AFFORDABILITY OF RENEWABLE ENERGY PROVISION IN RECREATIONAL PROPERTY. CASE STUDY OF AFEMAI WONDER CITY, AUCHI

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CERTIFICATION

This is to certify that this project titled "**Affordability of Renewable Energy Provision in Recreational Property. Case Study of Afemai Wonder City, Auchi** was written by **IFADA SHEGUN** with Matriculation Number **ENV/2082050290,** in partial fulfillment of the requirements for the award of Higher National Diploma (HND Estate Managementand Valuation Department, Auchi Polytechnic, Auchi.

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DEDICATION

This project work is dedicated to Almighty God, for giving me life, strength, wisdom, understanding to complete my education.

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My gratitude goes to Almighty God for His guidance, wisdom, knowledge and understanding throughout the duration of my programme.

My profound gratitude goes to my project supervisor**, ESV. (Mrs) Ohiro, E.I** for her wonderful contribution, advice and guidance he rendered to me during the course of carrying out this study and to the Head of Department, **ESV. Ojeh P.A.P** and all lecturers in the Department of Estate Management and Valuation.

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ABSTRACT

Sustainable energy has become one of the most promising means of handling the challenges the of energy demand problems worldwide. In Nigeria, the most prominent is the hydropower and solar energy, which are most clean, with less environmental hazard implication. This research work assessed the affordability of renewable energy provision in recreational property in Auchi with particular reference to Afemai Wonder city. Survey research design was adopted in the study. Data for the study were obtain through a well structured questionnaire properly administered to the targeted population whom are management and staff of Afemai Wonder City, solar Engineers and clients to the facility. Data collected were analysed using simple statistical tools like frequency distribution tables, mean score and relative important index. The researcher discovered amongst other findings that, hydro power is the major source of power supply in the study area, and solar power as the alternative. Affordability of this alternative (solar) is slightly affordable and manageable, though the cost of installation is eating deep into the profits. The researcher recommends immediate awareness campaign of the benefits of renewable energy (solar) on the environment; and also that the government should encourage the individuals and investors with favourable and friendly financial policies.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Energy plays the most vital role in the economic growth, progress, and development, as well as poverty eradication and security of any nation. Uninterrupted energy supply is a vital issue for all countries today. Future economic growth crucially depends on the long-term availabilities ability of energy from sources that are affordable, accessible, and environmentally friendly. Security, climate change, and public health are closely interrelated with energy. (Ramchandra et al 2011). Energy is an important factor in all the sectors of any country's economy. The standard of living of a given country can be directly related to the per capital energy consumption. The recent world's energy crisis 1s due to two reasons: the rapid population growth and the increase in the living standard of whole societies. The per capital energy consumption is a measure of per capital income as well as a measure of the prosperity of a nation (Rai, 2004).

Nigeria is endowed with significant renewable energy resources that includes large and Small hydroelectric power resources, solar energy, biomass, wind, potential for hydrogen utilization and development of geothermal and ocean energy (Sambo, 2009). Renewable energy (RE) resources abound in Nigeria but have not been fully exploited. Nigeria is an energy resource rich country, endowed with abundance of renewable energy (RE) resources, providing her with great capacity to develop an effective national energy plan. However, Nigeria is yet to exploit these huge available energy potentials with less environmental and climatic impacts. On the contrary, the National energy supply is at present almost entirely dependent on fossil fuels and fuel-wood. These two are being depleted due to failure to harness other energy resources (Chigbo, 2010). Despite Nigeria’s steady access to fossil based and renewable energy sources, its per capita electricity has been among one of the

lowest in Africa. As power demand studies have projected a medium to long-term electricity demand of 30,000MW and 192,000MW respectively, there will need to be substantial improvement in the energy production and supply sector if this demand is to be met (Nnaji, 2010). The current installed capacity of grid electricity is about 6000MW, of which about 67 percent is thermal and the balance is hydro-based (Council for Renewable Energy, Nigeria (CREN), 2009). Hence, the urgent need to optimally harness the renewable energy potentials available in Nigeria for the benefit of her citizens and Africa in general. Non-conventional renewable energy is a key element in the overall strategy of the Federal Government of Nigeria in rapidly expanding access to electricity services in the country. Beyond large hydropower, the total contribution of renewable energy in Nigeria's electricity industry is about 35MW composed of 30MW small hydropower and about SMW solar PV. This represents about 0.06°o of total electricity generating capacity in the country (Council for Renewable Energy, Nigeria (CREN), 2009). However all represents the motivation for this study.

Energy supports the provision of basic needs such as cooked food, a comfortable living temperature, lighting, 'the use of appliances, piped water or sewerage, essential health care (refrigerated vaccines, emergency, and intensive care), educational aids, communication (radio, television, electronic mail, the World Wide Web), and transport. Energy also fuels productive activities including agriculture, commerce, manufacturing, industry, and mining. Conversely, a lack of access to energy contributes to poverty and deprivation and can contribute to the economic decline. Energy and poverty reduction are not only closely productivity, income growth, education and health Nnaji, et al (2011), this a recreational property would be more productive if constant and affordable energy is readily available.

The sunlight that reaches the earth comprises of up to 50% visible light, 45% infrared radiation, small amount of ultraviolet and other forms of electromagnetic radiation

(Encyclopedia Britannica, 2009). This radiation has a strong potential of either been converted to thermal energy or electrical energy. (Encyclopedia, 2009) defined thermal energy as the internal energy present in a system in a state of thermodynamics equilibrium by virtue of its temperature. The flat plate collectors and the concentrating collectors are the two main types of devices used in capturing and converting solar energy into thermal energy.

Solar energy can be converted directly to electricity by solar cells; it basically works on the principles that in such cells, a small electric voltage is generated when light strikes the junction between a mental and a semiconductor. The potential of the solar energy is enormous giving an account of generating almost 200,000 times the world's daily electricity consumption if only it can be utilized. The sun generates more than 10,000 times the amount of energy the entire world consumes annually (Green living ideas, 2011). Unfortunately, though the solar energy itself is free, the high cost of its collection, conversion and storage all hinders its exploitation; therefore, its usage has been highly ignored and sometimes considered to be un-economical. This research work is to provide a line-light to this, its effective utilization and affordability.

1.2 Statement of the Problem

Epileptic power supply to consumers in Nigeria no strong scenario one wonders how citizens especially the business men and women survived this menace. From survey/ observation despite the poor distribution of power from the energy authority (Electricity Distribution Company), people are still in business. Thanks to the renewable energy; even when there are inadequate technology and lack of infrastructure necessary to support this renewable energy technology. There are lack of trained personnel, to train, demonstrate, maintain and operate this renewable energy structure, especially in areas with low educational background more also, business owners are unwilling to import the technologies for fear of failure and to crown it all, the cost are unbearably high, to this end, the researcher

is out to find out how affordable this renewable energy is to Wonder City, a recreational facility that depends or utilizes power so much for it's operation.

1.3 Research Question

1. What are the readily available Renewable Energy Technologies in Auchi?
2. How affordable is renewable energy in the running of Wonder City?
3. What are the affecting the provision of renewable energy in the study Area?

1.4 Aim and Objectives

The aim of this research is to examine the affordability of renewable energy provision in housing Estate in Auchi. To achieve this aim the following objectives are formulated.

1. To identify the available Renewable Energy Technologies in Auchi
2. To examine the affordable of renewable energy (solar energy) provision in the operation of Wonder land.
3. To examine the factors affecting the provision of renewable energy in the study Area.

1.5 Significance of the Study

It is envisaged that findings from the study will reveal affordability of renewable energy provision in running a recreational facility. The research project will provide users and energy investors a crystal clear view with a systematic analytical method outlining various risk factors such as initial cost of investment and its long term benefits for adopting solar source of energy over other sources. It will significantly increase investments in solar energy from medium scale and small scale investors, more so, it will give an insight to recreational business operations on how to be in business all day long using all other sources of power generation aside National electric power authority.

Finally, the research study will directly impact low and medium scale investments in the energy sector leading to more. Efficient and sustainable flow electricity and other energy uses throughout the country.

1.6 Scope of Study

This study is carried out to comprehend the affordability of solar energy as an alternative source of power in operating a recreational facility.

1.7 Area of Study

Auchi the town where Wonder land is situated is a rapidly developing rural-urban center and the administrative headquarters' of Etsako West Local Government Area of Edo State, South-south Nigeria. It is a distance of only 130 kilometers from Benin City the Edo State capital A town that has grown rapidly in status, activities and population as a result of the presence of Government establishment at both state and federal level. Auchi is located in northern part of Edo state. It is approximately at hundred and thirty kilometers (130kms) away from Benin city the capital of Edo State. It is located on the intersect of latitude 7 degree North longitude 6 degree East in the tropics. Auchi is the head quarter of Etsako west local government. It is bounded to the North by jattu, to South by Aviele clan, to the east by Iyakpi, South Ibie and to the West by Ivbiaro in Owan West local government. Wonder land recreational centre is situated along mechanic Pastorial road, boundary between Igbe-Akhalunah and Sabo-ibie. Wonderland was developed, and commissioned in 2021.

1.9 Operational Definition of Terms

Recreation: An activities engage in purposely with free happy natural attitude full of fun and expression. Any activities which one engages in because of an inner desire and not because of outer compulsion (Ohiro, 2006).

Recreational property: recreational properties are those properties developed to enhance leisure, to amuse, educate, and stimulate the individual at his or her free will (Agboola, 2018).

Investment: It is a money set aside for future purposes (Kalu, 2001).

Property: Is an object of legal right, which embraces possessions or wealth collectively frequently with strong connotations

Solar: This can be defined as the proceeding from the sun, as light or heat.

Energy: This can be defined as the power derived from the utilization physical or chemical resources, especially to provide light and heat or to work machine.

Solar Energy: This refers to capturing the energy from the sun and subsequently converting it into electricity. We can then use that electricity to light up our homes, street, business, and power our machines as well.

Residential Housing: This refers to any building, structure or portion there of that is primarily occupied, or designed or intended primarily for occupancy.

Cost-Effectiveness: This refers to the degree to which something i effective or productive in relation to its cost.

Appraisal: This refers to the act of estimating or judging the nature or value of something or someone. Or an estimate of value as for sale, assessment, or taxation.

Power Supply: This refers to an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the current voltage, current and frequency to power the load.

Electricity: This is the flow of electrical power or charge; it is a secondary energy source which means that we get it from the conversion of other source of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources.

Consumption: This is define as the use of goods and services by a household.

Kilowatt-Hour (kWh): This is the unit of energy utility companies use to measure how much gas and electricity you are using (the use of power over a period of time).

Technology: This refers to the branch of knowledge that deals with the creation and use of technical means and their interrelation with life, society, and the environment, drawing upon such subjects as industrial arts, engineering, applied science, and pure science.

Electromagnetic Radiation: this is a form of energy that is all around us and takes many forms, such as radio waves, microwaves-rays and gamma rays. Sunlight is also a form of electromagnetic energy.

CHAPTER TWO

LITERATURE REVIEW

2.1 Concept of Recreational Properties and Types

Recreational properties are those properties developed to enhance leisure, to amuse, educate, and stimulate the individual at his or her free will. According to (Agoola, 2018) recreation par say are activities which are not work or sleep or other fundamental need. The pace, time or scope are not the standard. No imposition of such activity. One indulges in it on one's own volition. Example of such activities are outdoor and indoor games: swimming, racing, weight lifting, playing of games like ludo, fishing, dancing, playing of ball, sightseeing, trading on tourist basis, walking, running and cycling.

Properties that enhance these activities are threatres, holiday resort, art galleries, music stand and seaside, nature parks, tourist accommodation, polo/golf ground, football/ pitch, gymnasium, ranches, zoological and botanical gardens.

The development of these kind of properties are highly complicated and they need technical experts for design and construction. They are purpose built. The height, shape, size depends on the type of activities each of them is meant to cater for. Also vast expenses of land/ site with a suitable terrain is needed for golf course, ranch, game, reserves pitches and fields etc. facilities essentially in recreational property development varies according to use. But most essentially are recreational property development varies according to use. But most essentially are utilities like water, sewage and drainage facilities, power supply, road network, transportation, open space/car parks, communication facilities, fencing to control and monitor users, shopping hub or exhibition room. Rentable rest house/ accommodation, fire stations centre/ restaurants, administrative section with gate and ticket control unit, first aid and emergency exist, a tower or observation platform. (Ohiro, 2014). They are usually located at

the periphery of a town. Though, which would be engulfed within the town due to physical development expansion?

Recreational property means all lands that are predominately intended to provide outdoor recreational activities under the control and operation of a government agency, such as outdoor parks. Reserves, campground, wildlife or games, etc. Recreational property is purchased for recreational purposes, whether it be hiking, fishing, days on the lake and may be specifically zoned for "recreational" use. For this reason, recreational property is different from a primary residence. Whereas a primary residence is a dwelling where a person usually lives, a recreational property is typically associated with occasional use.

2.2 **Concept of Renewable Energy**

The term "renewable" is generally applied to those energy resources and technologies whose common characteristic is that they are non-depletable or naturally replenishable. Renewable energy, often referred to as clean energy, comes from natural sources or processes that are constantly replenished. Renewable energies (or renewable) are ways to generate energy from (theoretically) unlimited natural resources. These resources are either available with no time limit or replenish more quickly than the rate at which they are consumed (Sambo, 2009). Renewable energies are generally spoken of as opposed to fossil fuel energies. The fossil fuels' stocks are limited and non-renewable in the human timescale. The most known examples of these resources are coal, oil or natural gas. On the contrary, renewable energies are produced from renewable sources.

Renewable resources include solar energy, wind, falling water, the heat of the earth (geothermal), plant materials (biomass), wave, ocean currents, temperature differences in the oceans and the energy of the tides (Stephen et al., 2012) Renewable energy technologies produce. Power, heat or mechanical energy by converting those resources either to electricity or to motive power. The policy maker concerned with development of the national grid

system will focus on those resources that have established themselves commercially and are cost effective for on-grid applications. Such commercial technologies include hydroelectric power, solar energy, fuels derived from biomass, wind energy and geothermal energy. Wave, ocean current, ocean thermal and other technologies that are in the research or early commercial stage, as well as non-electric renewable energy technologies, such as solar water heaters and geothermal heat pumps, are also based on renewable resources.

2.3 **Types of Renewable Energy**

Renewable resources include solar energy, wind, falling water, the heat of the earth (geothermal), plant materials (biomass), waves, ocean currents, temperature differences in the oceans and the energy of the tides. Renewable energy technologies produce power, heat or mechanical energy by converting those resources either to electricity or to motive power. The policy maker concerned with development of the national grid system will focus on those resources that have established themselves commercially and are cost effective for on-grid applications. Such commercial technologies include hydroelectric power, solar energy, fuels derived from biomass, wind energy and geothermal energy. Wave, ocean current, ocean thermal and other technologies that are in the research or early commercial stage, as well as non-electric renewable energy technologies, such as solar water heaters and geothermal heat pumps, are also based on renewable resources.

2.3.1 **Solar Energy**

Solar, or photovoltaic (PV), cells are made from silicon or other materials that transform sunlight directly into electricity. Distributed solar systems generate electricity locally for homes and businesses. either through rooftop panels or community projects that power entire neighborhoods. Solar farms can generate power for thousands of homes, using mirrors to concentrate sunlight across acres of solar cells. Floating solar farms or

"floatovoltaics" can be an effective use of wastewater facilities and bodies of water that are not ecologically sensitive. (National Renewable Energy Laboratory, 2008).

2.3.2 Solar Energy Potentials in Nigeria

Solar energy is the term used for the heat and light which the sun light contains. Sunlight reaches to earth in the form of photons. Photons are energy packets that contain light in it. Solar energy is considered as a renewable energy source because it does not destroy our ecological system and is present naturally in the environment. There are basically three ways that we can use the sun energy. The first is by solar cell in which photovoltaic or photoelectric cells are used to convert light directly into electricity. The second is solar water heating in which the heat from the sun is used to warm the water in ion glass panels on the roof therefore no longer requiring gas or electricity to heat the water. The third is solar furnaces which use mirrors to capture the suns energy into a congested place to produce high temperature

2.3.4 **Wind Energy**

The wind power is another renewable energy. Here, the wind's kinetic energy makes turbines spin and create a mechanical movement. Afterward, a generator transforms this mechanical energy into electricity. There are several types of wind renewable energies: onshore wind turbines, off-shore wind turbines and even floating wind turbines. But 'the operating principles are basically the same for all these types of wind-generated energy.

2.3.5 **Hydroelectric Power**

Hydropower is the largest renewable energy source for electricity in the United States, though wind energy is soon expected to take over the lead. Hydropower relies on water typically fast-moving water in a large river or rapidly descending water from a high point and the force by spinning a generator's turbine blades. Nationally and internationally, large hydroelectric plants or mega-dams are often be nonrenewable Mega-dams divert and reduce

natural flows, restricting access for animal and human populations that rely on rivers. Small hydroelectric plants (an installed capacity below about 40 megawatts), carefully managed, do not tend to cause as much environmental damage, as they divert only a fraction of flow (Sherwani, et al 2010).

2.3.6 **Biomass Energy**

Biomass is organic material that comes from plants and animals, and in¢ludes crops, waste wood, and trees. When biomass is burned, the chemical energy is released as heat and can generate electricity with a steam turbine. Biomass is often mistakenly described as a clean, renewable fuel and a greener alternative to coal and other fossil fuels for producing electricity. However, recent science shows that many forms of biomass especially from forests produce higher carbon emissions than fossil fuels. There are also negative consequences for biodiversity. Still, some forms of biomass energy could serve as a low-carbon option under the right circumstances. For example, sawdust and chips from sawmills that would otherwise quickly decompose and release carbon can be a low-carbon energy source.

2.3.7 **Geothermal Energy**

The Earth generates and stores geothermal energy. In other words, radioactive materials decaying inside the Earth are emitting energy. Electricity can be created using directly or indirectly this energy, depending on the technology implemented. There are 3 main ways to use geothermal energy:

- Generating electricity directly from the Earth's heat
- Producing heat directly from hot water boiling on the planet's surface
- Using pumps over the shallow ground to heat (and also to cool) buildings

2.4 Renewable Energy Applications

Renewable energy applications generally break down into two categories or applications, “on-grid” and “off-grid”.

According to Oseni (2012), a “grid” may be defined s an integrated generation, transmission, and distribution system serving numerous customers. Characteristically, a grid is portfolio of generating units operating under the control of a central dispatch center. Grids may be national, regional or local (in the latter case they are typically referred to as “mini-grids”). “On-grid” and “off-grid” are terms which describe how electricity is delivered, Technically, every one of the commercial renewable resources can and have been installed both on-grid and off-grid. Furthermore, although larger megawatt installations tend to be on-grid, large renewable plants may profitably be built “inside the fence” a term describing a self generator, a plant built to supply a single customer such as a mine, a manufacturing plant or a agribusiness.

Hydroelectric, biomass and geothermal facilities tend to be economical at capacity levels well in excess of one megawatt (1 MW) and, therefore, are typically but not necessarily developed and financed as “base load” electricity resources (i.e., he normally operated generating facilities within a utility system) and connected to a grid. Solar rrays and “wind farms” also can be grid connected.

“Off-grid” applications, in general, serve only one load , such as a home or small business. Off-grid applications can take many forms, from photo voltaic for an individual village home to Centralized windmills to power a village water pump a commercial battery charging facility.

These off-grid applications are most generally used in emote or rural settings. “Mini-grids” have begun to be developed by system engineers over the past few years, fo isolated communities. These systems may integrate wind, solar energy and, in some cases, diesel

generators and/or storage systems to provide power from a mix of resources to more than one customer, typically a village or cooperative.

2.5 **Energy Poverty in Nigeria**

Nigeria's crude oil reserves are currently estimated at 35 billion barrels; its natural gas reserves an estimated 185 trillion cubic feet. Though import levels have since dropped dramatically, in March 2007 the United States imported 41,767 barrels of Nigerian crude oil and petroleum products. Despite this, 44 percent of Nigerian households have no access to electricity (Okafor and Uzuegbu, 2010).

Indeed, even in Nigerian homes with electricity, the quality of service provided is often intermittent while growing increasingly unaffordable. In an op-ed in the International New York Times, published August 8, 2014, author Adewale Maja-Pearce explained that in February 2014 his monthly bill jumped from $30 per month to nearly $185 per month, despite the fact that he was receiving roughly three hours per day of power. This price increase occurs at a time when 92.4 percent of Nigerians live on less than $2 per day, and 70.8 percent live on less than one dollar per day. The problem of energy poverty is not exclusive to Nigeria. According to the International Energy Agency, "over 1.3 billion people are without access to electricity and 2.6 billion are without clean cooking facilities. More than 95% of these people are in sub-Saharan Africa or developing Asia and 84% are in rural areas" (CBN, 2019). Though the problem is not unique to Nigeria, it does bring to light the global inequality behind the phenomenon of energy poverty despite Nigeria's status as a major energy exporter. It is seemingly paradoxical for a nation which began exporting large amounts of liquid petroleum gas through Chevron in 1997 to have a per capita liquid petroleum gas usage rate of 0.4 kilograms per second, one of the lowest in the region. Addressing energy poverty is a key point in the fight against global poverty. Greater access to alternative energy sources will reduce unnecessary deaths, such as the 95,300 Nigerian deaths

which occur annually from smoke created by the use of solid biomass fuels. It will enhance the financial capabilities of those nations currently struggling to provide power to businesses. This, in turn, will expand the global community of consumers (CBN, 2019). Regardless, the importance of treating energy exporters as nations, and not simply as trade partners, remains a primary challenge moving forward in the fight against global inequality.

2.6 Potential of Renewable Energy Sources in Nigeria

Energy plays the most vital role in the economic growth, progress, and development, as well as poverty eradication and security of any nation. Uninterrupted energy supply is a vital issue for all countries today. Future economic growth crucially depends on the long-term availability of energy from sources that are affordable, accessible, and environmentally friendly (Energy Commission of Nigeria (ECN), 2005). Nigeria is blessed with a large amount of renewable energy resources, based on the resource situation and the technological base of the country, the Policy Guideline focuses on hydropower, biomass co-generation, solar PV and wind energy for electricity production.

2.7 Prospects of Renewable Energy in Nigeria

The prospects of renewable energy in Nigeria are as follows (Energy Commission of Nigeria (ECN)(2008):

Integrated Rural Village Energy Supply, IRVES: Renewable energy resources such as solar radiation, wind, small-scale hydropower and biomass are, in general, well distributed over the country, The concept of the IRVES programme is to study the energy needs of a rural community for various socio-economic activities, the energy resources available to the community, energy related environmental problems, as well as the skills and trainability of its manpower. An energy supply and consumption system for the village is then developed, utilizing the available energy resources, which are mostly renewable, to meet the identified needs in a sustainable way. Capacity building programmes and post-project management are

provided for, to enhance sustainability. Key features of the post-project management arrangements are: Provisions for community participation in the management and payment, by beneficiaries, for centrally provided energy services, to cover operation and maintenance costs.

Rural Electrification: Distributed Power Supply Solar-PV, wind and micro-hydro systems have proved more cost-effective on a life-time basis, than grid electricity or diesel generators in situations where loads are low and far from the grid.. The threshold distances depend on the technology, power level and prevailing costs of equipment, fuel, electricity, operating and , maintenance costs. The dotted nature and low power demand levels of rural load centers suggest the use of decentralized and small-scale power supply systems to which solar-PV, wind; micro-hydropower and other renewable energy power generators are adequately suited. Deliberate policies and programmes are required to identify and implement the above concept in rural areas that are unlikely to be grid connected in the long term (15-20 years). This will require the joint participation of government, the private sector and consumers.

Alternatives to Fuel-wood: The large scale and predominant consumption of fuel-wood has been identified as contributing significantly to the environmental problems of soil erosion and desertification. Other serious hazards include respiratory and visual disorders. There is great potential in alternatives to traditional fuel-wood based technologies. The 1992 Presidential Task force on Alternatives to fuel-wood recommended the large scale introduction of biogas technology and solar cookers, (as well as the use of coal briquettes, natural gas and kerosene) in order to reduce the share of fuel-wood in the energy mix. Solar water heaters and improved wood stoves ought to be added to these set of technologies.

2.8 Challenges of Renewable Energy in Nigeria

The challenges of renewable energy potentials in Nigeria are outlined as follows (National Bureau of Statistics (NBS), 2007):

1. **Technical challenges:**

Lack of technical competence remained and may continue to be a major challenge towards the development of renewable energy systems in Nigeria. The technical failures of RE systems can be traced to lack of understanding of local energy requirements; lack of research and development to adapt technologies to local government conditions, resources and requirements; lack of local skilled labour to install, operate and maintain the equipment properly; and lack of access to spare parts. These are the basic technical reasons behind the failure of most pilot programmes on the development of RE systems in Nigeria. It is on record that most of the pilot programmes are carried out in rural communities. These communities are quite remote that most initial] installers will not be willing to get back there to render maintenance services. Even when they do, the professional charges are beyond the capabilities of the beneficiary rural dwellers. The concept; design, application and use of most RE devices are conceived without any local input, and there is little or no effort to update the systems to various usage requirements.

The result is that anytime it becomes difficult to get assistance in terms of component or intellectual property, as may be required to maintain or update the energy systems, the energy systems will simply face redundancy and finally abandonment by the user.

II. **Economic and Financial Challenges:**

Coupled with low income per capita stigma of most African countries, it is observed that economic and financial barriers might be another major issue to contend with the development of renewable energy systems in Nigeria. These challenges arise from lack of access to capital; lack of means of life support; lack of information by appropriate financial institutions; lack of investment; scale of energy systems; inappropriate subsidies by the government or other agencies; size of organizations. Fear of the workability of new technologies as a result of lack of access to educational or information materials, many

financial institutions are not normally willing to invest in the businesses relating to renewable energy. The result of this is that both the potential installer and the end user are starved of the funds for either initial procurement or upgrade of existing systems. The scales of the renewable energy systems are in most cases a barrier in themselves. The size in terms of the functions are appreciated in long term use, but the initial cost compared with the immediate derivable services are not in any way to be compared with the similar services from the equivalent equipment using fossil fuel. Conviction for most intending end users has therefore become an uphill task, thereby slowing down the rate of patronage. Investments in new technologies are very expensive. The cost for renewable energy systems in Africa may continue to be high because of high financial input and low profit margin in the course of manufacturing the component parts caused by low patronage and high cost of research and development.

iii. **National Policies and Awareness Programme Challenges:**

Activities of the government are highly instrumental to the success or failure of any matters of national interest including the programmes that will tend to enhance the very life status by introduction of new ways of living. Introduction of renewable energy systems is in the deployment programme for most African countries. The rate of growth of the programme can only increase or decrease within the context of the government interest. Till the end of year 2005, there was no known government policy on renewable energy in Nigeria. This made it almost impossible for proper co-ordination of renewable energy activities in Nigeria. The growth before 2005 was largely dependent on individuals, societies and few corporate interest and activities. Absence of functional government fiscal policies and integrated planning on renewable energy in Nigeria was traced to government instability and inconsistency in policy formulation, with personal interest at decision making level having priority over national goals The resultant effects of all these are that the growth in the

deployment of renewable energy in Nigeria may be slow with the system costs remaining comparatively high and a high percentage of Nigerians not being aware of the gains of the renewable energy systems.

The focus of national policy has consistently been on centralized conventional sources of electric power several incentives were established to promote investments in conventional power generation. Subsidizing grid power has so far penalized investments in alternative energy solutions. This lack of a level playing field for all energy sources and technologies has constituted a formidable barrier to the growth of alternative electricity services.

IV. **Social, cultural and environment constraints:**

Social acceptance of the renewable energy technology is very important, as its absence can be a major challenge. If the local Community does not accept the technology: there will be no demand for its services. For example, it may not make much sense to install solar cookers in communities which forbid women to cook in the middle of the day. Most renewable energy installations failed because the beneficiaries are not carried along during the decision making to deploy the energy systems to them. Involving the end users may generate more interest as they tend to benefit more, having been given the chance to express their very need or convinced on what is being provided.

V. **Political, institutional and legislative challenges:**

Massive deployment of renewable energy systems in Nigeria has great future if only the right political and legislative framework can be put in place. Since the technology is foreign, there is need to put proper legislation in place, to prevent turning the country into a dumping ground by the technologically advanced nations. Proper legislation may see Nigeria imposing zero taxes to renewable products, since with zero taxes and large subsidy, the poorest of the poor are the targets. Also the importation of substandard goods will be adversely reduced Challenges based on the security of the installation; Insecurity of

installations is not only an African problem. Globally, the security of the installation is paramount in the decision as to how and where to install the systems. In most cases, the security provisions will simply make the cost grow unreasonably high. Most known major projects have suffered one level of vandalism or the other. Installed equipment in one site can be found in the market within 24 hours after its commissioning. This challenge cuts across all nature of installations, from personal solar home stations to community mini solar and solar street lights.

Vii. **Intermittency of resource availability:**

An underlying challenge affecting all renewable electricity resources is the intermittency of their availability. The challenge of energy storage and system management presents a major challenge and adds to the complexity and costs of renewable electricity.

Viii. **Inadequate resource assessment:**

The growth of the renewable power industry will depend to a large extent on the availability of a solid resource database. Reliable and up-to-date sources of data will assist investors in making decisions on renewable electricity.

IX **Standards and quality control:**

A major constraint to the development of the renewable energy market in Nigeria is the poorly established standard and quality control of locally manufactured and imported technologies. Creating quality assurance is a precondition for building consumer confidence and in growing the market for renewable energy. Two important dimensions to issues of quality include the perception of potential users, poorly developed regime for standards setting, testing and certification as well as professionalism among operators.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This chapter describe the methodological frame work used in attaining the stated aim and objectives of the study area. The chapter also showed how the research were empirically determined and examined the relevant methodological approaches adopted in the study.

3.1 Research Design

The research design adopted in this study will be the survey method. The cherice of this research design will be predicated to the premise that it utilized survey study to obtain relevant data and it is effective in eliciting responses from respondents.

3.1.1 Population of the Study

The population of the study will be all staffs of Wonder land recreational centre solar power installers and all customers/ visitors that were present on the faithful day of visitation.

3.1.2 Sample Size/ Sampling Techniques

Owing to the small size of the population, there was no need for sampling. All persons present were covered in the survey. But for the oral interview conducted using purposive sampling on top management staff of the facility.

3.1.3 Instrumentation/ data collection procedure:

Both open and close ended questionnaire were designed and administered directly to the staff and everyone in the premises the respondent were made to answer the questionnaire and returned same. Oral interview was used as supplementary method of data collection. This method of data collection allows the researcher to personally ask the respondent questions and obtain answers relating to the subject matter.

3.2 **Method of Data Analysis**

Descriptive analytical tools such as frequency and percentage will be used to obtain perception of the respondents the percentage are then ranked in other of factors. Weighted mean score and relative importance index fill will also be used.

Analytical Tools table

Objective	**Tools**
1. Availability of renewable technologies in the study area/ Auchi	Mean score
2. Affordability of renewable energy provision	Frequency table
3. Factors affecting provision of Renewable energy	Weight mean score and relative importance index

For the purpose of this study, weighted mean score (wms) is determined as follows

$$WMS = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5n_5} \quad \ldots\ldots\ldots (1)$$

Where n_5 = number of respondent who answered strongly agreed, agreed, Undecided, disagreed, strongly disagreed

`CHAPTER FOUR

DATE ANALYSIS, INTERPRETATION AND DISCUSSION

4.0 Introduction

This chapter presented the analysis, interpretation and discussion of findings from data obtain from the field.

4.1 Date presentation

Table 4.1.1: Questionnaire Distributed and Retrieved

S/N	Questionnaire	Frequency	**Percentage**
1	Number distributed	82	100
2	Number retrieved	80	-

Source: field survey, 2021

A total of 82 questionnaires representing the sample size were administered to the respondents, 80 questionnaires were retrieved. The table above showed the analysis of the questionnaire distributed and retrieved.

Table 4.1.2: **Socio-Economic characteristics**

S/N	**Gender**	**Frequency**	**percentage**
1	Male	65	81
2	Female	15	19
	Total	80	100
	Academic Qualification of Respondent	**Frequency**	**percentage**
1	primary leaving certificate	09	11
2	SSCE/WAEC	26	33
3	OND	22	27
4	HND	15	19
5	BSC	08	10
	Total	80	100
	Categories of respondents	**Frequency**	**percentage**
1	Staff	28	35
2	Installers	02	02
3	Visitors/ Clients	50	63
	Total	80	100

Table 4.1.2 above showed the gender distribution of the respondents. 65 respondents representing 81% of the total respondents are males while 15 respondents representing 19% of the total respondents are females. This shows that there more males respondents among the respondents.

The table above shows Academic Qualification of the respondents. 9 respondents representing 11% of the total respondents are Primary Leaving Certificate holder, 26 respondents representing 33% of the total respondents are SSCE/WAEC holder, 22 respondents representing 27% of the total respondents are OND holder, 15 respondents representing 19% of the total respondents are HND holder while 8 respondents representing 10% of the total respondents are B.Sc holder. This shows that there are more SSCE/WAEC respondents among the respondents.

Table above shows Categories of respondents. 28 respondents representing 35% are staffs, 2 respondents representing 2% are installer, while 50 respondents representing 63% are Visitors/ Clients. This shows that there are more staffs among the Categories of respondents.

SECTION B

Table 1: Showing facilities present in Afemai Wonder City

S/N	**Facilities**
1	A storey building, ticket control unit, with extension gate house
2	2,500 sitting/ seat capacity cinema
3	Swimming pool measuring 2lenght by 12 breath (4 by 6 and 8 by 10 deep)
4	VIP launch/ bar, a storey building
5	Shisha gallery
6	Conference hall and lodging accommodation
7	Flyer chair
8	Pendulum
9	Pirate ship
11	Tagana

12 Bouncing castle

13 Water slide for children

14 Suya grilling stands

15 Public toilets

16 Bush bars

17 Circular water pond

18 Bore holes and water stands

19 KVA generators housed in generator room

20 Solar panels

21 Solar bulbs/ light

22 Car park

All these enclosed with a wall/ fence on 9205. 156m^2 land

Table 4.2: Energy Source in Nigeria

S/N	Items	5	4	3	2	1	Total	MIS	Rank
1	Fuel wood	50	20	10	-	-	80	4.5	2nd
		250	80	30	-	-	360		
2	Coal	30	30	-	-	20	80	3.6	4th
		150	120	-	-	20	290		
3	Hydropower	70	10	-	-	-	80	4.9	1st
		350	40	-	-	-	390		
4	Solar (Sun energy)	40	10	10	20	-	80	3.9	3rd
		200	40	30	40	-	310		
5	Wind	10	20	30	10	10	80	3.1	7th
		50	80	90	20	10	250		
6	Wave and Tide	20	10	30	20	-	80	3.4	6th
		100	40	90	40	-	270		
7	Nuclear	-	-	20	10	50	80	1.6	9th
		-	-	60	20	50	130		
8	Geothermal	-	-	60	10	10	80	2.6	8th
		-	-	180	20	10	210		
9	Biomass & Biogas	30	10	30	-	10	80	3.6	5th
		150	40	90	-	10	290		

Source: Field Survey, 2022

Table 4.2 Identified Energy Source in Nigeria, among the variables Hydropower was ranked number 1st with a mean score of 4.9; Fuel wood and Solar were ranked 2nd and 3rd with mean scores of 4.5 and 3.9 respectively. The least of Energy Source in Nigeria are Nuclear and Geothermal with mean scores of 1.6 and 2.6 respectively.

Table 4.3: Most Sustaining Energy Source in Nigeria

S/N	Items	5	4	3	2	1	Total	MIS	Rank
1	Fuel wood	50 250	10 40	10 30	10 20	- -	80 340	4.3	3rd
2	Coal	30 150	5 20	20 60	10 20	15 15	80 265	3.3	7th
3	Hydropower	69 345	10 40	- -	1 2	- -	80 387	4.8	1st
4	Solar (Sun energy)	60 300	8 32	10 30	2 4	- -	80 366	4.6	2nd
5	Wind	40 200	10 40	19 57	- -	11 11	80 308	3.9	5th
6	Wave and Tide	30 150	15 60	25 75	- -	10 10	80 295	3.7	6th
7	Nuclear	- -	- -	30 90	20 40	30 30	80 160	2.0	9th
8	Geothermal	- -	20 80	40 120	20 40	- -	80 240	3.0	8th
9	Biomass & Biogas	40 200	10 40	20 60	10 20	- -	80 320	4.0	4th

Source: Field Survey, 2022

Table 4.3 Identified the Most Sustaining Energy Source in Nigeria, among the variables Hydropower was ranked number 1st with a mean score of 4.8; Solar (Sun energy) and Fuel wood were ranked 2nd and 3rd with mean scores of 4.6 and 4.3 respectively. The least of the Most Sustaining Energy Source in Nigeria are Nuclear and Geothermal with mean scores of 2.0 and 3.0 respectively.

Table 4.4: Alternative Source most useful in Wondercity Auchi

S/N	Item	Frequency	Percentage
1	Solar (Sun Energy)	26	32.5
2	Fuel	50	62.5
3	Biomass	2	2.5
4	Wind	2	2.5
	Total	80	100

Source: Field Survey, 2022

Table 4.4 above showed the Alternative Source most useful in Wondercity Auchi. 26 respondents representing 32.5% of the total respondents uses Solar (Sun Energy). 50 respondents representing 6.2.5% of the total respondents uses Fuel. 2 respondents representing 2.5% of the total respondents uses Biomass. 2 respondents representing 2.5% of the total respondents uses Wind. The analysis shows that fuel is most useful in Wondercity Auchi as an alternative source.

Table 4.5: Affordability of the renewable energy

S/N	Item	Frequency	Percentage
1	Highly affordable	-	-
2	Averagely affordable	50	62.5
3	Not affordable	30	37.5
4	Strongly not affordable	-	-
	Total	80	100

Source: Field Survey, 2022

Table 4.5 above showed the Affordability of the renewable energy. 50 respondents representing 62.5% of the total respondents says renewable energy is Averagely affordable . 30 respondents representing 37.5% of the total respondents says renewable energy is not affordable. The analysis shows that renewable energy is Averagely affordable.

Table 4.6: **Cost Implication of Installation**

S/N	Response	Frequency	Percentage
1	Manageable	10	12.5
2	Averagely manageable	20	25
3	Eating into the profits	40	50
4	Not manageable	10	12.5
	Total	80	100

Source: Field Survey, 2022

Table 4.6 above showed the Cost Implication of Installation. 10 respondents representing 12.5% of the total respondents says the cost implication of installation is Manageable. 20 respondents representing 2.5% of the total respondents says the cost implication of installation is averagely manageable. 40 respondents representing 50% of the total respondents says the cost implication of installation is eating into the profits.10 respondents representing 12.5% of the total respondents says the cost implication of installation is not manageable. The analysis shows that the cost implication of installation is eating into the profits

Table 4.7: Challenges/ Factors Affecting Renewable Energy Provision

S/N	Challenges	5	4	3	2	1	Total	MIS	Rank
1	Non availability of professional/ experts	60 300	10 40	5 15	5 10	- -	80 365	4.6	1st
2	Finance/ cost of installation	59 295	10 40	- -	5 10	6 6	80 351	4.4	2nd
3	Maintenance of facilities	45 225	8 32	5 15	10 20	12 12	80 304	3.8	6th
4	Fake products	40 200	10 40	10 30	15 30	5 5	80 305	3.8	5th
5	Insufficient energy generation	50 250	20 80	- -	- -	10 10	80 340	4.3	3rd
6	Increased cost of production and manufacturing of parts	50 250	5 20	20 60	- -	5 5	80 335	4.2	4th
7	Ignorance/ lack of awareness	30 150	25 100	- -	- -	25 25	80 275	3.4	7th

Table 4.7 Identified the Challenges/ Factors Affecting Renewable Energy Provision, among the variables Non availability of professional/ experts was ranked number 1st with a mean score of 4.6; Finance/ cost of installation and Insufficient energy generation were ranked 2nd and 3rd with mean scores of 4.4 and 4.3 respectively. The least is Ignorance/ lack of awareness and Maintenance of facilities with mean scores of 3.8 and 3.4 respectively.

Table 4.8: Possible Solution to the above challenges

S/N	Solution	5	4	3	2	1	Total	MIS	Rank
1	Education/ Encouragement	60 300	15 60	- -	5 10	- -	80 370	4.6	2nd
2	Government intervention	70 350	10 40	- -	- -	- -	80 390	4.9	1st
3	Large scale purchase	45 225	20 80	5 15	5 10	5 5	80 335	4.2	4th
4	Training and Retraining of Engineers	50 250	10 40	10 30	- -	10 10	80 330	4.1	5th
5	Provision of panels of Engineers	60 300	10 40	- -	- -	10 10	80 350	4.4	3rd

Table 4.8 shows the possible Solution to the above challenges, among the variables Government intervention was ranked number 1st with a mean score of 4.9; Education/ Encouragement and Provision of panels of Engineers were ranked 2nd and 3rd with mean scores of 4.6 and 4.4 respectively. The least is Training and Retraining of Engineers and Large scale purchase with mean scores of 4.1 and 4.2 respectively.

Table 4.9: Positive Impact/ benefit of renewable energy in running any business venture

S/N	Challenges	5	4	3	2	1	Total	MIS	Rank
1	24 hours power supply	70	5	-	-	5	80	4.7	2nd
		350	20	-	-	5	375		
2	Increase the total energy portfolio	50	10	-	10	10	80	4.0	6th
		250	40	-	20	10	320		
3	Increase level of patronage	55	15	-	10	-	80	4.4	3rd
		275	60	-	20	-	355		
4	Increase in knowledge and technology	50	-	20	10	-	80	4.1	5th
		250	-	60	20	-	330		
5	Client Satisfaction	70	10	-	-	-	80	4.9	1st
		350	40	-	-	-	390		
6	Sustainability	65	5	-	-	10	80	4.4	4th
		325	20	-	-	10	355		
7	Prestige of owner	20	10	-	40	10	80	2.9	7th
		100	40	-	80	10	230		

Source: Field Survey, 2022

Table 4.9 shows the Positive Impact/ benefit of renewable energy in running any business venture, among the variables Client Satisfaction was ranked number 1st with a mean score of 4.9; 24 hours power supply and Increase level of patronage were ranked 2nd and 3rd with mean scores of 4.7 and 4.4 respectively. The least is Prestige of owner and Increase the total energy portfolio with mean scores of 2.9 and 4.0 respectively.

Table 10: **Cost of Installation (Installers)**

S/N	Items Description	Unit Cost
1	1000w Polycrystal Silicon Pv Solar Light	50,000
2	Galvanized poles and Accessories	20,000
3	Concrete base and civil work	10,000
4	Fabrication and Painting	15,000
	Power Sector (KVA)	**Cost Price**
5	8.4 KVA	600,000
6	10KVA	2,100,000
7	20KVA	4,200,000
8	30KVA Diesel	6,030,000
9	80KVA Diesel	20,000,000
10	500KVA (CAT)	38,000,000

4.2 Discussion of finding.

Data were analyzed based on the responses gotten from the questionnaires distributed. 82 questionnaires were administered, while 80 were retrieved representing 97.6%. Analysis was made on the socio economic background of the respondents and the research questions were also treated. Table 4.1 above examined the Personal Data of respondents 81% of the respondents were male while 19% of the respondents were females. From the above statement it is very clear that majority of the respondents were males. 11% of the respondents were primary leaving certificate holders. 33% of the respondents were SSCE/WAEC, 22% of the respondents were OND holders, 15% of the respondents were HND. 08% of the respondents were B.Sc holders. This shows that majority of the respondents were SSCE/WAEC holders. From the analysis above it can be deduced that majority of the respondents were Visitors/ Clients.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

This is section of the research present the summary of the findings, conclusion drawn by the researcher as well as recommendations as appropriate

5.1 Summary of Findings

After a careful analysis of the questionnaires administered, the following findings were discovered and highlighted below:

1. The study revealed that a lot and different kind/types of recreational facilities are present in Afemai Wonder City. Wonder City it is indeed. Also of note is that, development is still on going and more different kind of recreational facilities are yet to be provided.
2. That hydropower energy is still the major source of power supply and most sustaining in Nigeria and the study area.
3. That the most useful alternative source of energy in Wondercity is solar next to fuel.
4. The affordability of alternative energy is averageably manageable and affordable.
5. That cost of installation is eating into the profit. That professionals and cost of installation are the highest challenges in renewable energy provision.
6. That the benefit of this provision is most sustaining (i.e solar energy).

5.2 **Conclusion**

As a result of the findings from the research study, the researcher considered its necessary to conclude that renewable energy is the most sustaining energy source with little or no environmental hazard. Renewable energy is averageably affordable and it impact positively on patronage clients satisfaction is greatly enhanced with 24 hours power supply, this, impact the business and owners prestige greatly.

5.3 **Recommendation**

Having considered the findings, the researcher thus, recommend as follows:

1. Awareness compaign of the environmental benefits of renewable energy
2. Subsidy from government for procurement
3. Training and retraining of solar power engineers
4. To power authority, reduction of large dams to smaller dams, with small scale low-head hydropower
5. Construction of smaller turbines to generate enough power for single family houses
6. Friendly government financial policies

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Appendix I

Department of Estate Management and Valuation,
School of Environmental Studies,
Auchi Polytechnic, Auchi
Edo State,
P.M. B. 13,

15th November, 2022

Dear Respondent,

This questionnaire is administered for a Higher National Diploma (HND) Research at the Department of Estate Management and Valuation, Auchi Polytechnic, Auchi. It is designed to get relevant information on "**Affordability of Renewable Energy provision in Recreational Property. Case study of Afemai Wonder City, Auchi**"

Attached to this is a questionnaire meant to gather relevant information for the research.

Your response will be treated with utmost confidentiality and shall be used strictly for academic purpose only.

Thank you,

IFADA SHEGUN
Researcher

QUESTIONNAIRE

Instruction: Please, tick [√] where appropriate.

Section A: Personal Data

1. **Sex**: (a) Male ( ) (b) Female ( )
2. **Academic Qualification:** Primary Leaving certificate ( ) SSCE/WAEC ( ) OND ( ) HND ( ) B.Sc ( ).
3. **Category of Respondent (a)** Staff ( ) (b) Solar Energy Installer ( ) (c) Visitor/ Client ( ) (d) 16-20years ( ) (e) 20years and above

SECTION B

4. Please can you name all the recreational facilities present in Afemai Wonder city?.....
5. What other alternative sources are most useful in Auchi? Pleases state: …… ……..
6. What are the readily available renewable energy technology in Auchi. …….
7. Solar energy provision improves performance of the business please rate::……. …….

Table 1: **What are the energy sources known to you in Nigeria**

S/N	Energy Sources	5	4	3	2	1
1	Solar					
2	Geothermal					
3	Wave and Tides					
4	Wind					
5	Hydro-power					
6	Coal					
7	Fuel					
8	Nuclear Power					

8. Which of the above name energy is most sustaining? ……. …….

Table 2: **Is Renewable Energy is affordable in Auchi**

S/N	Energy	5	4	3	2	1
1	Highly affordable					
2	Averagely affordable					
3	Not affordable					
4	Strongly not affordable					

Table 3: **How affordable is renewable energy in running of Afemai wonder city? Cost implication**

S/N	Energy	5	4	3	2	1
1	Very affordable					
2	Affordable					
3	Undecided					
4	Really affordable					
5	Not affordable					

Table 4: **Challenges/ factors affecting renewable energy provision in the study area**

S/N	challenges	5	4	3	2	1
1	Non availability of professional experts					
2	Finance/ cost of installation					
3	Maintenance of facilities					
4	Fake products					
5	Insufficient energy generation					
6	Increased cost of production and manufacturing					

9. Please state any other problem not listed above:……
10. Please state "Possible solution to the above listed problem:……..

Table 5: **Positive impact of renewable energy in running any business venture.**

S/N	Items	5	4	3	2	1
1	24 hours power supply					
2	Increase in the total energy portfolio					
3	Increase in patronage					
4	Increase in knowledge and technology					
5	Client satisfaction					

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