase 4: Post Audit Assessment

This process includes the following: Analyzing the data from samples collected; developing mitigation measures for all identified impacts; Reporting audit findings; developing recommendations to abate all lapses noticed during the facility audit; Collating all information received and reported writing; Submitting the draft report to FMEnv Through NESREA.

Overview of the Facility

Description of the Facility Location and Operation Description

Whitefield Hotels Limited Facility is located at Plot 37 Muslim Pilgrims Road, off Western Reservoir, with postal code No. 234031 in Ilorin west local government Area of Kwara state, Nigeria. The facility site has its geographical coordinates marked at its four edges and the center (Hotel Central as location1, the Northern part of the hotel as location2, the Southern part of the hotel as location3, the Western part of the hotel as the location4 and Eastern part of the hotel as location5) and represented as Central: Location 1:N 80 28' 47" E 40 29' 54," Location 2: N 80 43' 47" E 40 29' 53," Location 3: N 80 28' 45" E 40 29' 52," Location 3: N 80 28' 46" E 40 29' 55," Location 4: N 80 28' 52" E 40 29' 51," and Location 5: N 80 28' 43" E 40 30' 21" and a registered limited liability company with Registration Number as RC. 1144641 commissioned to carry out hospitality business (Source: As Obtained from the Field).

The colonialists' development of the hospitality sector is apparent with the development of ubiquitous government "Catering Rest Houses" established mainly between the 1920s and 1930s in virtually all the provinces across the country. Other guest houses, inns, lodges, and hotels sprang up over time and were run by corporate organizations. From what was then the catering rest house, they developed into full-fledged hotels owned by the Federal and State governments. The Metropolitan Hotel, Port Harcourt; Central Hotel, Kano; Ikoyi Hotel, Lagos; hill Station Hotel, Jos, among others, are given. These hotels came under the management of Nigeria Hotels Limited, and some were sold to private individuals under the privatization exercise (BPE: 2003).

Some states also inherited the rest houses to transform them into state Hotels like those found in Maiduguri in the 1930s. Public corporations and Organized Private Sectors were also encouraged to participate in the hotel business, which gave birth to most high-class hotels across the cities, including the Tran-scorn Hotel, which was once under the Contract management of the Hilton Group. Hospitality legislation in Nigeria is rooted in the laws of the United Kingdom (UK) inherited with the colonization of Nigeria effective from the first day of January 1900. Today's laws that rule the industry are deeply in the Inns and Hotel Proprietors' Acts. Whitefield hotels cover 10.75 m^2 hectares of land, with an area size of 0.2 km^2. There is a need to get the right people in the proper departments (or operations); this is highly important for any hotel business to run successfully. At Whitefield, hotel operations are structured so that all the key areas are present and running. The critical operations are as follows:

Whitefield hotels Limited at Ilorin township has some of its operations as The main operation of Whitefield hotels limited accommodation, Feeding, Entertainment, Communication, sport, and social engagement, which are bench-marked according to seven core earth check TM indicators (Scott et al., 2014): as earlier stated above but not limited to that as there is a division of labor at White field hotels which include while the health safety section is a branch of Standard Operating Procedures in the day to day operation of white field hotel.

DOI: 10.26730/2618-7434-2025-1-22-51

Figure 1 – Facility Layout (Source: As Obtained from the Field)
Рисунок 1 – Схема расположения объекта (Источник: получено на месте)

Figure 2 – Kitchen. As the popular saying goes, "a hungry man is an angry man". In this regard, the kitchen department at Whitefield hotel is where food preparation takes place. They ensure that food items are prepared under hygienic conditions and that kitchen safety regulations are carried out
Рисунок 2 – Кухня. Как гласит народная поговорка, «голодный человек – злой человек». В связи с этим кухонный отдел в отеле Whitefield – это место, где происходит приготовление пищи. Они следят за тем, чтобы продукты готовились с соблюдением гигиенических условий и правил безопасности на кухне

Figure 3 – Engineering, Maintenance and Energy generating Department (Source: As Obtained from the Field)
Рисунок 3 – Департамент инженерии, технического обслуживания и генерации энергии (Источник: получено на месте)

DOI: 10.26730/2618-7434-2025-1-22-51

Sales & Marketing

How do you attract more customers and increase/maintain the visibility of an organization, if not through sales and marketing? The Sales & Marketing team is the perfect go-to. This department at Whitefield Hotel keeps up and utilizes marketing channels to the advantage of the hotel, spreads the brand message, and converts projects to paying guests. However, note that you can be more open about having this team, especially if you are starting a small hotel. There are credible hospitality sales and marketing agencies that can effectively carry.

Figure 4 – Sales & Marketing Department (Source: As Obtained from the Field)
Рисунок 4 – Отдел продаж и маркетинга (источник: получено на месте)

Figure 5 – Food Beverage Department (Source: As Obtained from the Field)
Рисунок 5 – Отдел продуктов питания и напитков (Источник: получено на месте)

DOI: 10.26730/2618-7434-2025-1-22-51

General Description of Surrounding Hotel Environment

The hotel area's environmental characteristics (climate, air quality, vegetation, geology, hydrogeology, soil, and socio-economic framework) are presented below. The description of the present condition of the Whitefield Hotel Limited site is a result of a field assessment and a summary of data from previous environmental studies carried out on the hotel.

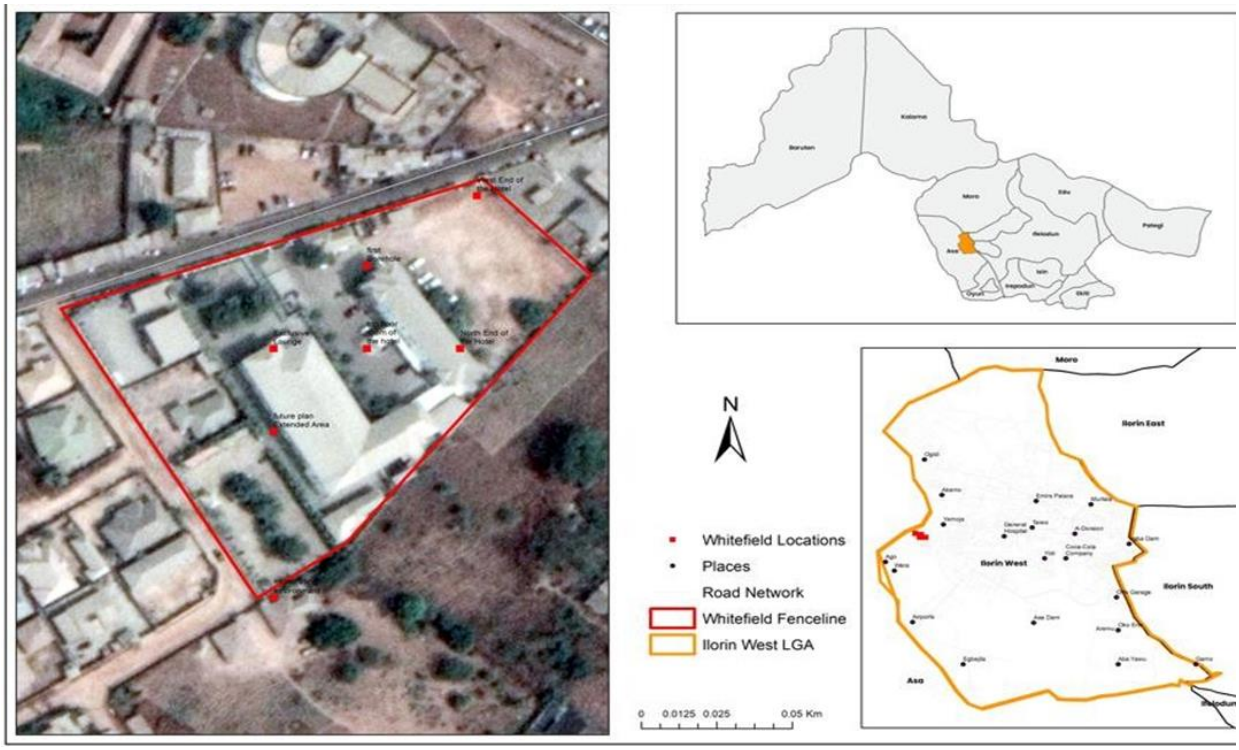

Figure 6 – Map of Kwara State Shown Whitefield Hotels (Source: Obtained from the hotel through Coordinates and imaging)
Рисунок 6 – Карта штата Квара, на которой изображены отели Whitefield (Источник: получено из отеля через систему координат и визуализации)

Kwara State Profile

Capital**:**	Ilorin
Area:	36, 825km^2
Population:	2,748,100 (year 2011) but expected to be 3,599,800 in 2020
Major language:	Baatonum, Bokobaru, Bokobaru Nupe and Yoruba
Governor:	Abdurrahman Abdulrazaq (APC)
ISO 3166-2:	NG-KW
Date Created	27th May 1967
Population Rank:	Ranked 31st

Regional Profile of the Project Area

Kwara State is one of the oldest states in Nigeria. It was among the initial states created by Yakubu Gowon in 1967 when Nigeria changed from the regional structure in the aftermath of the civil war. Initially, the state covered parts of Kogi State and Niger State, especially the Kabba division of Kogi and Borgu LGA of Niger State (Ashaolu and Aro, 2017).

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Hydrogeology

Kwara State's hydrogeology falls within the Upper Niger River Basin. The Upper Niger basin represents the upper arm of the drainage area of the River Niger, covering an area of about 116,300 sq km. Generally, the more significant part of this country is undulating and sparsely populated. According to Michael et al. (2000), two major formations are seen within this Upper Niger basin: the Illo formation and the Nupe (Bida) Sandstone, which the project area falls under, having characterized alluvial deposits. Groundwater in the alluvium is recharged directly by rainfall or the adjoining overflowing river systems. In the dry season, the alluvium sustains considerable subsurface groundwater flow. The distribution and circulation of groundwater are controlled by geological factors such as the rocks' lithology, texture, and structure, and by hydrological and meteorological factors such as stream flow and rainfall. Groundwater occurs both in unconfined and confined conditions.

Alluvial deposit: Alluvial deposits associated with the course of the River Niger are variable in texture and composition, ranging from coarse sands and gravels to fine silts and clays. The thickness also changes, ranging from a few meters to 30 m. Variably, they overlie the Nupe sandstone and its equivalent, and in places, they cover the basement directly. The fine texture of the sands and the rapid alteration of sands with clay, mudstone, and silt reduce the groundwater potential of the Nupe sandstone, the area within which the project site is located.

Demographics

Kwara State is a heterogeneous state attracting different ethnic groups, including the Yorubas, Nupes, Barnabas, Fulanis, and Hausas. The major ethnic groups in the state are the Yorubas, and their language is widely spoken across the state. Since the early 17th century, when many Islamic scholars came to settle around present-day Kwara State, in particular Ilorin, Islam has gradually become the leading religion in the state. This dynamic was enhanced during the Fulani jihad of the 19th century when large portions of the savanna region of the state came under the control of emirs until a defeat in 1897.

Geography/Geology

It has an elongated shape running from west to east and covering an area of about 34,467.5 sq km. The state has the River Niger as its natural boundary along its northern and eastern margins and shares a common internal border with Niger State in the north, Kogi State in the east, Oyo, Ekiti, and Osun States in the south, and an international boundary with the Republic of Benin in the west. It is, therefore, appropriate to say that the state is indeed a middle-belt state serving as a ‘gateway’ between the North and the South and a “melting point” for the northern and southern cultures of relatively flat and undulating land with interior and lacustrine deposits; dispersed hills and valleys in parts of Baruten and Moro Local Government areas. The geology and drainage of Kwara consist of Precambrian basement complex rock. The soils of Kwara are made up of loamy soil with medium and low fertility. Because of the high seasonal rainfall coupled with the high temperature, there is a tendency for the lateritic ground to constitute the primary soil type in Ilorin due to the leaching of minerals and nutrients in the soil (Abdullah et al., 2004).

Minerals:

Solid minerals in Kwara State include marble, granite, haematite, clay, kaolin, feldspar, gold, mica, quartz, laterite, and talc (Abdullah et al., 2004).

Soils

Many states are characterized by ferruginous tropical soils on crystalline acid rocks. Alluvial and hydromorphic soils are predominantly found in the state. The ground is fertile (sandy loamy/composite), and the state is well watered by the various tributaries of the Niger River, which run through hills and valleys. Ekiti, Oke Ero, Irepodun, Isin, and Oyun Local Government areas have some lowland rainforests. The western section of the state is at a slightly higher altitude than the east (Abdullah et al., 2004).

Climate, Meteorology, and Vegetation

Kwara State is located in the west-central area of Nigeria and lies in the region termed the Middle Belt of Nigeria. It is located in the forested savanna and enjoys mild dry and wet seasons, with heavier rains falling in September and October. The derived guinea savanna grasslands dominate the Northern parts of the state, while some parts of Southern Kwara fall within the rainforest agroecological zone of

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Nigeria. Parts of the state, especially those surrounding Asa local government, is a low-lying Nigerian basement complex between 300-400 meters above sea level. In some of the forest-savanna areas of the state, a native African savanna tree, the Prosopis Africana, can be found. The tree is heavily used for such purposes as handles for hoes, chewing sticks to protect against gum decay, etc. The state borders Niger State to the north, Kogi State to the east, the Republic of Benin to the West, and Oyo, the Osun State, to the south. Some of the rivers in the states are Moro, Asa, Niger, Weru, Adere, and Oshin. The Kwara State shares a boundary to its West with the Republic of Benin and has as its northern boundary the Niger River. Kwara state comprises rain forests in the southern parts, with wooded savannah covering the more significant part of the state.

The months of December and January coincide with the cold and dry harmattan period. The Rivers Asa, Awon, Oshin, and Moro in the central state have a mean temperature of 30 °C to 35 °C. The natural vegetation comprises Edu and Patigi local government areas, guinea, derived savanna, and rain forest. The climate of Kwara is characterized by both wet and dry seasons. The rainy season begins towards the end of April and lasts until October, while the dry season starts in November and ends in April. The temperature of Kwara ranges from 10 ºC to 35 ºC from November to January, while from February to April, the value ranges between 34 ºC to 40 ºC. Days are sweltering during the dry season. The total annual rainfall in the area ranges from 0.00 mm to 400 mm. The rain in Kwara state exhibits the double maximal pattern and more significant variability both temporarily and spatially. The relative humidity ranges from 0.00%-200% thought the year, according to the meteorological obtained below in Figures 7 to 11 (Nigeria Meteorological Agency, 2022).

(a) Average Temperature in Ilorin

The hot season lasts for 2.6 months, from January 23 to April 10, with an average daily high temperature above 92°F. Ilorin's hottest month of the year is March, with an average high of 94°F and a low of 73°F. The cool season lasts for 3.6 months, from June 22 to October 10, with an average daily high temperature below 85°F. The coldest month of the year in Ilorin is August, with an average low of 70°F and a high of 83°F.

(b) Rainfall in Ilorin

To show variation within the months and not just the monthly totals, we show the rainfall accumulated over a sliding 31-day period centered around each day of the year. Ilorin experiences extreme seasonal variation in monthly rainfall. The rainy period of the year lasts for 8.7 months, from February 24 to November 14, with a sliding 31-day rainfall of at least 0.5 inches. The month with the most rain in Ilorin is September, with an average rainfall of 7.0 inches. The rainless period of the year lasts for 3.4 months, from November 14 to February 24. The month with the least rain in Ilorin is December, with an average rainfall of 0.1 inches.

(c) Wind Speed in Ilorin: This section discusses the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground. The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages. Ilorin's average hourly wind speed experiences significant seasonal variation over the year. The windier part of the year lasts for 6.5 months, from February 17 to September 2, with average wind speeds of more than 6.7 miles per hour. Ilorin's windiest month is April, with an average hourly wind speed of 8.4 miles per hour. The calmer time of year lasts for 5.5 months, from September 2 to February 17. Ilorin's most relaxed month is November, with an average hourly wind speed of 4.8 miles per hour.

(d) Best Time of Year to Visit Ilorin

We compute two travel scores to characterize how pleasant the weather is in Ilorin throughout the year. The tourism score favors clear, rainless days with perceived temperatures between 65°F and 80°F. Based on this score, the best time of year to visit Ilorin for general outdoor tourist activities is from early December to mid-January, with a peak score in the last week of December.

(e) Humidity Levels in Ilorin

We base the humidity comfort level on the dew point, as it determines whether perspiration will evaporate from the skin, thereby cooling the body. Lower dew points feel drier, and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically

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followed by a muggy night. Ilorin experiences extreme seasonal variation in the perceived humidity. The muggier period lasts for ten months, from February 6 to December 6, during which the comfort level is muggy, oppressive, or miserable at least 34% of the time. The month with the muggiest days in Ilorin is August, with 31.0 days that are muggy or worse. The month with the fewest humid days in Ilorin is January, with 6.4 days that are muggy or worse.

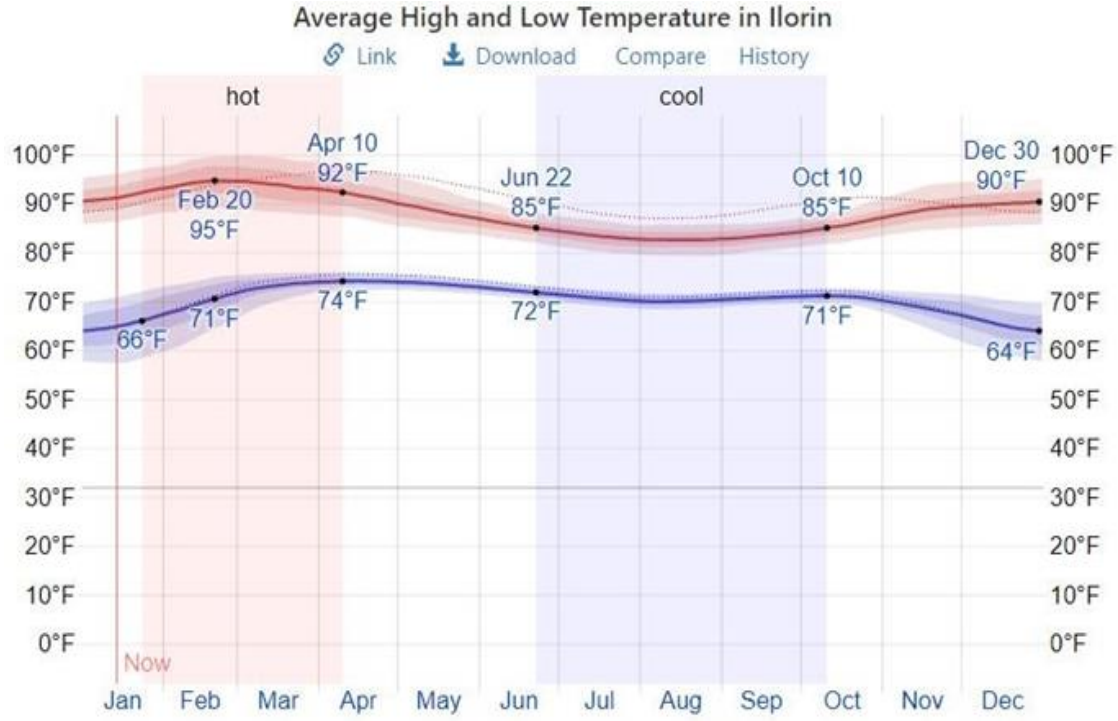

Figure 7 – Average High and Low Temperature in Ilorin (Source: Nigeria Meteorological Agency (NIMET)

Рисунок 7 – Среднемесячная максимальная и минимальная температура в Илорине (Источник: Нигерийское метеорологическое агентство (NIMET)

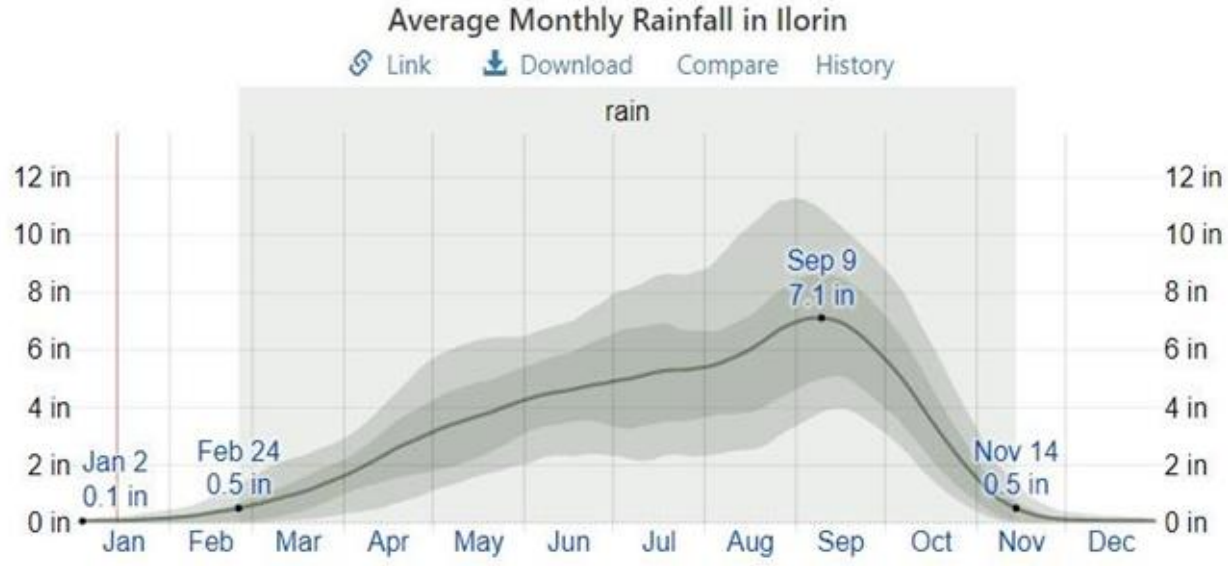

Figure 8 – Average Monthly Rainfall in Ilorin [Source: Nigeria Meteorological Agency (NIMET)]

Рисунок 8 – Среднемесячное количество осадков в Илорине [Источник: Нигерийское метеорологическое агентство (NIMET)]

DOI: 10.26730/2618-7434-2025-1-22-51

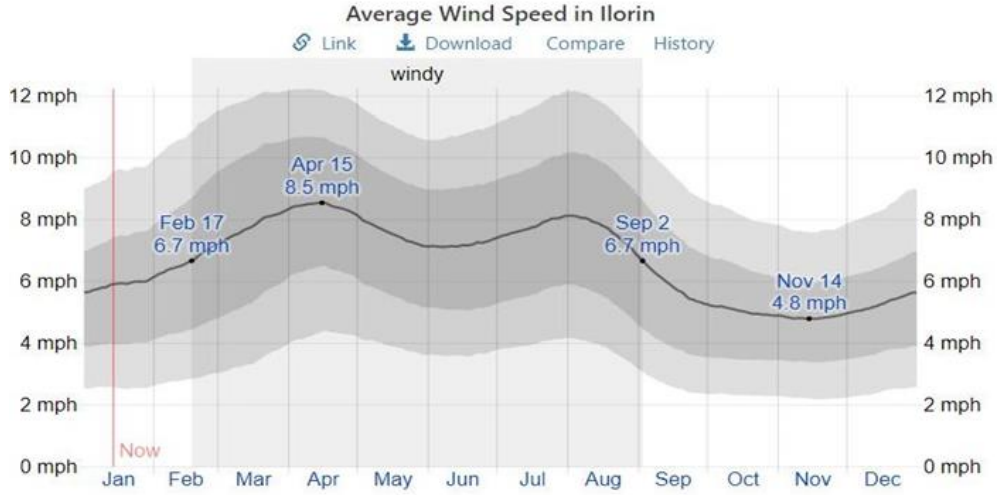

Figure 9 – Average Wind Speed in Ilorin (Source: Nigeria Meteorological Agency (NIMET)
Рисунок 9 – Среднемесячная скорость ветра в Илорине [Источник: Нигерийское метеорологическое агентство (NIMET)]

Figure 10 – Tourism Score in Ilorin [Source: Nigeria Meteorological Agency (NIMET)]
Рисунок 10 – Показатель туризма в Илорине [Источник: Нигерийское метеорологическое агентство (NIMET)]

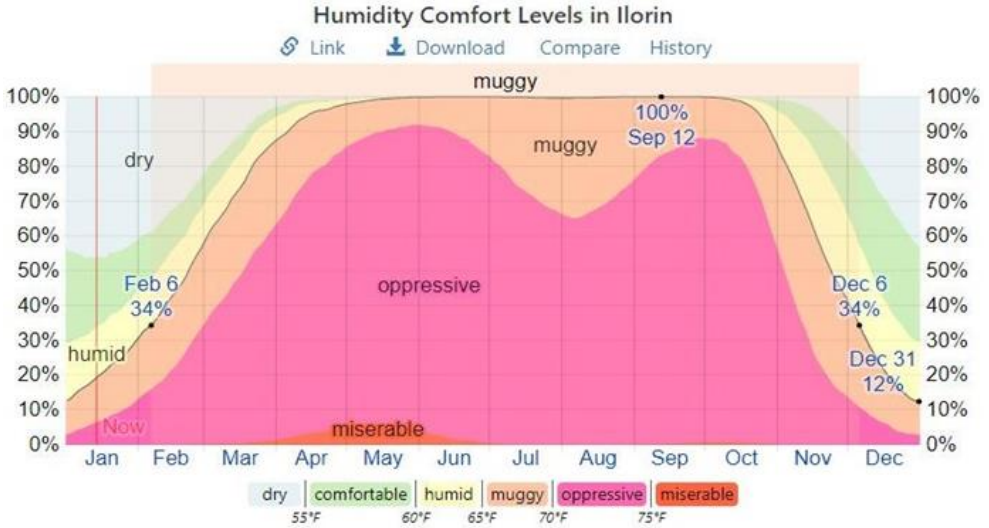

Figure 11 – Humidity Comfort Levels in Ilorin [Source: Nigeria Meteorological Agency (NIMET)]
Рисунок 11 – Комфортные уровни влажности в Илорине [Источник: Нигерийское метеорологическое агентство (NIMET)]

DOI: 10.26730/2618-7434-2025-1-22-51

Methods of Baseline Data Acquisition

The environmental baseline data for the Whitefield Hotel Limited was obtained through literature review, desktop research, field observation, sampling and measurements, and laboratory analyses of biological, chemical, organic, and physical characteristics of sampled environmental components. The field investigations were carried out between the 17th and 25th of September 2021. A multi-disciplinary approach was employed to acquire baseline data on the proposed hotel area. The multi-disciplinary approaches include:

Literature Review

Before the surveillance and field investigation, the project profile in the form of a feasibility study report was collected from the major stakeholders as an essential source of information on the project concept and its scope. Published and unpublished materials about the area were collected from different sources, which included internet sources, government departments, and agencies such as records from the National Meteorological Agency, Federal and Kwara State Ministries of Environment, Federal Ministry of Environment/NESREA, as well as from the General Manager of Whitefield Hotels. These were used to define the scope of the field. Considering the inter-disciplinary need for conducting the EAR (ROYGBIV Analytical and Environmental Services Nigeria Limited) ensured that a relevant and well-experienced team was assembled to deliver on the set objectives. To achieve this, a multi-disciplinary team of experienced scientists and environmental professionals was made to carry out the required resource assessment, generation, and analysis of baseline data. Baseline data for the study area was generated using a combination of field studies; analysis of maps, plans, and aerial photos; review of background project documents (feasibility studies); structured interviews; social surveys; and internet searches. Below are the various study approaches and data acquisition methodologies adopted.

Air Quality Assessment Method

Table 1 summarized the Air Quality Analytical and test methods for the hotel's determination of air quality and prevailing meteorological characteristics was based essentially on direct measurements using handheld in-situ air monitors, software, and portable meteorological stations. Temperature, gas emissions, relative humidity, and noise levels were measured using online satellite imaging following standard analytical methods. The air quality parameters measured at each sampling point are: temperature, air quality, relative humidity, sulfur IV oxide (SO_2), nitrogen II oxide (NO), nitrogen IV oxide, suspended particulate matter (SPM), carbon IV oxide, benzene, and noise level.

Table 1 – Air Quality Analytical and Test Methods
Таблица 1 – Аналитические и тестовые методы испытаний качества воздуха

S/N	Component	Measurement	Method
1.	Air Quality	In situ	AOAC
2.	Carbon II oxide (CO)	In situ	AOAC
3.	Carbon IV Oxide (CO_2)	In situ	AOAC
4.	Sulphur IV Oxide (SO_2)	In situ	AOAC
5.	Nitrogen II oxide (NO)	In situ	AOAC
6.	Nitrogen IV Oxide (NO_2)	In situ	AOAC
7.	Hydrogen Sulphide gas (H_2S) and Ammonia (NH_3)	In situ	AOAC
8.	Suspended Particulate Matter	In situ	AOAC
9.	Benzene gas	In situ	AOAC
10.	Noise Level	In Situ	AOAC

DOI: 10.26730/2618-7434-2025-1-22-51

Temperature and Relative humidity:

The concentration of this pollution in the ambient air is the consequence of anthropogenic and natural environmental processes. The ambient temperature of the hotel environment was measured using hand-held digital equipment. The equipment measures temperature, relative humidity, light intensity, and noise level. The device is battery-operated, handy, and easy to operate. The measurement did not require the use of chemicals and was done in situ. The theoretical methods are unique to each pollutant and are shown in the table below:

Vegetation Characterization Method

The general characterization of the vegetation of the study area, including flora composition/diversity, physiognomy, plants, and crop pathology, was undertaken with specific reference to the following parameters: frequency of occurrence of species, the density of species, height of species at random, and girths at an appropriate height for a sizeable number of trees. The farmers engaged in farming yams, corn (maize), sorghum, millet, onions, and beans, which are the most important staple crops; rice and sugarcane are significant cash crops in the Niger floodplains. Cotton and tobacco were also included. Five transects were selected for the entire study block in such a way that one runs vertically while the other runs horizontally. Vegetation physiognomy was characterized in terms of the number of stories as well as the ground cover and the conditions that permit their establishment. Following the classification criteria adopted, care was then taken to cover adequately all areas of clear variations and density in vegetation cover for the 2 km radius. This covered flora composition, diversity, physiognomy, plants, and crop pathology. In doing this, the frequency of occurrence of species, density of species, and height of species at random were taken, whereas girth at an appropriate height for a sizeable number of trees was determined.

Method of Soil Studies

Sampling locations for soil samples at the hotel premises were chosen in a way that enhances mapping. At each sampling point, soil samples were collected from two depths, representing surface (0-20 cm) and subsoil (21-40 cm). All six samples were collected from the proposed project site with a soil auger, while a control sample was taken outside the area. The samples were stored in labeled polythene bags. In-situ observations were made on soil color, texture, consistency, internal drainage, presence or absence of nodules, concretions, mottles, parent materials, shape, and erosional features. The set of equipment used includes a pH meter, conductivity bridge, soil hydrometer, flame photometer, Cecil double beam spectrophotometer, Kjeldahl digestion block, assorted glassware, and other standard laboratory materials. Table 2 shows the methods used for the physico-chemical analysis of collected samples.

Table 2 – Tests Methods for Physico-Chemistry and Point of Sampling with Coordinates
Таблица 2 – Методы физико-химических испытаний и точки отбора проб с координатами

PARAMETERS		ANALYTICAL METHODS	
Physical		AOAC	
Chemical		AOAC	
Locations of the Coordinates in the (EAR) Study Area			
S/N	GPS: Reading Easting	GPS: Reading Northing	Description
1.	4° 29’ 54’’	8° 28’ 47’’	Hotel Central Point
2.	4° 29’ 53’’	8° 43’ 47’’	Northern part of the hotel
3.	4° 29’ 55’’	8° 28’ 46’’	Southern part of the hotel
4.	4° 29’ 51’’	8° 28’ 52’’	Western part of the hotel
5.	4° 30’ 21’’	8° 28’ 43’’	Eastern part of the hotel
Biological and Organic		AOAC	

Sampling Procedure for Water Quality

DOI: 10.26730/2618-7434-2025-1-22-51

Field Data Collection

For each of the following points for both surface and underground water, field measurements and observations were recorded in a field data logbook and field data sheet. At these points, the following information was captured: Station ID (Sampling Code), Sampling Date, Location (GPS Location for Geo-referencing), Sampling Depth, Sampling Time, and all measured field parameters and their respective values. In situ physico-chemical parameters, especially for water measured, included part or all of the following: Dissolved Oxygen, Temperature, Conductivity, pH, Total Dissolved Solids, and Turbidity.

Recording Field Observations

Upon arrival at the stream, observations on the general appearance and condition of the water (for example, color, odor, taste, foam, appearance), other information related to water quality, and water use (for example, for fishing or swimming and other domestic and industrial use) were documented. Existing socio-economic activities along the stream banks were also noted. The general observations were recorded to aid in interpreting water quality information. Areas covered by the comments include:

(a) Water appearance: General observations on the water include color, an unusual amount of suspended matter, debris, or foam. (AOAC 2014 and Pepsi International 2005)

(b) Weather: Recent meteorological events that may have affected water quality include heavy rains, a cold front, or very dry or very wet conditions.

(c) Biological Activities: Excessive macrophytes, phytoplankton, or periphyton growth. Observing water color and excessive algal growth is essential in explaining high chlorophyll or low Dissolved Oxygen (DO) values. (AOAC 2014 and Pepsi International 2005)

(d) Unusual Odor: Examples include hydrogen sulfide, mustiness, sewage, petroleum, chemicals, or chlorine. This is common to wastewater. (AOAC 2014 and Pepsi International 2005)

(e) Watershed: Events that decrease water quality, for example, bridge construction, shoreline mowing, or livestock watering upstream, shall also be recorded.

Water samples were collected for physicochemical analysis and sterilization of bottles for oil and grease analysis. These samples were preserved in iced packed coolers and immediately sent to the laboratory. For samples collected from the stream, grab pieces were managed to achieve a representative stream sampling.

(f) Turbidity and Conductivity/TDS

The turbidity of the water sample was measured in situ using specialized equipment, and the conductivity of the water sample was measured. The measurement was achieved by filling the cuvette with 10 ml of the sample collected, replacing the cuvette with the turbidity meter, and pressing read, after which the turbidity level of the water sample would show on the screen, which also applies to conductivity measurement while TDS is a factor of 0.16 (AOAC 2014 and Pepsi International 2005).

(g) Temperature: The temperature of collected water samples was obtained in situ using hand-held equipment specifically made for the purpose. The temperature meter, when switched on, displays the reading digitally once the probes are dipped into a beaker containing the water sample. (AOAC 2014 and Pepsi International 2005).

(h) pH

The pH of the collected water sample was obtained using the Hanna pH meter made explicitly for measuring the pH level of both surface and underground water (AOAC 2014 and Pepsi International 2005).

Dissolved Oxygen

The determination of dissolved oxygen serves as the basis of the BOD test; thus, they are the foundation of the most critical resolution used to evaluate the pollution strength of domestic and industrial wastes. The rate of biochemical oxidations is measured by determining residual dissolved oxygen at various intervals. The collected DO of samples was obtained in situ using the Dissolved Oxygen meter that was dipped into a beaker containing the water sample and allowed to read (AOAC 2014 and Pepsi International 2005).

Sampling Analysis/Methodology

DOI: 10.26730/2618-7434-2025-1-22-51

The following were tested to infer the current quality status of the surface and underground water. (AOAC 2014 and Pepsi International 2005).

Physico-Chemical and Heavy Metal Parameters

The physicochemical parameters for each water sample are: Temperature (°C), pH value, conductivity (μS/cm), Turbidity (NTU), Nitrate (NO_3), nitrite (NO_2), sulphate (mg/L), phosphate LR (mg/L), Manganese LR (mg/L), color, Dissolved Oxygen (ppm), alkalinity (mg/L), magnesium (mg/L), ammonia (mg/L), copper (mg/L), lead (mg/L), Potassium LR (mg/L), Silicon (mg/L), Zinc (mg/L), Total phosphorus (mg/L), Cadmium (mg/L), Calcium (mg/L), Iron (mg/L), Sodium (mg/L), Nickel (mg/L), Arsenic (mg/L), Organic nitrogen (mg/L), and Organic carbon (mg/L). The results were tabulated and compared with normal values (FMEnv, WHO, and SON) (AOAC and Pepsi International 2005).

Bench Spectrometer Drel 5000

All the physicochemical parameters except some heavy metals (cadmium, Arsenic, and lead) were determined using the appropriate reagents with the Bench Spectrometer Drel 5000. Lead, Cadmium, and Arsenic were analyzed using an Atomic Absorption Spectrophotometer. Plate 3.5: Multi-parameter bench photometer for measuring the Physico-chemical parameters of water samples. (AOAC 2014 and Pepsi International 2005).

Heavy Metals and Inductive Couple Mass Spectrophotometer (IC-PMS)

This is an analytical method for determining heavy metals using high-precision Analytical equipment called an Inductive Couple Mass Spectrophotometer. The technique involves samples pre-treatments before inspiration into the machine. The Spectrophotometer DRE 500, afore-mentioned, was used to determine other heavy metals except for cadmium (Cd), Arsenic (As), and lead (Pb), as well as other non-metals such as Nitrate (NO_3), (SO_4), etc. therefore, it became necessary for the use (AOAC 2014 and Pepsi International 2005)

Water Sampling and Sample Pretreatment:

Sterilized reagent bottles of 250 ml capacity were used in sampling water. For surface water (Stream), the bottle was held at the base with the left, and the stopper was carefully removed using the right hand. The bottle was plunged neck downwards, below the water surface, and titled upwards, facing the opposite direction of water flow. Filled bottles were brought out, stopped, and then covered with an aluminum foil sheet. The samples were then labeled and put in an insulated cold box. Or in other occasions, the Water sample collected from the sampling area was stored in a plastic container, labeled, submerged in an ice chest cooler, and taken to the laboratory for further treatment or analysis depending on the parameter in question. Inductive Couple Mass Spectrophotometer (IC-PMS) (AOAC 2014 and Pepsi International 2005).

Digestion:

This is an analytical pre-treatment method. The 100ml of water sample was measured into a cleaned 250 ml beaker. 9 ml of concentrated nitric acid and 3mL of Hydrochloric acid were added, and this mixture was heated for some time until the content reduced to about 10ml. About 50ml of distilled water was added, and the content was filtered into a 100ml volumetric flask using a funnel and filter paper. The beaker was washed with several portions of distilled water to ensure quantitative transfer into the volumetric flask and their made-up mark. The resultant solution was transferred into a day- clean 50ml plastic sample bottle labeled and transported for further analysis Nigerian Industrial Standard (NIS-554-(2015) and (AOAC 2014 and Pepsi International 2005).

Determination of heavy metal using Inductive Couple Mass Spectrophotometer (IC-PMS): The resultant solution obtained after the digestion process in (ii) was used to determine the heavy metal. The sample was inspired by the machine equipped with appropriate hollow cathode lamps. The concentration of each heavy metal was determined in each piece.

Biological Parameters

The biological parameters that were measured include the Do; Coli form unit, E-coli (AOAC 2014 and Pepsi International 2005).

DO-Determination

100 ml of the incubator water sample was measured into a clean conical flask and three drops of 1% starch indicator were added. A Blue-black color appeared, and the resultant solution was titrated

DOI: 10.26730/2618-7434-2025-1-22-51

with 0.0025N sodium thiosulphate. The average value of triplicate titrations results was reported as the DO. (AOAC 2014 and Pepsi International 2005)

Cali form/E. Coli Isolation:

To achieve the isolation of Coli form and E-coil, there is a need for a particular water sampling method for both surface water and groundwater (AOAC 2014 and Pepsi International 2005)

Coliforms Isolation from Samples

Appropriate dilution of the raw water with sterilized distilled water (10-1-10-3) Inoculated duplicates by spread plating on Eosin methylene Blue Agar (EMB) to enumerate the total mesophilic coliforms at 35 ± 2^0C for 24-28 hrs. Eosin methylene Blue Agar (EMB) is commonly used because it is selective and different in a medium. The dye methylene Blue inhibits the growth of Gram-positive bacteria and allows the development of Gram-negative Bacteria. 1.0 ml of the diluted sample was introduced into each sterile petri – dish, and 15.0 ml EMB agar at 45^0C was poured into the plate. The plate was gently rotated to facilitate the even distribution of isolated colonies. The colonies were counted using Bibby Stuart's scientific counter. (AOAC 2014 and Pepsi International 2005)

Membrane Filtration Method for Isolation of E-coli Faecal Coliforms

World Health Organization (WHO, 1993) and (Chees brough, 2001) methods were employed. Sterile nitrocellulose membrane paper with a pore size of 0.45 mm was used. Seitz filter apparatus was assembled and sterilized in an autoclave, while steel was insulated with an aluminum foil sheet. Using sterile blunt-ended forceps, a clean membrane filter was picked and placed centrally on the filter base. 20.0 ml of untreated water was poured into the funnel, and suction drew water through the membrane filter using an electrical device. A sterile blunt-ended forceps were used to remove the membrane from the filtration apparatus before placing the same, face–up on a clean double–layered McCaskey broth–saturated Whitman No one filter paper pad in a sterile petri dish and then incubated at 440C for not less than 24 hrs oblique lighting, yellow lactose fermenting colonies, 1-3 mm diameter on nitrocellulose membrane filter were counted as in standard spread plate count method in EMB agar.

Land Use and Landscape Patterns

The use to which the land is/are put together with the general spatial pattern was examined using satellite remote sensing techniques/GIS, in situ field observations, and existing literature. The central land uses found within the project environment are:

l Forest land

l Agricultural lands

l Residential lands

Socio-Economic Assessment

Besides the physical, chemical, and biological assessment of water samples, socio-economic checks were also carried out on the quarry environment. This was done to evaluate the significant socio-economic activities around the quarry environment to know how they can affect the health of the residents. Consultation assisted in identifying likely interactions and assisted in identifying those environmental risks of particular concern. It is also essential that the assessment process quickly leads to a refinement in the number of hazards and effects being studied. This study considers these factors; a detailed environmental and ecological risk assessment was also undertaken. At the end of all the laboratory analyses, the results were subjected to statistical risk analysis.

Quality Assurance and Quality Control Measures

A quality control program was established at the beginning of the fieldwork to ensure the validity of results and comparability of acquired biological data. This involved detailed procedural guidelines for sampling, preservation, labeling, storage, and laboratory analysis. To ensure the accuracy and reliability of in-situ field measurements, field instruments were calibrated before use and crosschecked from time to time. Field data sheets were carefully kept and inspected at the end of the day's fieldwork to ensure no samples were missed. Other Quality Control measures adopted in the field are included in the summary Initial Calibration for Target Compounds and Surrogates. Continuing Calibration for Target Compounds and Surrogates, Retention Time Windows Analytical Sequence, Method Blank and Laboratory Control Sample, Surrogate Recoveries Internal Standards, Initial Demonstration of Capability, Dilution Analysis, Reporting Limit, Method Detection Limit Studies, Nonconformance

DOI: 10.26730/2618-7434-2025-1-22-51

Memo, Representativeness of samples and repeatability of data, Samples collection, preservation and storage, Labeling, Minimizing laboratory matrices and, data verification, the sensitivity of Analytical Equipment, Calibration and Re-Calibration of Analytical Equipment, calculation Relative Standard Deviation (RSD), Statistical Data, Data sheets for relevant environmental and ecological observations and laboratory logbook for laboratory-based aspects of the study were kept. All samples were analyzed soon after collection to ensure that results obtained during analysis compare favorably with the in-situ environment. Standard laboratory quality control procedures were adhered to.

Sampling Points

The sampling points were selected randomly within the study area and those around the immediate vicinity covering the recommended radius (Our spatial boundary for the baseline data gathering was 2 km except for socio-economic studies, which were for about 3 km). The use of GPS adequately captured the sampling points. The overriding considerations in selecting sampling points included accessibility, ecological features, geographical location of settlement, and siting of control points in apparently undisturbed areas.

Table 3 – Field Sampling Procedures
Таблица 3 – Процедуры отбора проб в полевых условиях

S/N	**Field Activity**	**Method Employed**
1.	Verbal Information Gathering	Focus Group Discussion and Rapid Appraisal
2.	Biodiversity Plants Plankton Amphibians Reptiles Birds Mammals	Transects and Quadrant Plankton net Observations and Interviews Observations and Interviews Observations and Interviews Observations and Interviews
3	Health Impact Assessment	Focus Group Discussion
4.	Air Quality	Various hand held and high-volume electronic samplers
5.	Meteorology	Field Studies and Existing Data
6.	Noise	Noise Meter (Hand held digital in-situ equipment within 2 km radius)

Table 4 – Air Quality Parameters in and around the hotel
Таблица 4 – Параметры качества воздуха в отеле и вокруг него

Sites	GPS Easting	GPS Northing	SO_2 ppm	Noise (dB)	Temp (℃)	NO ppm	CO ppm	CO_2 ppm	Benzene ppm	NO_2 ppm
Hotel Central Point	4° 29’ 54’’	8° 28’ 47’’	0.00	55 dB	26.0	0.0	0.0	7.20	0.00	0.00
Northern part of the hotel	4° 29’ 53’’	8° 43’ 47’’	0.00	80 dB	26.0	0.0	1.20	6.24	0.00	0.00
Southern part of the hotel	4° 29’ 55’’	8° 28’ 46’’	0.00	80 dB	26.0	0.0	0.0	3.60	0.00	0.00
Western part of the hotel	4° 29’ 51’’	8° 28’ 52’’	5.00	167 dB	36.0	3.0	3.0	9.50	14.0	8.00
Eastern part of the hotel	4° 30’ 21’’	8° 28’ 43’’	3.00	75.0	26.0	0.0	0.03	7.20	7.0	4
FMENV’s Limits	-	-	0.1-3.0	0.0	≥ 25.5	0.00	0.10	13.0	50.0	40-150

DOI: 10.26730/2618-7434-2025-1-22-51

Baseline Environmental Assessment Result

Air Quality Analysis and Results

During the site assessment, the air quality and noise status of the quarry were measured and recorded as thus contained in the table below. Results obtained show that all measured parameters are within the approved maximum limit except for hotel and mining areas that are slightly above the limit.

Soil Analysis and Results

Representative soil samples were obtained from different locations around the hotel area using a soil auger. These soil samples collected measure between 1-6cm from the top 6-30cm bottom. The collected samples were grounded in a laboratory after oven drying for 24 hours to obtain the soil content characteristics. A 2 cm sieve was used to remove the gravel fraction. From the sieved fractions, log sub-samples were used for laboratory analysis. Samples were analyzed for texture pH, Exchangeable Cations, temperature, and Heavy Metals**.**

General Characteristics of the Soil

Pollution arising from anthropogenic activities is a common phenomenon. Soil samples were collected from five locations near the hotel sites in Ilorin Kwara state Nigeria in September 2021. It was observed from the result of the Physico-chemical analysis following standard analytical procedures and using appropriate methods, the pH of the soil was basic, ranging from 7.60 - 9.92, electrical conductivity ranged from 255 – 273 uS/cm, Temperature from 34.60 - 37.24 (°C) while salinity had a range of 27.00-60.26. The textural class was sandy-clay, implying that the soil contains sand in a higher proportion. The Total Moisture content was 14.84 -30.02 %, and the Chloride content ranged from 18.12 -33.67%. In contrast, total nitrogen and nitrogen-based parameters were generally deficient in terms of concentration in the soil. Extractable phosphorus content in the soil ranged from 0.685 – 3.27%; total organic carbon ranged from 12.87-33.0%, and the entire hydrocarbon content ranged between 11.37-31.02. (Olayinka; 2014)

The observed result indicated that human activities within the town had influenced the physicochemical speciation of the soil samples in a hotel limited in Ilorin township, Kwara State, Nigeria. The high content of the organic components of the soil samples in and outside the hotel site can serve as helpful manure for the cultivation of plants. To better describe the general characteristics of the soil and achieve a better characterization, observable field parameters such as topography, texture, consistency, parent materials, structure, and land use for every soil profile were made. The parent materials were found to comprise decomposed sedimentary basement rocks mainly. The consistency was generally soft and plastic at the upper soil horizon, while the lower horizons were hard and brittle. The structures of the upper horizons are blocky and angular in the lower horizons outside of the Whitefield.

Soil Texture in and Vicinity of the Hotel

The soils fall into three broad texture classes, as follows:

Sandy loam: These are mostly on cultivated upland except the eastern end that is high in hydrocarbon.

Sandy clay loam: These are mostly found on the floodplains (but are very restrictive in distribution in the area).

Clay: Found on the floodplains.

Here, at the study site, the soil texture is fine and sandy. Its type is sandy/loamy; Having a moisture content of 5-9%.

Soil Reaction. In this study, the soil pH values range between 7.60 and 9.92, indicating that the soils are moderate to fundamental in reaction. However, the analysis results also show that the grounds become more essential from the upper to lower horizons reflecting decreases in the number of acidic elements but an increase in the number of crucial elements down and up the soil profile. This has no engineering but agricultural effects (Olayinka, 2014).

Exchange Bases. Exchangeable Bases plays important role in the soil, as soil nutrient determines the productivity of the soil. In the study's lab result, NO_{3-1} is observed to be within the range of 0.5 - 0.88, while SO_{4-2} is absent (nil) in the soil (Olayinka, 2014).

Temperature. The soil temperature at study was observed to be within the range 34.60°C-37.24°C; indicating that the soil around hotel area is good for farming (Olayinka, 2014)

DOI: 10.26730/2618-7434-2025-1-22-51

Heavy Metals

The high content of heavy metals is very detrimental to the overall health of plant species. Its presence in water is usually seen as very harmful because such an environment could be giving life forms to it. During the soil analysis, heavy metals are determined and found in some of the samples. Metals like those that Iron (Fe) has a mean value of 2215 - 2839, Nickel (Ni) has a mean value of 4.1 - 9.9, and Lead (Pb) from <0.01. The availability of these metals can be attributed to anthropogenic factors. The values of the various metals are generally within the limits for agricultural soils except for Iron, Manganese, and Nickel whose concentrations are on the high side. One can then posit that Whitefield hotels have not adversely contributed to the increase of heavy metals in the area/environment where her hotel is located as findings shows that heavy metals are within the acceptable FMEnv limits (Olayinka *et al.*, 2014).

Vegetation Studies

The dominant vegetation, which falls within the guinea savannah, comprises widespread grass under the storm, which occurs annually, and dense patches of shrubs and Plant/Vegetation Sampling**.** It is well established that plant mineral nutrient element uptake is a function of the soil solution concentration of the elements, among other factors. It is also known that plant tissue concentration of ingredients is a good index of nutrient uptake, such that plant tissue concentration indicates the extent of the nutrient that gets into the food web. Therefore, plants actively growing on the land areas sampled for soil analysis were also collected for tissue analysis. The sampling was carried out focusing on a particular plant that grows in all the areas of study. Using different plant species as indicator plants were avoided to minimize the errors that may arise from using several plant types. Using the same plant type as the indicator species permits easy comparison of nutrient uptake data by the same plant growing in different micro-environments. Olayinka; (2014). The plant samples were handled, preserved, stored, and analyzed using the methods in APHA-WPCF (1980) and USDA- NRCS-NSSC (1996).

Land use

From site investigation, one can conclude that peasant farming predominates in the immediate surrounding of the hotel; hence, the primary land use is the construction of buildings, institutions, and SME Industries and is partly agricultural. The presence of the Whitefield hotels within the vicinity could, at worst, be said to have little or no negative impact on the environmental activities of the people. From the focus group discussions with the locals, there has not been any reported case of communal clashes with Whitefield hotels Limited because of their hospitality business, and that is a plus for the hotel. What has been said has to do with a multiplier effect accruing from the location of the hotel on the ground that it has given opportunities for employment of the local people in various departments of the hotel. An occupational migration from farming to the hotel is on the floor now.

Water Quality Assessment

Water is an essential requirement of man, and because of its multi-purpose usability quest, a detailed study was executed to also conform to the needs of FMEnv in Nigeria Standards for drinking and Industrial water as far as safety and quality of usage are concerned. Quality has been described by ISO (2003) as a set of characteristics of a product that bears on its ability to satisfy potential or an intended need. The quality was determined through various tests.

Consequently, a detailed analysis was carried out to ensure that the location of Whitefield hotels Limited does not contribute to an undesirable negative impact on the environment. To that effect, the water quality parameter, which gives a detailed description of the Physico-chemical, microbiological and Organic properties of water, was carried out to document the baseline water characteristics in the environment to assess the level of impact on the hotel's resources.

(a) General Indicators of Health Hazard:

General water quality indicators are parameters used to indicate the possible presence of other harmful contaminants. Testing for indicators may eliminate costly tests for specific pollutants. Generally, if the indicator is excessive, the supply may also contain other pollutants, and further testing is recommended. For example, coliform bacteria are present in the air, soil, vegetation, and all warm-blooded animals. A positive total coliform bacteria test result may be followed by a fecal coliform or E. coli bacteria test, which, if present, would confirm that sewage or animal waste is contaminating the water. The pH value is considered a general water quality indicator, along with total dissolved solids.

DOI: 10.26730/2618-7434-2025-1-22-51

The total dissolved solids should stay the same over time. The test for nitrate provides a good routine (as often as once a year) analysis for most water supplies unless there is a reason to suspect other contaminants. With the above information, one can understand the enormity of the task ahead when dealing with a hotel; hence, the need to comply with set standards and relevant national and international protocols, rules/guidelines, principles, and frameworks for hotel operation. Whitefield Hotel Limited conforms.

Table 5 – Results of Heavy Metals in Soil in and around the hotel Area
Таблица 5 – Содержание тяжелых металлов в почве на территории отеля и вокруг него

Sites	Depth (cm)	Mn	Ni	Fe	Cr	Cu	Zn	Cd	Pb
A 1.	0-15	199.7	8.1	2681.0	0.78	9.3	89.2	0.48	<0.01
A 2.	15-30	149.2	4.1	2693.8	0.33	9.2	84.7	0.13	<0.01
B 3.	0-15	355.3	9.9	2640.5	0.43	29.5	97.3	0.53	<0.01
B 4.	15-30	247.2	6.2	2641.1	0.10	7.5	75.3	0.05	<0.01
C 5.	0-15	97.5	9.7	2839.4	0.78	9.3	89.2	0.90	<0.01
C 6.	15-30	84.7	8.1	2681.2	0.08	8.4	65.6	0.01	<0.01
D 7.	0-15	3.5	5.8	2694.7	0.28	9.6	26.9	1.60	<0.01
D 8.	15-30	0.1	5.5	2215.7	0.01	5.9	21.9	0.01	<0.01
E 9.	0-15	17.8	5.8	2275.8	3.70	7.9	37.5	0.55	<0.01
E 10.	15-30	0.1	4.7	1746.4	0.24	5.8	29.5	0.48	<0.01
Control	0-15	36.1	2.5	1490.4	0.88	4.0	17.5	0.01	<0.01

Similarly, for the plants, the heavy metal concentrations in the plant tissues are also above the reported typical range for plants, and the concentrations of heavy metals obtained are considerably above the reported critical concentrations in plants. In addition, the rich metal content in plants sampled from different soil sampling locations shows that plants from other sites do not offer strong evidence of bioaccumulation of all investigated heavy metals. Therefore, the sediment/floor scrapings, soils, and plant tissues within and outside the Whitefield Hotel have shown evidence of heavy metal enrichment.

Community Development Agreement or Social Economic Analysis/Results between Whitefield hotels and Ilorin Township in Ilorin West Local Government area of Kwara State Nigeria

The socioeconomic survey of the project environment was carried out in Ilorin, where Whitefield Hotel Limited is located. Focus group discussions were conducted with the community youths, while public consultation was held with other stakeholders, the council of chiefs, and interest groups within Ilorin township. The project has a tremendous positive impact on the communities in and around the area earmarked for the hotel facilities and at the regional and national socioeconomic levels. Understanding this socioeconomic context is essential to identify and address social impacts at all levels.

Socio-Economic Baseline

a) Religion: The predominant religion practiced in the area includes mainly Muslims and fewer Christians.

b) Marriage: The marriage institution in the city is similar to what is practiced in other parts of the country, which includes monogamy and polygamy.

c) Educational Level: There is a high level of education in the EAR area, with many government primary and secondary schools, as well as two major higher institutions and some private primary schools. The educational level of the township is considered in planning corporate social responsibility by Whitefield Hotel Limited.

d) Health Facilities: There is a hospital around the hotel. However, Whitefield Hotel Limited is registered with private hospitals located in Ilorin. The hospital serves the hotel staff as well as guests of

DOI: 10.26730/2618-7434-2025-1-22-51

Whitefield Hotel Limited. In the event of an accident at Whitefield Hotel, the victims are taken to the hospital for treatment. Inferences from interactions with the hospital management show that the prevalent health complaints, in decreasing frequency, are malaria, typhoid, cough, and catarrh.

e) Social Amenities: There is electricity in the community and a market within the community as well.

f) Occupational: The principal occupations of the people of Ilorin are civil service, farming, and marketing of farm produce. However, there is evidence of petty trading, gari processing, wooden and metallic craftwork, tailoring, etc., in the township. Being mainly a civil servant environment and also lacking in any valuable minerals to date, the primary strategy of successive state administrations has been to encourage private enterprises to invest in the state on a small, medium, or large scale to complement those that are either wholly government-owned or those in which it has acquired shares.

Agriculture:

Farming is the predominant occupation of residents of Kwara, while some engage in craft activities such as weaving, blacksmithing, bricklaying, carpentry, welding, etc. They are the primary source of the economy, and the principal cash crops are cashew, pawpaw, mango, oranges, melon, and sugarcane. Others include cotton, cocoa, coffee, kola nut, tobacco, beni-seed, and palm produce. Major food crops produced in the state include cassava, yam, cocoyam, maize, millet, sorghum, and rice. However, the lack of adequate rural infrastructure, especially transport, hinders the full realization of the state's agricultural potential. Thus, there is a need for the state government to provide modernized agriculture in addition to establishing more stakeholders in nearby villages to Ilorin to help the farmers with subsidies in terms of land clearance, insecticides, pesticides, and fertilizers to improve yield per hectare.

g) Housing pattern: The houses are built with brick, blocks, mud, and thatch roofs. However, the housing types are mixed: mud bricks, thatch roofs, cement, and corrugated iron sheet roofs.

h) Health Impact Assessment: Hospitality operations involve a lot of health hazards. On a global scale, for instance, the technique of using a vehicle to transport guests from a hotel to other places. Many environmental risks are associated with this movement of people from the airport to the hotel, mainly due to the high traffic involved. Therefore, most countries now have strict regulations for traffic control. Preventive measures include:

- Enforcement of occupational health standards.
- Surveillance of potentially exposed population groups, especially the vulnerable ones (small children, pregnant women, workers).
- Water treatment and compliance with FMEnv standards on the environment.
- Awareness campaigns on handling minerals.
- Screening of children for blood levels over acceptable limits and referral for medical care as necessary.
- Provision of a first aid box, which is readily available at strategic points at Whitefield Hotel Limited.

Corporate Social Responsibility

- Whitefield Hotel Limited commits to the following community support projects:
- Facilitating the construction of Gerewu village road through the Kwara State government.
- Facilitating the construction of the drainage systems on the two sides of the road to Gerewu village.
- Provision of permanent and vacation jobs for indigenes.
- Distribution of food and other gift items to the people within the hotel area, especially during the pandemic period.
- Provision of potable water to people living in the immediate surroundings of the hotel.

While 88.3% are of the view that the project has a significant positive impact on the environment, 16.7% hold the view that it does not. 94.4% of the respondents are of the view that the project does not create dust that will constitute a nuisance, while 5.6% are of the view that it creates dust that would constitute a nuisance.

Evaluation of General Housekeeping Records

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This audit was carried out primarily to evaluate an existing facility (Whitefield Hotels Limited) located in Ilorin in Ilorin West Local Government Area, Kwara State. In line with FMEnv guidelines, the objective of the Environmental Audit was to evaluate the environmental condition of Whitefield Hotels Limited and how it can be improved. It also evaluates the general impact or effect of the facility on the surrounding biotic and abiotic environment. The main parameters examined during the study are: Occupational Health and Safety, Air Quality, Waste Management, Public Health, Energy Consumption, and Noise Pollution. In carrying out the Whitefield Hotels Limited audit study, the specific characteristics/parameters examined during the study are explained below:

Compliance Audit: This examined the institution's compliance with environmental rules and regulations applicable to such types of facilities.

Waste Audit: This examined the waste generation, sorting, and disposal process within the facility. It looked into the possibility of recycling and reuse of some generated waste. Finally, from the report of the audit and our interaction with significant stakeholders in Ilorin township, the aims and objectives of Community Social Development Agreements in the hotel are to provide some socio-infrastructures to aid in the economic, social, and general development of the host community. The main objective of Community Development Programmes is to improve the standard of living of the township people. They have been provided employment opportunities, road infrastructure, electrification facilities such as hotels and boreholes, and training to improve their agricultural production. Whitefield Hotels Limited also provides potable water for indigenes, construction of roads and drainages is facilitated, and free hotel accommodation is provided for visitors, as well as the provision of a hotel hall for township meetings at no cost. All these are meant to support some of the development that has taken place over the years in Ilorin town, as shown above:

Public Safety Audit: This helped to identify hazards and to quantify the risks arising from the business. It examined the procedures for emergency and accident response preparedness and training in areas of health and safety.

Occupational Health and Safety Audit: This examined the workforce's exposure to pollution and physical disabilities such as noise, vibration, temperature, etc. It evaluated the availability, quality, and usage of Personal Protective Equipment (PPE). Training and information were also assessed.

Structural Safety: This examined structural designs put in place during the construction of the building to ease the exit of the building during an emergency.

IDENTIFICATION, QUANTIFICATION AND CHARACTERISATION OF WASTE

Waste Management during Construction Phase

Whitefield Hotels Limited is responsible for monitoring, quantifying, transporting, and disposing of all wastes generated during the construction and implementation of its operational phases. Trash generated within Whitefield Hotels Limited is disposed of by the contractors under regulatory requirements using identified existing waste disposal/treatment/recycling facilities. A Waste Consignment Note (WCN) accompanies each waste movement, appropriately signed by the HSE coordinator or the contractor’s supervisor, and dumped at the government-approved site.

Waste Management during the Operational Phase

Whitefield Hotels Limited is responsible for monitoring, controlling, and disposing of all waste generated during the operational phase. A waste inventory is kept and approved by the General Manager to guarantee data integrity. The site HSE officer ensures that the waste segregation scheme is fully implemented and that other waste materials are collected in waste bins for disposal. Waste oil at the workshop is organized in drums and sold to other users of used oil.

Waste Management in Abandonment

Before site abandonment or decommissioning, an inventory of past practices shall be conducted to eliminate and avoid liabilities. Consideration shall be given to reusing equipment from the abandoned site. All contained sites shall be adequately remediated before abandonment. All materials shall be evacuated from the hotel, and the wastes disposed of accordingly.

IMPACT IDENTIFICATION

Introduction to Impact Assessment

DOI: 10.26730/2618-7434-2025-1-22-51

After a cautious hotel assessment, some induced environmental, social, and health impacts were identified and assessed. The impact (negative or positive) a prospective or existing facility has on its environment was assessed to be able to carry out mitigatory measures, especially where there is a marked deviation from the norm. This chapter looks into all positive and negative effects and details their mitigating measures as presented below.

Impact Rating

The rating used for this assessment is based on the impact significance. Impact significance rating is dependent on many factors, which include the magnitude of the impact, the sensitivity and value of the resource or receptor affected, the views of stakeholders, and the likelihood of occurrence.

Following the standard, the impact significance has been categorized into three classes:

1. Low (0-4.5)
2. Medium (4.5-7.5)
3. High (7.5-10)

The criteria applied for the three classes are primarily based on the expected magnitude of change caused by the facility activities in combination with the value/sensitivity of the receptor/resource.

Categories of environmental Impacts include;

Low significant impact hereafter referred to as a ‘minor impact’ is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.

Medium significant impact hereafter referred to as a ‘moderate impact’, will be within accepted limits and standards. Moderate impacts may cover a broad range, from the threshold below which the impacts are minor, up to a level that might be just short of breaching an established (legal) limit.

High significant impact hereafter referred to as a ‘major impact’ is one where an accepted limit or where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors.

Introduction to Mitigation Measures

Mitigation is the assessment stage where measures are adopted to avoid, minimize or remedy impacts. The measures were implemented as part of the impact management process and any necessary adjustments to respond to unforeseen effects. Both elements ensure that the EA process leads to practical action to offset the project's adverse environmental impacts. Mitigation aims to identify measures that safeguard the environment and the community affected by an activity. Mitigation is both a creative and practical phase of the EA process. It seeks to find the best ways to avoid, minimize, and remedy impacts.

Objectives of Mitigation

The objectives of mitigation are to:

- Find better alternatives and ways of doing things;
- Enhance the environmental and social benefits of an activity;
- Avoid, minimize or remedy adverse impacts; and
- Ensure that residual adverse impacts are kept within acceptable levels.

In figure 12 below, the elements of mitigation are organized into a hierarchy of actions.

First, avoid adverse impacts as far as possible by the use of preventive measures; second, minimize or reduce harmful effects on ‘as low as practicable’ levels; and third, remedy or compensate for unavoidable residual effects, which cannot be reduced further. Fundamental principles for the application of mitigation consistent with the above framework include the following:

- Give preference to avoid and prevent measures;
- Consider feasible alternatives to the proposal and identify the best practicable environmental option;
- Identify customized measures to minimize each of the main impacts predicted;
- Ensure they are appropriate, environmentally sound and cost-effective; and
- Use compensation or remedial measures as a last report.

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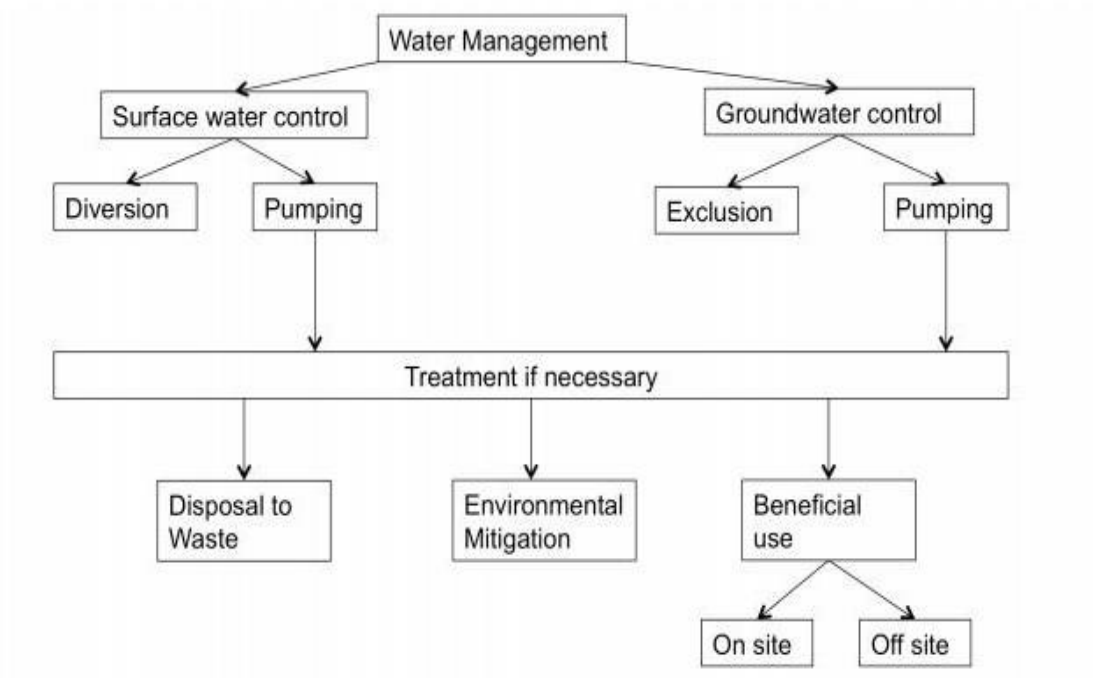

Figure 12 – Elements of Mitigation (source: Federal Environmental Protection Agency (FEPA), 1992)
Рисунок 12 – Элементы смягчения последствий (источник: Федеральное агентство по охране окружающей среды (FEPA), 1992)

Compensate for unavoidable impacts

Figure 12 above, where a structure is already on the ground, the opportunities for impact avoidance narrow, and the concern is to minimize and emend. However, these distinctions are flexible, and opportunities for creative mitigation should be sought at all stages of EA and project management.

RECOMMENDATION

Whitefield Hotels Limited, the owner of the hotel located in Ilorin West, Nigeria, has engaged an Environmental Audit Report on its hotel to adhere to applicable international, national, and state legislations regarding hospitality business activities. This enabled ROYGBIV to assemble its team of experts/consultants on different aspects of environmental management to execute the project. In pursuance of global excellence and best practices, this report was produced considering all available laws/regulations, and with the involvement of the host communities, balanced results were obtained. In doing this, ROYGBIV examined all existing operational practices at the hotel related to approved FMEnv standards/limits. The significant recommendations that follow our environmental assessment of the hospitality and hotel activities are outlined:

1. The location of the plant shall be such that the ingress of heavy vehicles does not block traffic.

2. There shall be a dust suppression system that comprises a covered water storage tank, pumps, an online water filter, connected GI pipes, and spray nozzles, each fitted with flow regulating valves, which would be used at the hotel in and out of the premises. The location of the plants and the hotel shall be far from residences to avoid the risk and effect of production noise, such as vehicular movement noise and ground vibration, on the health of the people.

3. A re-acclamation plan and program shall be put in place to reclaim the vegetation and natural habitat of the hotel area after the hotel's life. Adequate and well-planned gangue and tailing dump sites shall be implemented to avoid environmental hazards.

4. Oil leakages or spillages from heavy earth-moving machines and vehicles shall be addressed to avoid loss of wheel brakes or accidental falls of humans.

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5. Staff training on health, environment, and safety issues shall be periodically conducted, with the appointment of an HSE Officer, to sensitize the organization on the need for PPE and other HSE matters, such as placing a "Muster point" for staff workplace safety.

Table 6 – Impact Mitigative Measures
Таблица 6 – Меры по снижению воздействия

Environmental Component	Type of Impact	Potential Source	Rating	Mitigation Measures
SOIL	Soil pollution	During the discharge of diesel into the generator Poor maintenance process Improper discharge of used engine oil by maintenance personnel Leaking of oil, diesel or bitumen from tank during storage	Medium	Care shall be taken when discharging diesel tank so as to avoid spillage Collection tray shall be used during the servicing of the generator. All used engine oil shall be properly disposed of by the maintenance personnel. It shall be stored in tight covered drums. Oil storage facilities shall be properly bounded to avoid seepage
Noise and Vibration	Degradation of human welfare and hearing impairment, communication problems, increased stress levels as well as associated behavioral effects.	Generator Vehicular Movement	Medium	Proper shall be taken during maintenance so as to ensure good working condition of the generator. Ear mufflers shall be used by staffs who work within and around the generator house. The hotel is constructed with high concrete blocks that are environmentally friendly
Aesthetic	Facility image	Improper waste disposal will affect the aesthetic of the facility. Inadequate care of trees and lack of proper housekeeping around the facility will also affect the aesthetic of the area. Inadequate housekeeping around the facility will also affect the aesthetic of the area. Absence of waste management programme.	Low moderate	Proper housekeeping of the facility of the surroundings shall be ensured (especially in the Rest Rooms/Toilets) Waste collection point shall be cleared and all waste properly sorted and disposed appropriately. Signs urging people on site to use waste disposal bins shall be placed.

DOI: 10.26730/2618-7434-2025-1-22-51

Conclusion

The welfare of staff members and users of hotel facilities like this is paramount in their everyday living. For labor demobilization, the following shall be implemented: consult with labor at least once a year before the commencement of decommissioning; embark on a re-training process to enable labor to acquire other skills; project workers shall either be adequately paid off or relocated to other areas for employment. Overall, the observations made and recommendations to the owner of the hotel facilities should be well adhered to and monitored.

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Conflicts of Interest

The authors declare no conflict of interest.

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ЭКОЛОГИЧЕСКИЙ АУДИТ В НИГЕРИИ (НА ПРИМЕРЕ КОМПАНИИ WHITEFIELD HOTELS LIMITED)

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Abstract.
Для подготовки и выполнения данного экологического аудита компания Whitefield Hotels Limited привлекла компанию MESSR Roygbiv Analytical and Environmental Services Nigeria Limited – консультанта, аккредитованного NESREA (National Environmental Standards and Regulations Enforcement Agency). Отчет был подготовлен согласно руководящим принципам и протоколам NESREA по проведению аудиторских исследований и составлению отчетов с целью оценки воздействия деятельности компании Whitefield Hotels Nigeria Limited. Была проведена оценка территории с точки зрения совместимости, а также процесса и ведения домашнего хозяйства в отеле. Этот первоначальный контакт обеспечил согласие руководства и выбор аудиторской группы из отеля. Руководству и ключевым сотрудникам был предложен стандартный вопросник для получения информации, которая была использована при проверке объекта, а также для изучения записей и документов компании. Таким образом, были предложены различные стратегии обработки сточных

воздуха, почва, вода, экология, геоэкология

вод и твердых отходов, чтобы минимизировать их образование вместо обработки. В данном отчете были предложены дальнейшие меры, при которых отходы могут быть использованы повторно, с учетом рекомендаций NESREA. Кроме этого, в данной работе были рассмотрены вопросы общего благосостояния и безопасности здоровья, включая предотвращение распространения болезнетворных организмов, которые могут привести к заболеваниям.

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Конфликт интересов

Авторы заявляют об отсутствии конфликта интересов.

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