

Critical Challenges Mitigating Sustainable Construction In Nigeria: A Review

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Abstract—Fuelling the writing of this paper are the challenges mitigating sustainable construction in developing countries. Such challenges which are attributed not only to clients' growing demand, complexity of construction projects, and advancement in technology, but also to issues gathered from historical data and contributions obtained from various archival studies and related research literatures, that are based on ethical control, doubtful commitment of the government regarding continuity of construction projects, corrupt practices, reliance on foreign materials and labour as well as building and construction components, inflationary trends on building and construction materials and lack of accurate data. This paper therefore, examines challenges mitigating sustainable construction in developing economy, particularly Nigeria. In the exploration of these challenges, a copious number of scholarly articles were reviewed; hence the significant roles of the stakeholders cannot be compromised in maintaining sustainable construction. However, the unquestionable measures of fostering sustainable construction are inclusive of the clients being engulfed with the passion for a more sustainable built environment, with the promotion of sustainable construction practices sustained through the professionals' work, while the construction industry tasked to commit to a more sustainable construction processes, and regulatory bodies challenged to encourage, enable and enforce sustainable construction. Nevertheless, with the plight of the stakeholders having their roles fulfilled, the educational sector should be saddled with the responsibility of providing them with the necessary training and educators, who themselves are researchers to develop this new knowledge, while the participation and support of clients, contractors, professionals, governments that will be committed to ways of appropriating reduction in corrupt practices are advocated. This will enhance the widely impact and contributions of the construction industry on other industries.

Keywords—*Construction, Socio-economic development, Construction industry, Construction team.*

INTRODUCTION

The construction industry is unequivocally regarded as one of the most significant in terms of its impact on other industries (1), because it plays a major role in economic development of the less industrialized nations, since it constitutes a major portion of both gross national product and of employment. The industry embraces a wide range of loosely integrated organizations that collectively construct, alter, refurbish and repair a wide range of different building and civil engineering structures. However, (2) and (3) note that construction is a key sector of the national economy for countries all around the world, as traditionally, it takes up a big portion in the nation's total employment and its significant contribution to a nation's revenue as a whole. The role of the construction industry in economic development, therefore, has been addressed by various researchers and international bodies, many of whom have focused on developing countries (4-7, 27, 55). According to (8), the construction industry plays an important role in the economy, and the activities of the industry are also vital to the achievement of national socio-economic development goals of providing shelter, infrastructure and employment. Besides, it also plays a key role in satisfying a wide range of social development, agriculture, trade, commerce and industry, rural development, health services, employment generation, etc; and contributes significantly to the fulfillment of various major national goals. It is clear that construction activities affect nearly every aspect of the economy and that the industry is vital to the continued growth of the economy. The figure 1 below shows the dependence of other industries on construction industry. The industry, in relation to (9), includes companies, firms, and individuals working as consultants, main and sub-contractors, material producers, equipment suppliers and builders merchants. The stakeholders, which are

regarded as the construction professionals, includes the Clients, Architects, Engineers (structural, mechanical and electrical), Quantity Surveyors, Contractors, etc. (10-13).

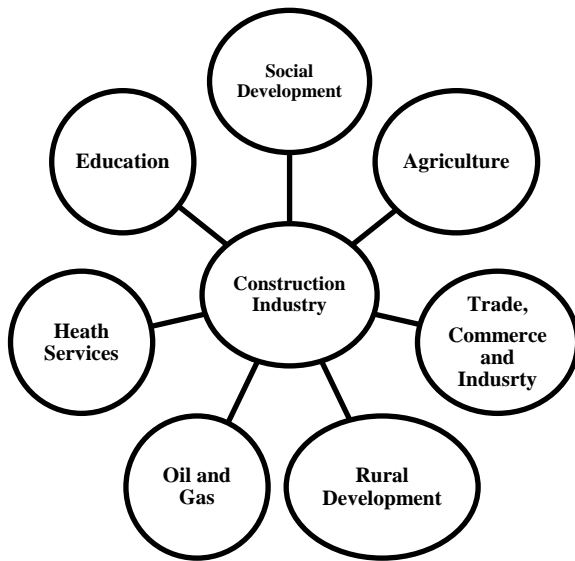


Figure 1: Typical chart of dependence of some industries on construction industry

Source: Authors (2017)

They are the ones that will take into account, all environmental, socio-economic and cultural issues for the design and the cost implication, vis-à-vis the feasibility and viability of the project. Whereas, (14) is of the opinion that sustainable construction is not limited to researchers. It requires concerted action by all stakeholders involved in the creation and use of the built environment. Even though the construction industry's service providers have been unable to fully grasp the issue of client satisfaction largely because of the absence or unawareness of a mechanism for measuring satisfaction in the construction process. According to (15), clients need to demand a more sustainable built environment, professionals need to adopt and promote sustainable construction practices through their work, the construction industry needs to commit to following sustainable construction processes, and regulatory bodies need to encourage, enable and enforce sustainable construction. If all these stakeholders are to fulfill their roles, the educational sector has to provide them with the necessary training and with educators who themselves are researchers to develop this new knowledge, they will need the participation and support of clients, contractors, professionals, governments that will be committed to sustainability. In addition, sustainable construction is generally used to describe the application of sustainable development to the construction industry. The industry is given a definition as all who produce, develop, plan, design, build, alter, or maintain the built environment, and includes building material manufacturers and suppliers as well as clients and end use occupiers. With regards to the contribution of (17), sustainable

construction involves issues such as the design and management of buildings, materials performance, construction technology and processes, energy and resource efficiency in building, operation and maintenance, robust products and technologies, long-term monitoring, adherence to ethical standards, socially-viable environments, stakeholders participation, occupational health and safety and working conditions, innovative financing models, improvement to existing contextual conditions, interdependencies of landscape, infrastructure, urban fabric and architecture; flexibility in building use, function and change, and the dissemination of knowledge in related academic, technical and social contexts.

II REVIEW OF LITERATURE

The construction industry is a project-based industry within which individual projects are frequently custom-built to client specifications. As a result of this, (18) believes that construction all over the world has not been static, but dynamic, and the reasons for this include: clients' growing demand, complexity of construction projects, and advancement in technology amongst others. The construction sector has enormous environmental impact. From a climate perspective alone, buildings' greenhouse gas emissions are significant and growing fast. Furthermore, construction materials are responsible for tremendous damage through mining, deforestation and other impacts resulting from their production and supply. Without major changes in practices, at some point this century we will simply run out of some of the key resources (e.g. certain metals) required to keep up with the explosive growth in building demand. We are simply exploiting resources at a much greater rate than the planet can sustain (19). There is no sector of the economy that does not have anything to do with the construction industry and its components. For example, building, civil and heavy engineering, oil and gas, manufacturing, textile, aviation, agriculture, mining, transport, water resources, telecommunication, electricity/energy, power/steel, etc. play major roles in economic development in the less industrialized nations. This implies that there is something unique about the construction sector which may not be found anywhere (20). It goes therefore, that the construction industry can be used to derive economic growth and development with any given national economy; if it is well managed (20; 21). Nevertheless, sustainable construction adopts different approaches and is accorded different priorities in different countries. It is not surprising that there are widely divergent views and interpretations between countries with developed market economies and those with developing economies. Nevertheless, countries with mature economies are in the position of being able to devote greater attention to creating more sustainable buildings by upgrading the existing building stock through the application of new developments or the invention and use of innovative

technologies for energy and material savings, while developing countries are more likely to focus on social equality and economic sustainability (6).

A. *The Nigerian Construction Industry*

Having a glimpse at the research of (16), Nigeria has a land area of 923,768 square kilometers, with an estimated population of 148million in 2008 (47% of West African population), population growth rate of 2.2%/annum, age structure of 15-64(55.3%), 250 ethnic groups and 500 languages. However, the country is recording a growth rate of 6.2% (2013 estimate), having her capital city in Abuja. Additionally, with the 2014 estimate of 177,155,754, Nigeria is with the latest GDP growth rate of 6.2% in relation to 2013 estimate. Further information is the industry fixed capital formation (69%), average age of workers (48 years), while the origin of her organized construction contracting was in 1940s with few foreign companies coming into operation, before independence with growing population, and the needs to commensurate housing (22). However, Nigeria's independence in 1960 bolstered by the "Oil boom" of the 1970s brought an upward trend in the construction activities and up to the end of the Second Republic in 1983, the construction industry in Nigeria has witnessed an overwhelming upsurge in construction contracting dominated by expatriate companies with few indigenous companies (7;23). Unfortunately, the period also exposed the country's indigenous company's low level of human resources development required for; planning, designing, constructing and maintaining the magnitude (in size and number) of projects conceived by the government. However, with improved training institutions, engagement of expatriates, collaborations between indigenous and foreign entrepreneurs, political stability and improved government policies, and the apparent resources gap needed for successful completion of complex projects between indigenous companies and their foreign counterparts are now closer compared to the pre-independence era (24).

B. *Etymology*

i) **Sustainable Construction**

Sustainable construction is referred to as construction practices that minimize environmental impact throughout the life of a building by designing for minimum energy and water use and waste production, preventing pollution and preserving and enhancing biodiversity. Consequently, (25) explains that sustainable construction involves issue such as the design and management of buildings, materials performance, construction technology and processes, energy and resource efficiency in building, operation and maintenance, robust products and technologies, socially-viable environments, stakeholder participation, occupational health and safety and working conditions, innovative financing models, improvement to existing contextual conditions,

interdependencies of landscape, infrastructure, urban fabric and architecture, flexibility in building use, friction and change, and the dissemination of knowledge in related academic, technical and social contexts. Nevertheless, (6) submits that sustainable construction adopts different approaches and is accorded different priorities in different countries. Moreover, the concept of sustainability in the construction industry has evolved over many years, because it has in turn become part of our living environment, affecting our living conditions, enhancing social well-being as well as sustaining our health safety measurement. Sustainable construction is a way for the building industry to move towards achieving sustainable development, taking into account environmental, socio-economic and cultural issues. Specifically, it involves issues such as design and management of buildings, materials and building performance, energy and resource consumption - within the larger orbit of urban development and management (6). It's also known as green construction with the economic, social and environmental impact of creating a usable structure, for instance it requires designers and contractors to use the building practices that will not cause long term damage to the environment.

ii) **Developing Economy**

The globally acceptable definition of a sustainable economy is the potential of an economy to support a definite level of economic production indefinitely, and of which the total GDP of the country must not be less than 2%, except when the country is recovering from a recession. However, with regards to (27), it is the ability to be increasing in the standard of living in a nation's population with sustained growth from a simple low-income economy to a modern, high-income economy. Also, if the local quality of life could be improved, economic development would be enhanced. Its scope includes the process and policies by which a nation improves the economic well-being of its people. Besides, (27) is quoted to see the construction industry as a driver of economic growth especially in a developing country like Nigeria. The industry can mobilize and effectively utilize local human and material resources in the development and construction processes to promote local employment and improve economic efficiency. So far so good, a cursory look at the numerous construction projects carried out either by the Local, State or Federal government in the country highlights the positive impact of the construction industry on socio-economic development.

Furthermore, (9) describes the construction industry as unique especially when cognizance is given to the physical nature of the project, the structure together with organization of the construction process, the demand, and the method of price determinations. All these culminate to the achievement of the main development targets such as urbanization, industrialization, export promotion, equitable income distribution, and sustainable economic development.

iii) **Socio-Economic Development**

For centuries, the construction business has played a pivotal role in the socio-economic development of all nations. Its role ranges from providing infrastructure support to factors of production for other sectors of the economy (28). Hence, (29), describes social development as organized aided development of people which leads to enhanced quality of life of persons reflecting in improved health care, better feeding and survival, provision of shelter, emotional satisfaction, freedom and self-esteem, better education, gender parity, participation etc. However, (27) submits that economic development is the increase in the standard of living in a nation's population with sustained growth from a simple low-income economy to a modern, high-income economy. Also, if the local quality of life could be improved, economic development would be enhanced. Its scope includes the process and policies by which a nation improves the economic well-being of its people.

iv) **The Construction Team.**

The construction team is what is popularly referred to as the construction professionals. However, toeing the line of (9) the construction team comprises firms which often functions as independence unit but is independent in terms of the work they undertake such as design and production of construction works. Arguably, appointing design and construction team who understands and responds to your requirements, as well as demonstrating good environmental and social performance is of importance. It is significantly necessary in stepping into the appointment of a team who can better develop an effective working relationship as well as maintaining an effective dialogue.

C. Impacts of Sustainable Construction on Nigerian Economy

The construction industry possesses a strong economic significance because it is a major client of the government, a large contributor to the national stock of investment goods, the provider of building to accommodate a wide range of essential activities, with a very large output and employing large numbers of people either directly or indirectly (30). Nevertheless, in consideration of research of (31), the impacts may be beneficial or adverse. Some of these impacts are employment opportunities in form of skilled and unskilled labour, cultural exchange like language mixture, inter-tribal marriages, food vendor opportunity, etc; provision of social amenities to the area where the construction is sited, thereby creating a socio-economic impact. While the adverse can be construction accidents, pollution, which may be in form of air, water or noise. However, (32) perceives the construction industry as the pivotal element in infrastructure development in developing countries, because it helps to lower productivity costs hence contributing to economic growth. The construction of relevant infrastructure like roads in rural areas has a

considerable impact on national wealth distribution. Despite the fact that the resources at Nigeria's disposal has offered solid base for ensuring rapid growth and sustainable development, but in the contrary, the nation has failed to attain its potentials (7). Equally (14) identifies the following inclusions as barriers to sustainable construction, lack of capacity of the construction sector, an uncertain economic environment, lack of accurate data, poverty and low urban investment, lack of interest of stakeholders in the issue of sustainability, technological inertia and dependency, together with lack of integrated research.

Furthermore, the serious economic difficulties now facing many developing countries pose certain problems to their construction industries that existing theories on their improvement did not consider (1). According to (17), sustainable construction aims to meet present day needs for housing, working environments and infrastructure without compromising the ability of future generations to meet their own needs in times to come. It incorporates elements of economic efficiency, environmental performance and social responsibility and contributes to the greatest extent when architectural quality, technical innovation and transferability are included. However, relying on the design of a project to achieve the goal of sustainable development, or to minimise impacts through appropriate management on site, is not sufficient to handle the current problem. The aim for sustainability assessment goes even further than at the design stage of a project to consider its importance at an early stage, before any detailed design or even before a commitment is made to go ahead with a development (4). In Table 1 below is the display of structure of the Nigerian economy.

D. Challenges Facing Sustainable Construction In Nigeria

i) Environmental Problems.

To be taken cognizance of is the fact that construction industry represents the largest employer of labour and it occupies a position in the economy of any nation because it is an important contributor to the developmental process. Considerably, as a follow-up to June 2010 forecasts, as reported by Global Construction Perspectives and Oxford Economics Estimates, suggestions featured that current growth in the construction industry is greater than that of India (34). However, the construction industry has been accused of causing environmental problems ranging from excessive consumption of global resources both in terms of construction and building operation to the pollution of the surrounding environment (4). Consequently, construction industry is classified as being responsible for the intensive use of energy both directly, in the creation of buildings and infrastructure, and indirectly, in the operational phase. As well as the carbon dioxide which is produced, a variety of other pollution is caused by construction processes and buildings in use.

ii) Ethical Quality Control.

Ethics affect corporate credibility and economic sustainability as well as personal security. Ignoring ethics can have significant impact on the quality of workmanship, cost of construction and general public perception of the profession (12). It is important for building industry professionals to observe a high level of professional ethics, and according to (25), the ethical quality control must be centered on the people, environmental concerns, economic viability and prosperity, quality and aesthetic significance, all simply because failure in design, construction or maintenance have the potential to cause significant injuries, illness or deaths amongst those who live, work or pass through buildings and make the client go bankrupt.

iii) Doubtful Commitment of the Government.

Doubtful Executive Commitment at the various levels of government is of the essence (13). (48) believes that in most developing countries, government policies tend to favour the urban areas, because a large percentage of government budgets are devoted to the provision of urban infrastructure at the expense of the rural areas. Most times, abandonment of construction projects is very obvious, most especially when there is a change of government from one political party to the other. It is necessary to radically improve the capacity of government at all levels to play an active role so as to have sustainable construction (35).

iv) Corrupt Practices.

By intensively looking at the belief of (36) corruption in Nigeria is very high and unbearable for effective sustainable construction development. In regarding to (37), most big time corruption in the public sector is perfected through construction projects. Corroborating this, (13) is of the opinion that corrupt practices have characterized building and construction projects in Nigeria. Corruption and fraud are like cancers that have become the bane of our collective existence and have together created an assault on the integrity of our nation. Our citizens all over the world have been subjected to abuse, ridicule, humiliation and assault as all are perceived or expected to be fraudulent. (38).

V) Dependent on Foreign Material and Labour Input.

It should not be taken with levity the challenges posed to Nigeria, as foreign material and labour input are depended upon for construction and building activities (13). It is an indisputable challenge indeed. In reality, building materials are a major contributor to the construction industry because materials constitute the single largest impact in construction often accounting for over fifty per cent (50%) of the total cost of construction (39-43). Following this, (44) submit that there is an ever increasing demand for import-based innovative products in Nigeria which has also led to a decline in quality of its indigenous materials.

vi) Dependent on Foreign Building and Construction Contractors.

Over the years, indigenous contractors in Nigeria have recorded a low level of participation and have often been sidelined in large scale construction activities. This has been attributed to, amongst a number of factors, mismanagement of funds and working capital which makes them prone to bankruptcy, with poor project execution and abandonment the likely outcome (45). Dependent on foreign building and construction companies against qualified local contractors is on the high side. (52) reports that deficiencies in indigenous construction capacity in Nigeria have resulted in unwholesome dependence on imported inputs: construction materials, machinery, and the skilled manpower required to implement much-needed infrastructure for economic growth and to improve living conditions. Consequently, expatriate contractors carry out substantial proportion (90%) of construction works in monetary terms across the three tiers of government although their numerical strength is only about 7% of the total number of contractors in Nigeria (52). Consequent upon this, (46) asserts that if the trend continues (and it is most likely to continue), the Nigerian construction industry may perpetually be foreign dominated.

vii) Inflationary trends on Building and Construction Materials in Nigeria.

Over a decade, there has been a dramatic increase in the costs of building materials in Nigeria, and this development threatens the performance of the construction industry (53). Corroborating this, (43) opine that, in Nigeria, most of building materials and other components incorporated into construction are sourced from overseas. Likewise, some of the materials produced locally also depend to some extent on foreign inputs, hence, the need to be concerned about the effect of foreign exchange and its inherent problems in the construction industry. Hence, this has posed a significant threat to both the construction industry and the power of demand and supply (47; 49; 50). According to (51), some of the factors affecting material cost include currency exchange, low or high demand, material specification, inflation pressure and availability of new materials in the country.

ix) Lack of Accurate Data.

The use of accurate data and information in achieving effective sustainable construction processes and policies for planning, evaluation, monitoring and reporting of building and construction projects is significantly important (13). According to (14), accurate data and information is critical to achieving effective sustainable construction processes and policies. Information is needed on current prices of materials that are available, including the types of materials, how they are employed and the resources and information regarding the life cycle. Similarly, it is

also important to have accurate information about the number of construction operatives, their mode of operation and the sector in which they operate. (33) submit that accurate data are not available, and that it is generally assumed that only a fraction of one percent (1%) of the industry's gross revenue is invested even in applied research let alone basic research. Corroborating this, (35) says statistical information for the construction sector is often either unavailable or unreliable. However, figure 2 below shows the multifarious challenges faced by sustainable construction at a global level.

III) METHOD AND MATERIALS

A reasonable number of scholarly articles in relation to sustainable construction were reviewed, while from the literatures the challenges mitigating the sustainable construction were drawn out and explicitly explained.

obvious that construction industry is the pivotal element in infrastructure development in developing countries, because it helps to lower productivity costs hence contributing to economic growth. The construction of relevant infrastructure like roads in rural areas has a considerable impact on national wealth distribution, and that the construction industry would add value to the country's development agenda through successfully undertaking the said projects. Certainly, the construction industry loses credibility, trust and reputation in the eyes of the public if projects it undertakes do not live to the expectations of the people (32). Thus, the banes were discovered by many writers to be ethical issues, doubtful commitment of the government regarding continuity of construction projects, corrupt practices, dependant on foreign materials and labour as well as building and construction components, high cost of building and construction materials and lack of accurate data. Additionally, a support is given to (6) that there should be documentation of appropriate and indigenous building technologies and best practice, there should also be building assessment models adopted for developing countries as well as Global Sustainable Construction Status Report and Monitoring System. Clients need to demand a more sustainable built environment. Professionals need to adopt and promote sustainable construction practices through design and management of buildings, operation and maintenance, long-term monitoring, and adherence to ethical standards. The construction industry needs to commit to materials performance, sustainable construction processes, robust products and technologies. The regulatory bodies need to encourage, enable and enforce sustainable construction standards, occupational health and safety and working conditions; innovative financing models; improvement to existing dissemination of knowledge in related academic, technical and social contextual conditions. The government must reduce corrupt practices to the minimum level and create enabling environment for the development of local capacity for the local production of construction materials.

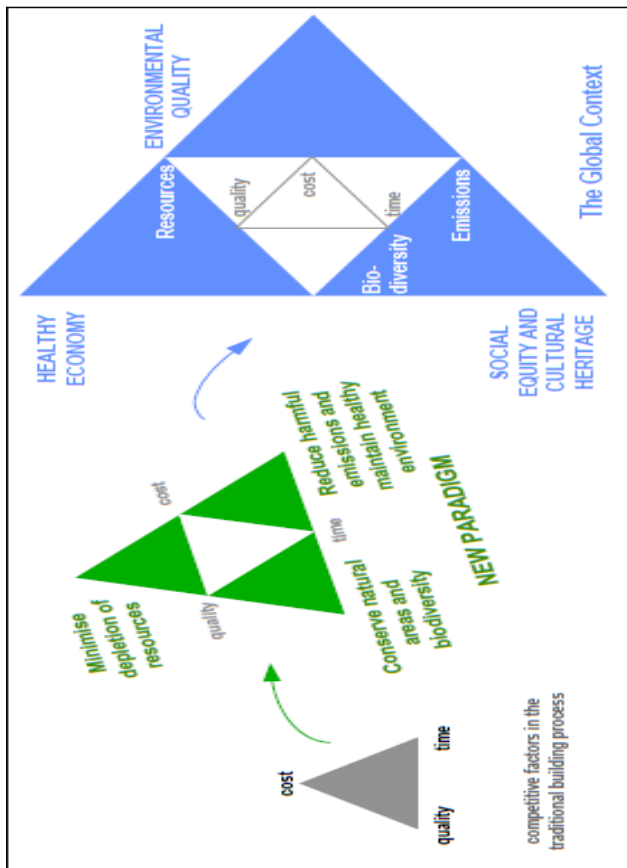


Figure 2: Challenges of sustainable construction in a global context. Source(26).

IV) CONCLUSION

This paper has explored the issues relating to challenges facing sustainable construction in a developing economy, Nigeria as a case study. It is

**STRUCTURE OF THE NIGERIA ECONOMY (ACTIVITY SECTOR CONTRIBUTION
AND REAL GDP SECTORAL GROWTH RATES)**

Sector	2005	2006	2007	2008	2009
Contribution to GDP in %					
1. Agriculture	41.19	41.72	42.01	42.13	41.70
2. Solid Minerals	0.27	0.28	0.30	0.32	0.33
3. Crude Petroleum and Nat. Gas	24.26	21.85	19.60	17.35	16.29
4. Manufacturing	3.79	3.91	4.03	4.14	4.17
5. Telecommunication and Post	1.45	1.83	2.31	2.92	3.66
6. Finance and Insurance	3.94	3.90	3.81	3.81	3.70
7. Wholesale and Retail Trade	13.75	14.95	16.18	17.41	18.14
8. Building and Construction	1.52	1.62	1.72	1.84	1.92
9. Hotels and Restaurants	0.38	0.41	0.43	0.46	0.48
10. Real Estate	1.40	1.47	1.55	1.63	1.69
11. Business and Other Services	0.78	0.81	0.84	0.87	0.89
12. Others	7.25	7.23	7.19	7.15	7.02
Sectoral Growth in %					
1. Agriculture	7.06	7.40	7.19	6.27	5.88
2. Solid Minerals	9.53	10.28	12.75	12.77	12.08
3. Crude Petroleum and Nat. Gas	0.50	4.51	4.54	6.19	0.45
4. Manufacturing	9.61	9.39	9.57	8.89	7.85
5. Telecommunication and Post	29.61	33.66	33.84	34.02	34.18
6. Finance and Insurance	2.85	4.98	5.03	4.82	4.01
7. Wholesale and Retail Trade	13.51	15.26	15.20	14.02	11.48
8. Building and Construction	12.10	12.99	13.03	13.07	11.97
9. Hotels and Restaurants	10.45	12.91	12.95	12.94	11.89
10. Real Estate	11.09	11.68	11.72	11.79	10.94
11. Business and Other Services	9.69	10.02	10.05	10.13	9.39
12. Others	6.38	5.79	5.85	5.29	5.00
13. Real Growth (Annual)	6.51	6.03	6.45	5.98	6.96

Table 1: Structure of the Nigerian Economy

Source: National Bureau of Statistics (NBS) cited in (13)

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