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A COMPARATIVE ANALYSIS OF FINNISH AND NIGERIA BIOECONOMY: BIOENERGY AND TOURISM PERSPECTIVE

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ABSTRACT:
DEVELOPED AND DEVELOPING ECONOMIES NEED TO EXPLOIT THEIR BIOECONOMY CAPABILITIES TO ACHIEVE SUSTAINABLE ECONOMIC GROWTH AND DEVELOPMENT. THIS STUDY SEEK TO EXAMINE THE FINNISH AND NIGERIAN BIOECONOMY FROM THE PERSPECTIVE OF BIOENERGY AND TOURISM. WE USED SECONDARY DATA FROM FOOD AND AGRICULTURE ORGANIZATION (FAO), INTERNATIONAL ENERGY AGENCY (IEA), UNITED NATION WORLD TRADE ORGANIZATION (UN WTO) AND WORLD BANK TO DRAW INSIGHTS ABOUT THE SUBJECT. BASED ON AVAILABLE DATA, DESCRIPTIVE STATISTICS SUCH AS CHARTS AND FREQUENCIES WERE USED TO EVALUATE THE BIOECONOMY OF FINLAND AND NIGERIA. THIS STUDY REVEALS THAT BIOECONOMY IS DESIRABLE TO DEVELOPING NATIONS SUCH AS NIGERIA. FOLLOWING THE DIFFERENCES IN BIOECONOMIC ADVANCEMENT BETWEEN THE FOCUS COUNTRIES, OUR STUDY HAVE SHOWN THAT DEVELOPING COUNTRIES AND NIGERIA, IN PARTICULAR, WILL HAVE TREMENDOUS BENEFIT IF ITS PARADIGM SHIFT TOWARD BIO-BASED ECONOMY. IMPLEMENTING THE MEASURES AND POLICIES OF DEVELOPED ECONOMIES SUCH AS FINLAND WILL DRIVE NIGERIA TOWARDS SUSTAINABLE BIOECONOMY DEVELOPMENT.

KEYWORDS: BIOENERGY, TOURISM, BIOECONOMY, FINLAND, NIGERIA, NATURAL RESOURCES

INTRODUCTION

Previously and even more recently, advancement in bioeconomy has been perceived as an essential tool that facilitates development at national and global level. Bioeconomy encompasses all economy based on the conversion of renewable natural resources to fuel and other useful products. The development of bioeconomy has been stimulated by a number of factors such as reducing dependence on fossil fuel and fossil fuel products, food availability, and cut-down on greenhouse gas (GHG) effects in addition to the development of rural area. The definition of bioeconomy has extended beyond producing and using bio/based product but

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also includes a novel way of living sustainably (Luoma, Vanhanen & Tomila, 2011)[3]. Due to its importance, many countries are focusing on developing a bio-based economy, which can be forest or agro-allied industry-oriented bioeconomy. However, bioeconomy tends to achieve common goals; availability of raw materials to run the economy, how they are used, and conversion techniques differ from one country to another. These differences, as well as their underlying policies, has an impact on the perception of bioeconomy and the actions taken to accomplish the set goals amongst countries. Finland and Nigeria are typical countries with different level of development and application of bioeconomy for the enrichment of its economy. Finland is a knowledge-based advanced economy; rich in the forest reserve and like other European countries have been at the forefront for the pursuit of a biobased economy. On the other hand, Nigeria with one of the largest economies in Africa is still a developing nation that perceives bioeconomy from a different angle.

In light of abundant available resources and available biorefining technology, Nigeria stands to benefit from bioeconomy to becoming a leader in bioenergy production in Africa. Both countries are different in many regards ranging from population, climate, culture, level of technological advancement, so have a different approach towards accomplishing a biobased economy. Bioenergy can be evaluated based on natural resources, raw material types, energy sources among others. It is therefore not out of place to compare the two nation's bioeconomy based on their natural resources, raw material types, energy sources, tourism and sector-based contribution to economy measured by gross domestic product (GDP). The objective of this work is to analyze the different perspective of bioeconomy and the extent of its development in Nigeria and Finland. Also, to further understand the policies associated with the development of Nigeria and Finnish bioeconomy.

METHODOLOGY

This study is descriptive in nature and draws insights from a systematic review of literature and secondary data from Food and agriculture organization (FAO), International energy agency (IEA), united nation world trade organization (UN WTO) and World Bank. Bioeconomy is complex and difficult to measure directly, we have used bioenergy and tourism as measurement parameters.

NATURAL RESOURCES

Nature's endowment of any nation or community provides them it a unique identity and means of survival and revenue. Countries in general and our case study countries in particular, have differences in supplies of natural resources and utilization is unique to each. In this study, we focus on universal resources, land, and energy to afford a basis for comparison of both countries.

Land itself is a universal resource on which agricultural activities are done. Nigeria has large forest reserve with agriculture being one of the mainstays of the economy and has contributed substantially to the economy prior to the discovery of crude oil (Etumnu 2013)[4] The percentage of total land area covered by forest decreased steadily from 18.9% in 1990 to 7.6% in 2015. The observed steady decrease in forest lands has been attributed to several factors such as forest encroachment, poor management as well as climate change (FAO, 2015)[5].

[3] Luoma, P., Vanhanen, J., and Tomila, T. 2011. Distributed Bio-based Economy- Driving sustainable Growth. Helsinki: Sitra.
[4] Etumnu, Tolulope Odetola and Chinonso. 2013. "Contribution of agriculture to economic growth in Nigeria." African econometric society (AES). Accra, Ghana. 1-28.
[5] FAO. 2015. Global Forest resources assessment: country report (online), Nigeria. Rome: FAO publisher.

Majority of the people (50.6%) live in the rural area and statistical data available from world bank 2016, shows that 78% of total land is used for agriculture purposes, 8% for forest and 14% for other purposes (figure 1). The decline in the agricultural sector development observed, is partly due to the abundance of petroleum which accounts for over 90% of the country's revenue from the export of petroleum products. Following the crash in the global price of crude oil, the potential of other sectors such as agriculture is being harnessed. In 2015, the agricultural sector accounted for 20.85% of 15,546.302 US$ total gross domestic product (GDP)/capita of the country with higher potential when properly managed.

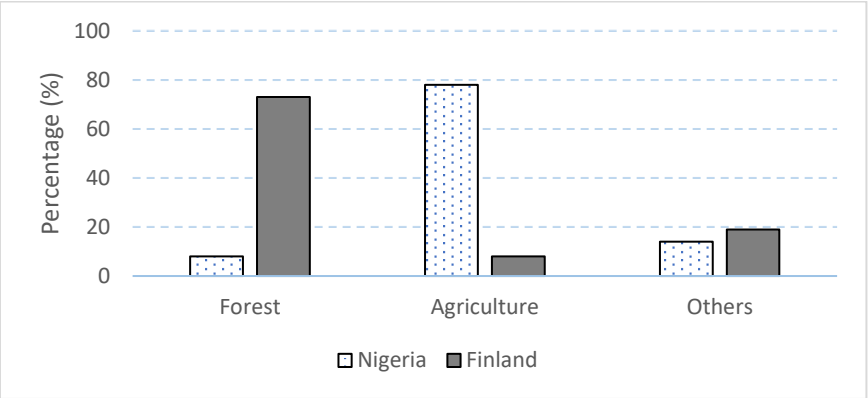

Figure 1. Land use distribution of Nigeria (left) and Finland (right). (World Bank, 2016)[6]

Finland on the other hand, reportedly has 73% of its total land area covered by forest, 8% agriculture and 19% for other use (figure 1). Due to its natural reservoir of the forest, Finland is classified as forest and wood-based rather than agricultural based economy even though agriculture contributed 2.5% of 40,978.871 US$ GDP/capita in 2015 (Worldbank, 2016)[7]. Agricultural contribution to GDP though small is stable as opposed changes observed in Nigerian agriculture for the period under consideration (Fig 2). Urban dwellers account for 85% as opposed to 49% in Nigeria. (FAO 2017)[8]

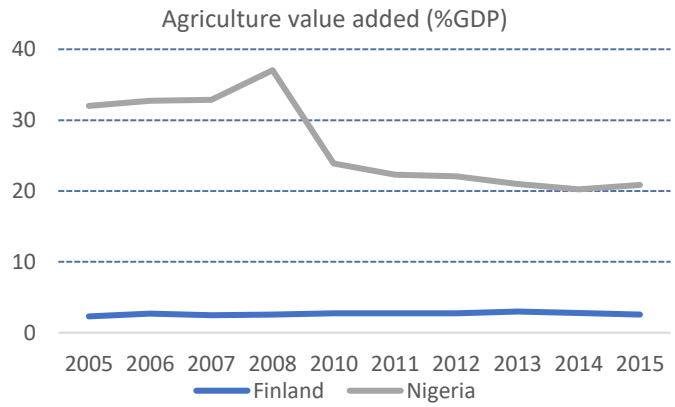

Figure 2. Trend of agricultural contribution to % GDP Nigeria and Finland 2005-2015 (www.worldbank.org)[9]

[6] World bank, 2016
[7] World Bank. 2016. www.world bank.org.
[8] FAO, 2017
[9] www.worldbank.org

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BIOMASS RESOURCES

Though biomass is defined as the lignocellulosic component of plant and plant materials, it simply includes plant and animals matter as well as algae that can be transformed into useful products such as fibers, chemicals, and fuel. Development in the use of micro and macro algae as a biofuel feedstock is slow compared to energy crops, there is, the however prospect of producing important chemicals from them. The absence of land competition with food or energy crops constitute added advantage for the use of algae as an energy feedstock. (Wijffels 2010)[10]. Its potential in biodiesel production has been well described (Mata T. M. 2010)[11]. Land Biomass can be classified into woody biomass and agricultural product biomass (herbaceous biomass and biomass from seeds and fruits). Renewable biomass materials can be directly burned (thermochemical conversion) to generate energy in the form of heat or converted to an array of biofuel products and other biobased chemicals. Wood which remains the common and abundant biomass can be directly burned to generate heat for cooking, heating, or energy. Direct combustion of wood is a common phenomenon in rural areas of Nigeria used in cooking compared to Finland where heat generated is mainly used for keeping homes warm during the winter period. High dependence on wood fuel for energy is discouraged because of its adverse effect on forest biodiversity. (Bouget, 2012)[12]. The adverse effect of forest logging on saprophytes, for example, is a known truth, quantifying the extent of its effect is, however, cumbersome. (Jonsell, 2007)[13]. Hiron et al 2017 in their study reveal that stump removal have a more detrimental effect than slash removal. In addition, their study suggests that mono-specie forest would promote biodiversity regardless of the harvest type used. (Hiron 2017)[14] . The process of the logging for firewood, not only affect the saprophytic and non-saprophytic community but also influences the soil structure and leads to loss of nutrients. Replenishing of soil nutrient can be achieved using ashes from combusted woody material (Brunner, 2004)[15] and allowing logging residues lie fallow. (Gunnarsson et al, 2004)[16]. Dependence on fuelwood may not be completely abolished, but the use of short rotation trees not only provide wood but also improves on biodiversity when managed properly.

Finland depends on its large deposit of woody biomass obtained from its forest whereas Nigeria, is focusing more on the agricultural products and waste as a source of biomass for the biofuel production. A potential that needs to be harnessed considering a large amount of waste generated because of its teeming population (Oladeji 2011)[17]. The cultivation of non-edible energy crops such willow plants is becoming of interest considering their potential and

[10] Wijffels, R. H., Barbosa, M.J. 2010. "An outlook on microalgal biofuels." Perspective (5993): 796-799.
[11] Mata T. M., Martins, A. A, Caetano, N. S. 2010. "Microalgae for biodiesel production and other applications: A review." Renewable and sustainable energy reviews 14 (1): 217-232
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[15] Brunner, I., Zimmermann, S., Zingg, A., and Blaser, P. 2004. "Wood-ash recycling affects forest soil and tree fine-root chemistry and reverse soil acidification." Plant Soil 267 (1-2): 61-71
[16] Brunner, I., Zimmermann, S., Zingg, A., and Blaser, P. 2004. "Wood-ash recycling affects forest soil and tree fine-root chemistry and reverse soil acidification." Plant Soil 267 (1-2): 61-71
[17] Oladeji, J. T. 2011. Agricultural and forestry wastes and opportunities for their use as an energy source in Nigeria- An overview. World rural observation. 107-112

increasing need for food and feed for the growing population (Mola-Yudego, 2014)[18]. Example of potential biomass feedstock for production of bioenergy in Nigeria includes sorghum, cassava, sugarcane, and Jatropha. These biomass feedstocks are mainly agricultural product. This, however, raises concerns due to their alternative use as food and animal feeds alike. This has however led to research into other crops, which are non-edible to prevent competition for available food and promote sustainability. The generation of waste from household and industries in the world today is inevitable and conserve a huge potential contribution to bioeconomic growth (Allen, 2015)[19]. Such can be termed secondary raw material when exploited could contribute to Nigerian as well as Finnish bioeconomy. Waste from livestock and human wastes have shown to have great potentials for microbial conversion to biogas. (Ben-Iwo et al., 2016)[20].

BIOENERGY FROM RENEWABLE SOURCES.

According to FAO, ‘’bioenergy is energy from biofuel’’. Biofuels are fuels from biological plants and animal materials or remains. The need to reduce dependence on fossil fuels such as coal, petroleum, and their products is essential to mitigate the amount of greenhouse gas GHG released into the atmosphere while providing sufficient food for the growing population. Furthermore, ashes generated from bioenergy production have shown potential application (Steenari et al. 1997)[21], thus leading to a complete cycle with minimum waste. These have a contribution to the concerns about utilizing renewable sources for energy production. For example, Nigeria’s CO_2 emission from petroleum consumption in 2014 was estimated to be 40 million metric tons whereas Finland produced only about 26 million metric tons for the same year. (International Energy Agency, 2014)[22]. Statistical data provided by IEA shows that 82% of the electricity used in 2014 emanated from burning of natural gas in Nigeria and only 18% of renewable energy that was majorly hydropower. For the same year, energy consumed in Finland came from diverse sources with only 8% of natural gas as well as renewable sources such as biofuel accounting for 17% of total energy (figure 3).

[18] Mola-Yudego B, et al. 2014. "A conceptual framework for the introduction of energy crops." Renewable energy 29-38.
[19] Allen B., Nanni S., Schweitzer J., Baldock D., Watkins E., Withana S., Bowyer C. 2015. International review of bioeconomy strategies with focus on waste resources. London: Institute for European environmental policy.
[20] Ben-Iwo, J., and et al. 2016. "Biomass resources and biofuels potential for production of transportation fuels in Nigeria." Renewable and sustainable energy reviews 172-192.
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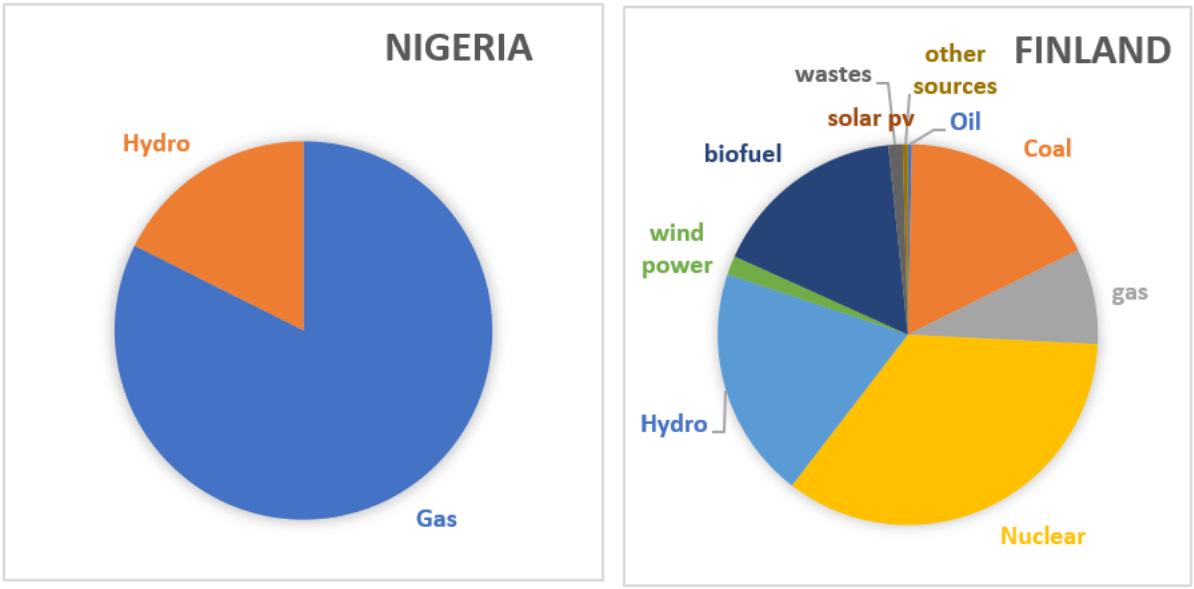

Figure 3. Energy sources and their proportion for Nigeria (left) and Finland (right) 2014, based on the data provided by International Energy agency (IEA). Source: IEA statistical report accessed 6.1.2017

Developing countries such as Nigeria and advanced European countries, like Finland are both working towards achieving bioeconomy goal but from different viewpoints especially based on the kind of raw material, biomass available. In the interest of maximizing the heat value and transportation costs has led to the technology of conversion of woody and agricultural biomass feedstock to more condensed biomass pellets for the generation of energy. (Malik B. 2015)[23] Pelletizing technology is increasingly growing in developed countries and its application is well known. Finland represents a major producer of pellets in Europe and FAO estimated a total of 302ktons of wood pellets produced in 2015. (FAOSTAT, 2016)[24]. Of the wood pellets produced, the percentage quantity exported was approximately 17% and 30% between 2012 and 2015. (Table 1). This is, however, a new technology for Nigeria where its application has failed to be reported.

Table 1. Wood fuel in the form of wood pellets production and exportation value in Finland 2012 to 2015. (FAOSTAT, 2016)[25]

Year	Wood Pellets (values in tons)		
	Production	Export	Approx. % Exported
2012	252370	61184	24
2013	270000	78239	29
2014	324000	55970	17
2015	302000	59812	20

Nigeria has a wide range of raw biomass material needed to propel the growth and development of bioenergy generation, which is an aspect of bioeconomy. The production of crops for biofuel which remains Nigerian's focal point for developing its bioeconomy (Agro &

[23] Malik et al. 2015. Biomass Pellet Technology: A Green Approach for Sustainable Development
[24] FAOSTAT. 2016. Forestry production and trade data. FAO.
[25] FAOSTAT. 2016. Forestry production and trade data. FAO.

Ogie 2012)[26], is still at the developmental stage and an estimated (1100kt of oil eq.) of biofuel was produced in 2014. On one hand, the production of biofuel in Nigeria is mainly done through enzymatic conversion of agricultural biomass to liquid biofuel, bioethanol. In table 2 below, is selected biomass which has potential in the production of bioethanol as well as biogas and biodiesel in Nigeria. Generation of woody biomass in the form of plantation especially in the tropics can be encouraged; the negative effect of biomass harvest may increase with shorter rotation year. (Onyekwelu et al 2006)[27].

Table 2. Biofuel production from selected potential raw materials and industrial feasibility in Nigeria.

Biofuel	**Potential raw material**	**Industrial feasibility in Nigeria**
Bioethanol	Sugarcane, sweet sorghum, cassava	Developing
Biodiesel	Jatropha, oil palm, soybeans	Under investigation
Biogas	Municipal solid waste, manure, sewage	Good

Adapted (Ben-Iwo et al., 2016)[28]

Pyrolysis is another biomass conversion technology that is of importance to the Nigerian bioenergy production. Pyrolysis of wood biomass to produce charcoal has been a lucrative activity which provides employment and source of income for the rural dwellers because of its high demand as a source of energy. In 2014, biofuel produced in Finland was 7,773 (100kt of oil equivalent) (IEA, 2016)[29]. Advancing this technology to produce liquid fuel with high calorific value would proffer alternative source of fuel, bio-oils for agricultural and other applications (Tiilikkala et al., 2010)[30]. This has been achieved but optimization is required to obtain the desired property.

Combined Heat Power (CHP) plant technology

In the combined heat and power plant technology, waste released in the form of heat from industrial processes is utilized in nearby homes as a source of heat and electricity. Finland and other European countries have embraced the process in general, thus promoting the share of green energy in the energy pool. This facilitates the reduction in greenhouse gas emission associated with global warming.

Finland and Sweden are examples of countries that have participated in developing both small and large scale combined heat power (CHP) plants system. It has been reported that CHP plants provide about 70% energy in district heating for locals residing around these industries and about 11% electricity to run its processes (Salomon et al. 2011)[31]. Biowastes such as rice husk have presented raw material potential in CHP systems (Chang et al. 2019)[32]. This

[26] Agro B. E., Ogie N. A. 2012. "A comprehensive review of biomass resources and biofuel production potential in Nigeria." Research journal in engineering and applied sciences 1 (3): 149-155.
[27] Onyekwelu, J.C,. 2006. "Productivity, site evaluation and state of nutrition of Gmelina arborea plantations in Oluwa and Omo forest reserves, Nigeria." Forest ecology and management 229 (1-3): 214-227.
[28] Ben-Iwo, J., and et al. 2016. "Biomass resources and biofuels potential for production of transportation fuels in Nigeria." Renewable and sustainable energy reviews 172-192.
[29] IEA. 2014. CO2 Emissions from consumption of petroleum. International Energy Statistics Press.
[30] Tiilikkala et al. (2010) History and use of wood pyrolysis liquids as biocide and plant protection product.
[31] Salomon et al. (2011). Small-scale biomass CHP plants in Sweden and Finland.
[32] Chang et al. (2019). Thermo-economic analysis of a taiwanese combined CHP system fueled with syngas from rice husk gasification

technology have a huge possible effect on the bioeconomy of developing nations which are yet to adopt this sort of technology. Waste constituting mayhem in such countries like Nigeria can be diverted into important use for generation of electricity from this platform. Previous study by Lamidi et al. (2017) have identified potential application of biogas CHP in rural communities of Nigeria reducing dependence on fossil fuel electricity (Lamidi et al. 2017)[33]. Thus, provides energy and mitigate the amount of gaseous industrial waste discharged into the atmosphere.

National policies influence bioenergy/bioeconomy growth

There exists a fundamental correlation between national policy and bioeconomy development. In comparison, this factor for different countries, caution must be observed as different policy have different source and interpretation. (Kröger 2017)[34]. National and local Policy likewise play a very crucial role in developing the bioeconomy and specifically the extent to which biobased energy contributes to the pool of a country or nation's energy sources. The Nigerian government in 2007, released the ''biofuel policy and incentives'' which connects the agricultural sector to the petroleum sector to foster the generation of renewable energy. Following the directive of the government, the Nigerian National Petroleum Corporation (NNPC) developed the first bioeconomy strategy with the aim of improving bioenergy production while creating more job opportunities. Though the policy overall focused on bioeconomic growth, it is specifically associated with bioethanol and biodiesel produced from agricultural products. (German bioeconomy council, 2015)[35].

Finnish ''bioeconomy strategy – sustainable growth from bioeconomy'' which has been adopted for the development of Finland's bioeconomy is a more holistic strategy which was established in 2014.

It considers bioeconomy development beyond bioenergy production but to include food production, products, and services based on renewable resources. Besides the glaring benefits of bioeconomy, the Finnish bioeconomic policies also aimed towards modifying the lifestyle of people towards appreciating sustainable living. (Luoma et al., 2011)[36]. Amongst other objectives of the strategy, the Finnish bioeconomy strategy focuses on diversification of products and considers water important in the development of a sustainable bioeconomy. (German bioeconomy council, 2015)[37]. Ease of improving the Finnish bioeconomy as well as any other depends not only on its national policies and implementation but also on global bioeconomy platform. (Kröger 2017)[38] The policies implementation towards bioeconomy development in Nigeria and Finland, have also incorporated measures such as incentives and tax-waiver to encourage the growth of the sector.

[33] Lamidi et al. (2017). "Evaluation of CHP for Electricity and Drying of Agricultural Products in a Nigerian Rural Community."
[34] Kröger, M., Raitio, K. 2017. "Finnish forest policy in the area of bioeconomy: A pathway to sustainability?" Forest policy and economics 77: 6-15.
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Tourism as an aspect of bioeconomy

Tourism plays an important role in the growth of the world's economy and in 2015, travel and tourism constitute a total contribution of 10.2% to GDP in 2016. (WTTC, Travel and tourism Economic impact 2017).[39] In the past, tourism has received less attention with respect to its contribution to the overall economy. Nonetheless, it is a growing sector and has been recognized as a major source of income for nations and as a source of foreign currency in Africa. Conversely, in Europe and Nordic countries development of tourism perceived as an essential ingredient towards the industrial development of biobased products (OECD, 2015)[40]. Based on periodic analysis by United Nations world trade organization (UNWTO), Finland had more visitors than Nigeria. Nevertheless, the total number of visitors increased by approximately 52 % and 24 % for Finland and Nigeria respectively from 2011 to 2012 (Figure 4). In addition, 55 % of 7,636 million total arrivals accounted for overnight visitors, whereas only 10% of the total 4,673 million visitors make up for tourists in Nigeria for the year 2012 as seen in figure 6. (World tourism organization, 2015)[41].

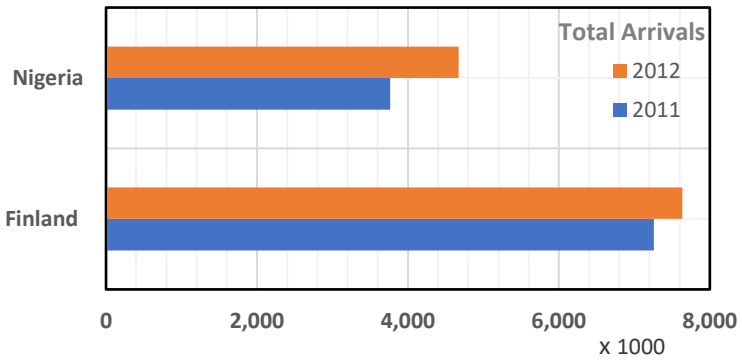

Figure 4. Two year-overall foreign arrivals into Nigeria (top) and Finland (bottom). Arrivals include visitors and tourists, or otherwise called overnight visitors. (united nations world trade organisation website 2016) [42]

In view of the benefits associated with tourism, Nigeria as well as other African countries recently signed and adopted the African charter on sustainable and responsible tourism which focuses on promoting tourism. In addition to tourism, the charter also aims at addressing climate issues through preservation of the environment, and respect for biodiversity of each Africa country. The main target is to promote sustainability in the tourism sector for the national economic growth and rural development of its member states upon following the guiding principles of the charter. (UNWTO, 2015)[43]. In Nigeria, statistical data showed that in 2014, tourism contributed 4.1% of total GDP expecting to rise by 1% in 2025. It, however, accounted for 2,198,500 jobs making up 3.6% of total employment. (WTTC, Travel & Tourism Economic Impact (online), 2015)[44]. Finland's tourism sector is nowadays considered to include activities such as fishing, hunting, as well as other activities such as camping; people enjoy doing at leisure times. In this respect, the rich forest reserve of Finland not only provide raw

[39] WTTC. 2017. Travel and tourism Economic impact 2017 world. World travel & tourism council
[40] OECD, 2015
[41] 2015. "World tourism organization." World tourism organization web site. April 6. http://statistics.unwto.org
[42] UNWTO. 2015. African sustainable and responsible charter (online). United Nations world tourism organization press
[43] UNWTO. 2015. African sustainable and responsible charter (online). United Nations world tourism organization press.
[44] WTTC. 2015. Travel & Tourism Economic Impact (online). World travel and tourism council press.

material and food for its population but is also associated with nature itself ''nature'' tourism. Thus, proper management of the forest has been identified as the way forward towards the development of the tourism industry. Dietz et al (2018)[45], observed that the policies implemented do not consider in full the risk associated with the development of national bioeconomy. Nonetheless, it is important to adopt an all-inclusive approach to the development of sustainable bioeconomy. In view of the importance of direct government involvement to bioeconomy, variation in advancement amongst developed nation exists (Bosman R., 2016)[46]

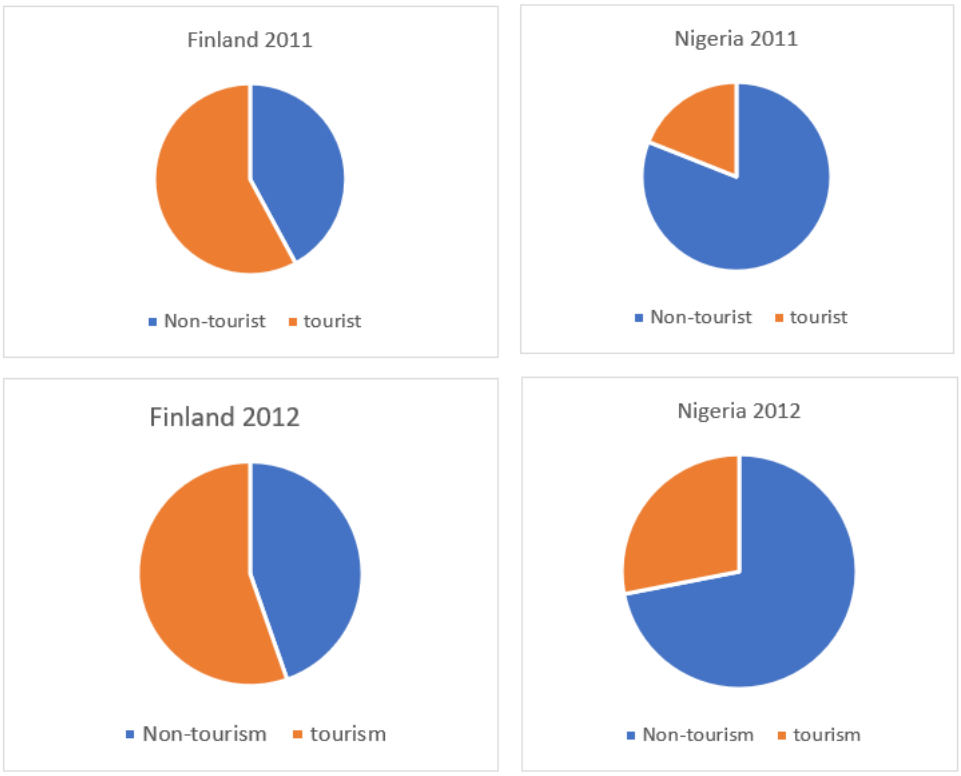

Figure 5: A comparison of percentage overall foreign tourist (overnight visitor) and other visitors in Nigeria (right) and Finland (left) for two years; 2011 and 2012.

The higher number of tourists in Finland (Fig 4 & 5) can be attributed to the well managed natural resources and more stable and inclusive policies towards achieving the proper management of resources compared to Nigeria. In addition, instability in economy and policies increases uncertainty and could possibly explain the observed differences in the number of tourists into Finland and Nigeria. This phenomena difference impact on tourism sector contribution of overall GDP of both countries. (Figure 7)

[45] Dietz T., Börner J., Förster J. J., Braun V. J. 2018. "Governance of the bioeconomy: A global comparative study of national bioeconomy strategies." Sustainability 10 (9). doi:doi:10.3390/su10093190.
[46] Bosman R., Rotmans J. 2016. "Transition governance towards a bioeconomy: A comparison of Finland and the netherlands." sustainability 8 (10). doi:10.3390/su8101017.

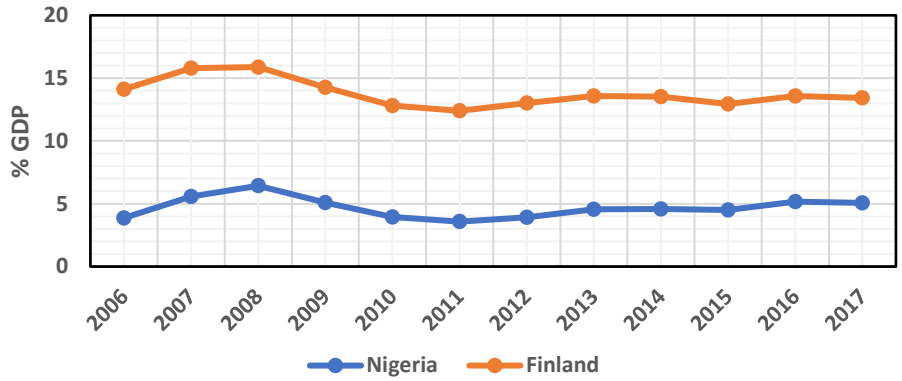

Figure 7. Tourism overall contribution to Nigeria and Finland national GDP for 11 years. (WTTC, 2018)[47]

The total contribution of tourism to GDP has been forecasted to grow from 6.5% of GDP in 2014 to 7.3% of total GDP in 2025. While the total contribution to employment accounting for 6.8% of total employment is expected to increase to 8.6% of the total employment. (WTTC, Travel & Tourism Economic Impact (online), 2015)[48]

CONCLUSION

Development of bioeconomy or bio-based economy has been highlighted as important to developing and developed nations. The holistic description of bioeconomy is, however, ambiguous. For this reason, bioenergy which is the earlier target of bioeconomic growth and tourism have been chosen to provide a yardstick to evaluate bioeconomy in the current study. In this study, based on secondary data, we have evaluated the Finnish and Nigerian bioeconomy. We have been able to demonstrate that the untapped resources of Nigeria from the perspective of bioeconomy development can be exploited if the government consciously make it a priority by revisiting the policies in line with global policies. Thus, Finland is a good example of a nation with less dependence on fossil fuel reserve and emulating its strategy is not out of place.

Finland has taken a conscious and active step towards developing its bioeconomy sector through a combination of science (research and development) and strong policies. Finland serves as a good example of a viable economy with a strong focus on improving its bioeconomic aspect of its economy. In the case of Nigeria, stakeholders and government need to set up a defined and coherent policy that can drive the development of bioeconomy. Thus, circumventing fluctuations on its economic stability, which depends largely on crude oil reserves. Embracing bioenergy will also benefit developing nations towards remediation of greenhouse gas (GHG) pollution; create job opportunity and a robust economy. By extension, this transforms the tourism industry that could connect Nigeria to countries with developed bioeconomy such as Finland. A trustworthy channel between Nigeria and bio-economically advanced nations can be a reality if the tourism sector is given attention. Suffice to say, issues such as safety of tourists and the nationals, when dealt with is a positive marker in the path to a sustainable and robust bioeconomy in the case of developing nation. With the potentials identified, it have become important for developing countries, Nigeria in particular to take the bull by the horn and consciously navigate the economy in the right direction.

[47] WTTC. 2018. world & tourism council. accessed 19.01.2019
[48] WTTC. 2015. Travel & Tourism Economic Impact (online). World travel and tourism council press.

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