

## Technology and Sustainable Development in Nigeria: A Study of the Ajaokuta Steel Project

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### Abstract

It cannot be analyzed that the technology holds the key to sustainable development in any country. Again, the fact remains undisputable that the steel mill is fundamental to the development of technology. Hence, the Ajaokuta steel project in Nigeria is the focus of this investigation. The study examined the significance of the Ajaokuta steel project in enhancing technological development for purposes of sustainable development in Nigeria. Data was obtained from secondary materials comprising, books, journals, periodicals, magazines, the interest, etc. The Neoclassical theory of a Closed Linear System (Pearce, 1972), was adopted as the theoretical framework while employing content analysis as the technique for analysis. Results from the analysis indicated that the Ajaokuta steel project which is yet to be completed has constituted the major stumbling block to the accelerated sustainable development in the country as it has slowed the pace of technological development and innovations. The study recommended that efforts should be made by government in power to ensure the steel complex is completed and activated.

### Keywords:

Technology, Sustainable development, Ajaokuta steel project, Stumbling block, Technological innovations.

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### **Background to the Study**

Sustainable development as a process, no doubt, stimulates many demands for innovation and has tremendous influence in the evolution of science and indeed R and D. This is in line with the views of Karl Marx, a classical economist who once observed the importance of economic organization in the development of link between science and production. This justifies the assertion by Abiodun (1999), that “scientific research in all its forms, is the cornerstone of a nation's social and economic development”. Though geographical and human size of a nation may be indicators of its potential power, the real power of a country is measured today in terms of its economic progress. This is to say that, the proven capacity to translate scientific knowledge through its judicious and determined exploitation of technologies in economic productivity, determines a nation's influence in the community of nations. This is why it is worrisome to observe that, “the Nigerian society lacks an in-depth understanding of the role of Science and Technology in national development plans” (Abiodun, 1999). Thus, the need to integrate S and T into national planning cannot be overemphasized.

Sustainable development of any country generally follows the development and application of Science and Technology (S and T). Many developed countries of the world today achieved their level of development by adapting technology and development of an efficient S and T capacity. In Nigeria, considerable number of scientific researches has not been designed to address the basic problems of the society. According to Herrera (1978), “this lack of connection between the goals of scientific research and the needs of society is a characteristic of underdevelopment”. The relevance of much scientific works in developing countries is widely acknowledged. Evidence abound that agricultural production in Nigeria “increased after the second world war, of which two thirds of the increase was as a result of more land cultivated and not due to increased productivity or yield” (Adeniyi, 1999). In contrast to Europe, despite the limited availability of land, production increased remarkably due to increase in yield and productivity within the same period. The same is the case with the industrial sector. Industrial technological research is obviously non-existent.

Nigeria is a late starter and technologically, the nation is far behind other developing countries like South Korea, Brazil and India. Worrisome as it may appear, while research in the more advanced developing countries deals with innovative changes in the mature industries (steel, capital goods etc) those in Nigeria are limited to examination of the introduction of technology and the potential benefits derivable there from. The United Nations Industrial Development Organization (UNIDO, 1985), observed that, “steel production in developing countries increased from 1.5% of the world total in 1950 to about 11% in 1983. However, all projects under implementation in sub-Sahara Africa, with the exception of the Ajaokuta plant have either been abandoned or frozen. Similarly, with the exception of steel projects in Mexico and some minor projects in Brazil, all steel projects on Latin America have either been frozen or cancelled. The commonest cause of delays and cancellation is shortage of funds.

Steel development demands a high level of skills, technical and organizational capability, and systematic sophistication (supply of capital goods and technical services). These are components that are available (partially or wholly) in most of the Asian nations, whereas they must be imported by African countries and paid for in foreign currency. Lack of finance, therefore, is a sign of more fundamental problems. The point to note is that, whatever it takes, the end will justify the means as the project on coming on-stream will always constitute a fundamental driver of economic growth. The benefits are immense and worth the trouble.

Steel projects are often characterized by long gestation which is inextricably linked with inflated costs. The bigger the project, the higher the costs of delay which manifest in contractual escalation costs, production losses, and prolonged paybacks. The table below presents the scenario in a nutshell.

**Table 1:** Cost (US\$) per unit (t) of installed capacity in selected countries (UNDDO, 1986)

Region and country	Company	Year	Cost (nast)	
Sub-Sahara Africa Tanzania	-	-	400	Project frozen indefinitely
Uganda	-	-	3500	-
Nigeria	Delta	-	2000	Includes infrastructure
	Ajaokuta	-	6000	Includes infrastructures
North Africa	Bellara	-	2000-3000	Estimate
Algeria	El-fouladh	-	600	Expansion
Tunisia	-	-	-	8x10 <sup>4</sup> t/year
Libya	Misurata	-	2700	Estimate
Egypt	Dekheila	-	1000	Estimate
Latin America	SICARTA	1976	850	-
Mexico	SICARTA	1982	2000	Estimate
Brazil	-	-	500	Expansion
	ACONIMAS	1986	900	-
	-	1979	1200-1700	-
	-	1985	3000-4000	-
Asia	-	-	-	-
Pakistan	PPRI	1979	1900	-
India	Vizakepatria	1985	3000	-
China	PAO SHAN	-	3000	-
Taiwan	CSN-vaoshiung	1978	430	1 <sup>st</sup> stage
		1982	700	2 <sup>nd</sup> stage
		1986	500	3 <sup>rd</sup> stage
South Korea	Posco(POHANG)	1982	422	9.6x10 <sup>6</sup> t/year
	Kwang yang	-	650	1 <sup>st</sup> stage 2.7x10 <sup>6</sup> t/year
	Kisco	-	850	Expansion

**Source:** UNIDO (1986)

Public exasperation with steel projects in Nigeria has been largely caused by the long time it has taken to materialize as well as the huge sums invested. The initial conception of the idea of a steel project in Nigeria was in 1958. However, it was not until 1971 that the Federal Government established the Nigerian Steel Development Authority (NSDA) through Decree No. 19 in order to advance the development of the Nigerian Steel Industry. Detailed market survey and investigations were carried out by the Authority on local availability of raw materials. The Preliminary Project Report (PPR) of 1974, Detailed Project Report (DPR), of 1977 and the Global Contract (1979) for construction of steel plant in Ajaokuta were all commissioned and executed during the NSDA period. The NSDA was thereafter dissolved through decree No.60 on the 18<sup>th</sup> of September, 1979. This decree also created Ajaokuta Steel Company Limited ASCL was therefore, the successor to NSDA/.

The Ajaokuta integrated steel complex was conceived and steadily developed with the vision of erecting a Metallurgical process plant cum Engineering Complex with other auxiliaries and facilities. The complex is meant to be used to generate important upstream and downstream industrial and economic activities that are critical to the diversification of the nation's economy into an industrial one. Ajaokuta steel plant is therefore aptly tagged as the Bedrok of Nigeria's industrialization. The project was embarked upon as a strategic industry, a job creator and a foreign exchange saver and earner. It was envisaged that the project would generate a myriad of socio-economic benefits and increase the productive capacity of the nation through its linkages to other industrial development, technology acquisition, human capacity building, income distribution, regional development and employment generation. While the project would directly employ about 10,000 staff at the first phase of commissioning, the upstream and downstream industries which will evolve across the country, will engage not less than 500,000 employees. As at 1994, the plant was reckoned to be at 98% completion in terms of equipment erected to the extent that some of its completed units operated at different times but had to shut down due to non-availability of fund.

### **Statement of the Problem**

Planning for the Nigerian steel sector began in 1958 but for over 50 years, the nation is yet to establish a stable iron and steel sector despite huge investment of over \$7billion. The Ajaokuta steel company (ASC) failed to take off while Delta steel company (DSC) and the three government owned inland/satellite rolling mills in Oshogbo, Jos and Kastina are moribund, working under low capacity utilization. Agu, cited in Abdulfatai (2017), blames the poor performance of the Nigerian steel sector on, "inadequate funding, poor planning and implementation and political influences". There is also the issue of:

*The legal battle in 2008 and 2016 between Global Infrastructure Holding limited and the federal Government of Nigeria following the termination of the contract on the management of the plant which was meant to last for ten years as against the three years honored by the consortium (Akinwale, 2018).*

It is obvious that these ugly developments have not enhanced Nigeria's drive for the development of technology and its implications for the nation's quest for sustainable development. It then behoves the curiosity of a researcher to investigate the extent to which the setback on Nigeria's drive to technological advancement has impacted on the quest for sustainable development and food security.

### **Objectives of the Study**

The broad objective of this study is to investigate the role of technology in the quest for sustainable development in Nigeria. Specifically, the study seeks to:

1. Ascertain the role of technology in environmental sustainability in Nigeria
2. Assess the importance of the Ajaokuta steel project in agricultural (food) production in Nigeria.

### **Research Questions**

The study will provide answers to two questions which include to:

1. What extent can technology enhances environmental sustainability in Nigeria?
2. How would the Ajaokuta steel project be useful in the agricultural sector in Nigeria

### **Conceptual Clarification**

**Sustainable Development:** The Bruntland Commission in an effort to link the issues of economic development and environmental stability, published its report, our common future. The report provided the oft-cited definition of sustainable development as, "development that meets their own needs" (United Nations General Assembly, 1987). This concept aims to maintain economic advancement and progress while protecting the long-term value of the environment.

**Environmental Sustainability:** Broadly speaking, the concept of 'environmental sustainability' may be perceived as adding depth to a portion of the meaning of the most common definition of sustainable development, ie., "meeting the needs of the current generation without compromising the ability of the future generations to meet their own needs". However, the definition is taken further to include, "meeting the resource and service needs of current and future generations without compromising the health of the ecosystems that provide item", (Our common future). Environmental sustainability could also be perceived as a condition of balance, resilience and interconnectedness which allows the human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity. The term may also be defined as those practices that minimize energy use, pollution and water consumption, resulting in a smaller carbon footprint for the district through innovative efforts focused to reduce, renew and recycle.

**Technology:** The term technology has been variously defined by previous literatures. Kumar and Persaud(1999), view technology as consisting of two primary components:

- a. A physical component which comprises of items such as products, tooling, equipments, blueprints, techniques, and processes.
- b. The informational component which consist of know-how in management, marketing, production, quality control, reliability, skilled labor and functional areas. Sahal (1981), views technology as 'configuration' observing that the transfer object (the technology), relies on a subjectively determined but specifiable set of processes and products.

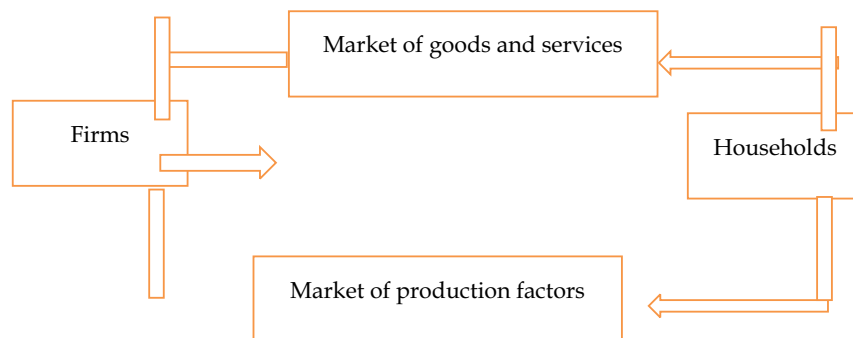
Studies have been carried out on the role of technology in sustainable development. Ifijeh, Iwu-James, and Adebayo (2016) conducted a study on Digital Inclusion and sustainable development in Nigeria: The role of libraries. The study examined the concept of digital inclusion and its role in sustainable development. An assessment of the situation revealed that libraries at different levels have critical roles to play in surmounting the challenges of digital inclusion in the country. The paper concluded with a way forward for libraries and key actors in the Nigeria polity.

In a related development, Oloruntoyin and Adeyanju (2013) studied the role and prospect of information technology in national development. The study observed that information and communication technology (ICT) has a role and prospect in national development. It noted that over the past decade, new applications of ICT have improved services delivery, transparency, and public access in national development. The paper highlighted some of the ways that ICT tools can be used in the sustainable economic and social development of the society. Effective integration of ICT into the community for information sharing can enable forces which lead to a sustainable societal development.

Another study by Ogundeinde and Ejohwomu (2016) titled, “knowledge economy: A panacea for sustainable development in Nigeria”. It examined specifically, whether the Nigerian economy is knowledge patent ready and what kind of social arrangement would enhance or impede knowledge generation and its diffusion. Using the interpretative paradigm, through the inductive analysis of some knowledge based economies, the study draws on the Burrell and Morgan's typology of sociological paradigms to develop KBE (Knowledge-Based Economy) framework. The findings from the study revealed that there is a disequilibrium in the supply and demand for skilled and proficient manpower in Nigeria, especially in the trades sector. It was underscored that, there is a need to strengthen the Nigerian patent law to give protection and incentive for idea generation, diffusion and commercialization. Similarly, there is a need for secondary institutions and infrastructure that would provide a breeding ground for practical skill development for start-ups and university-industry collaboration.

### **Theoretical Framework**

The economic system of a closed and linear system. The neoclassical theory of a closed linear system is hereby adopted as the theoretical framework of this study.



**Sources:** Romanian Statistical Review NR 12/2013

As the endogenous growth models are in alignment with the basic philosophy of the Solow approach (i.e removing both the assumptions of decreasing productivity of capital and exogeneity of technical progress), which leads to deny that in the future, we have the process of convergence between the growth rates of the various countries and to predict the tendency to continue expanding, there is no implicit mechanisms to stop (it was in fact, the diminishing marginal productivity of capital which has led to the rest of growth unless it was offset by exogenous technical progress). For classical economists like Malthus, Ricardo, Mill, Marx, etc. it is clear that the economic activity was conditioned by the environment. They believed in the role of the market as an indispensable basis for economic growth. The market would have in fact, distributed merits and efficiency, generating wealth for all. The theoretical conclusion and confidence by the classics held only in the short-term context. In the long-run however, the economy would still be found in stationary state which coincides with the mere subsistence level by all. This is because of the full awareness of natural resources as a scarce and limited entity, or as a finite set of natural resources, causing a brake on growth. The point of view, “pessimistic” of all the classics in the long-term is well expressed in the studies of Thomas Malthus and Ricardo who watched the constraints imposed by the environment in terms of scarcity of fertile land for cultivation.

Unlike the classical, the traditional neo-classical economists in considering the economic system as a closed and linear system (Turner, Pearce and Bateman), did not take into account, the binding connection between the economic system and the environment. The environment only has an instrumental value. There are resources to be shaped and used in the production function to meet the market equilibrium. The unlimited exploitation of natural resources is commonly accepted as the price to pay for fueling economic growth and provide employment.

### **Research Methodology**

This descriptive analysis employs the methodology of content analyses in discussing the variables of the study. Thus, data obtained from secondary materials are synthesized to yield results. The secondary data to be subject to analyses were obtained from books, journals, periodicals, magazines, newspapers and the internet.

The analyses run in the following sequence:

**Research Question (1):** what role would technology play in sustaining the Nigerian environment?

The National Academies Press (1995), reporting on the role of technology in environmentally sustainable development, lists pathways to sustainability. The council believes that the world must move to a more energy efficient society, one that uses resources more responsibly and organizes industrial processes in ways that minimize and re-use wastes. It lists the following pathways:

**Energy:** Sustainability depends on the evolution of energy technologies. In the short term, dependence on fossil fuels is unavoidable. Ultimately, however, the world will need to reduce use of fossil fuels. Technical efforts must be directed to increasing the efficiency of energy supply and energy use, and to using fossil fuels in a less-polluting manner.

**Public Infrastructure:** Public infrastructures are vital to sustainable development. These include water resource and supply systems, power systems, bridges, roads as well as communications and transportation facilities. To a large extent, the technologies are well developed. However, there is the major challenge in the diffusion and use of such technologies to developing nations like Nigeria, where they are most needed.

**Water:** In the public sector, securing public health will remain the basic feature of urban water systems; water transportation and treatment technologies must be chosen accordingly. Technologies now exist for controlling many types of pollutants.

### **Manufacturing and Mining**

Manufacturers have begun reduce, re-use, and recycle materials and products in search for industrial ecosystems that can imitate natural ones. Companies have begun to change product and process design in ways that give the environment the same level of consideration as worker safety and the cost and quality of products.

The mineral extracting industry is adopting environmentally sound practices and is developing approaches and technologies for remediating past environment damage. These technologies are now increasingly applied to rehabilitating degraded landscapes.

**Information Technology:** Information technology has the potential to alter how and where people work and live, and thus the nature of urban areas of the future. It is changing the way that enterprises are managed. It is improving the efficiency of air, land, and water-based transportation systems, among other sectors of the economy. Networks of fibre optic cables and systems of Earth-orbiting satellites are extending the ability of man to survey and protect the environment. These technologies permit real-time monitoring of environmental conditions.



Flowing from the above, it is clear that the adoption of environmental technology by the entire human society will enhance the reduction of environmental impacts, risks and costs of ecosystem degradation or collapse and adaptation to environmental changes. This fact is buttressed in the empirical investigation by Adebile and Shangodoy in titled, "the need for science and technology driving forces in sustainable socio economic development in Nigeria. The paper observed that effective science and technology policies are crucial in advancing Nigeria economically, socially and politically given the varieties of challenges facing the largest population in Africa. The paper suggested alternate sources of energy to alleviate the inadequacy in electricity supply in Nigeria based on availability of needed local resources. Credence was also lent to the role technology in environmental sustainability in the works of Ifijeh, Iwu-James and Adebayo, who studied, "Digital Inclusion and sustainable development in Nigeria: The role of libraries. The study examined the concept of digital inclusion and its role in sustainable development. The assessment revealed that libraries at different levels have critical roles to play in surmounting the challenges of digital inclusion in the country.

**Research Question two (2):** To what extent would the Ajaokuta steel project enhance the application of technology to boost Nigeria's agricultural performance?

In a study by Ede, (2015), it was observed that steel is at the heart of economic and sustainable development of any nation. It is a resource used by every sector including agriculture. The paper examined steel production and consumption in Nigeria: Data obtained on Nigerian steel industries and the best practices on the international seen were analyzed. The results of the analyses showed that the root cause of poor performance of the Nigerian economy is located in the performance of the Nigerian steel industry.

*The qualities of steel such as strength, recyclability, availability, variability and affordability make a unique material. In fact, once steel is produced, it becomes a permanent resource to the society because it is 100% recyclable without loss of quality and has a potentially endless life cycle. (WASA, 2012).*

The study by Ocheri, Ajani, Daniel and Agbo (2017), observes that the Ajaokuta steel project will, "serve as the backbone of industrialization of our great country, Nigeria if all the necessary parameters are put in place". It observed that the steel industry will contribute to all facets of the economy, including important role steel plays in economic development. The study lists the various ways as follows;

**Steel and Industrialization:** The role of iron and steel industry in national industrialization is pre-eminent. Steel is the bedrock of the industrial growth of any nation. "The giant technological stride by Japan and South Korea, who are among the largest producers of steel in the world today is attributable to the development of steel industries" (Ilori, 1996).

**Steel and Food Production:** The steel industry plays prominent role in the transformation of agricultural sector from the mere production of raw materials to the conversion of the raw materials to intermediate or finished products for export. The three board levels of technology, namely: the hand tool technology (HT), Draught annual technology (DAT) and Engine Power Technology (EPT), are all applied in the agricultural sector of Nigeria.

The metal produced from the steel company would be used to fabricate different types of farm machinery and spare parts that could be used in agric-mechanization. The production of these metals is possible only if the steel company is well established and allowed to meet the demand. The non-completion of the steel company means that the plan to mechanize agriculture will remain elusive. The completion of the project will enhance the development of indigenous technology (i.e farm inputs). Otherwise we will continue to rely on importation of farm machinery with its obvious adverse implications for the nation's foreign reserve. Thus, 'there is great need to complete the steel company and sustain it in contributing towards the development of agric mechanization nationwide" (Ojo, 1986). The account above shows that the Ajaokuta steel company would enhance transportation, health and power which are all related to the agricultural sector. Thus, the company would boost the performance of the agricultural sector.

### **Findings**

The analyses in this investigation yielded a number of findings listed below:

1. Technology would move the world to a more-energy-efficient society in which resources are more responsible used while industrial processes are better organized in ways that minimize wastes enhance re-use.
2. Technology has enabled companies to begin to change product and process design in ways that give the environment the same level of consideration as worker safety and the cost and quality of products.
3. Information technology has the potential to alter how and where people work and live, and thus the nature of urban areas of the future. It is improving the efficiency of air, land and water-based transportation systems, among other sectors of the economy.
4. It is clear that the adoption of environmental technology by the entire human society will enhance the reduction of the entire human society will enhance the reduction of environmental impacts, risks and costs of ecosystem, degradation or collapse, and adaptation to environmental changes.
5. The Ajaokuta steel company will serve as the backbone to the industrialization of all sectors of the economy including agriculture.
6. The metal produced from the steel company would be used to fabricate different types of farm machinery and spare parts that would boost agric-mechanization.
7. The non-completion of the steel project means that the plan to mechanize agriculture will remain only on paper and therefore, elusive in Nigeria.
8. The steel complex will activate the metallurgical industry which is currently far from being optimally efficient.

9. The three broad levels of technology, namely, the hand tool technology (HTT), Draught animal Technology (DAT) and Engine-Power Technology (EPT) are all applied in the agricultural sector.
10. The steel industry plays a prominent role in the transformation of agricultural sector from the mere production of raw materials to intermediate or finished products for export.

### **Conclusion**

Imitated in 1958, the non-completion of the Ajaokuta steel project has set the country far away from taking its rightful place in the community of nations. This is so as the nation has suffered a big blow in its quest for industrialization and sustainable development. The non-completion of the project has further incapacitated the nation in keying into the global rise to the challenge of climate change, global warming, environmental degradation, environmental sustainability and sustainable development. The mechanization of agriculture has continued to remain elusive while the challenge of food insecurity is far from being addressed in practical terms. The benefits of technology are obvious and numerous. Nigeria is yet to be a beneficiary.

### **Suggestions**

This study makes bold to suggest as follows:

1. Government should endeavor to boost technological growth to encourage its use in enhancing agricultural productivity in Nigeria.
2. Technology should also be advanced to enhance the protection of the environment
3. The Ajaokuta steel company should be activated to stimulate healthy competition among metallurgical companies
4. Government should use the Ajaokuta steel company to enhance the mechanization of agriculture.

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