Sustainable Industrialization and Economic Development: The Role of Iron and Steel Sector in Nigeria

Nasir Ahmad Sarkin Dori
Department of Political Science
Federal University Dutse, Jigawa State

Abstract

This paper examines the role of iron and steel sector in facilitating sustainable industrialization and economic development with special reference to Ajaokuta Steel Complex. The study adopts secondary source of data collection for overall understanding of the subject matter. The major findings of the study revealed that development of iron and steel sector determines industrialization and economic development. That iron and steel industry produced critical industrial goods such as: machine tools, rolling mill facilities, rods and bars, wires which can lead to industrialization and economic development in Nigeria. Sustainable Industrialization is a key to sustainable transformation of raw materials, increased capital goods, productivity, generate employment opportunities, increased exports, foreign exchange earnings and increased per capita income which can lead to economic development in Nigeria. The study recommends that development in iron and steel sector require adequate attention and funds, policy consistency and political will among leaders.

KEYWORDS: Economic Development, Globalization, Industrialization, Iron and Steel Industry

Introduction

Iron and steel industry is a strategic sector in a country's economy that facilitate easy realization of sustainable industrialization and economic development. To industrialize, there is the need to have a sound industrial base. This will provide the solid foundation on which the industrial structure will be built. Development of iron and steel industry led to the production of critical industrial raw materials, technologies, metal, capital goods, energy, tools and machines require for industrial development and sustainable industrialization. One of the important strategies for achieving industrialization is local resource-based strategy. Steel and iron sector is the bedrock of the industrial growth and technology of any nation. Nigeria's industrial sector lacks heavy, productive and vibrant iron and steel industries which can transform the sector into industrial revolution. The reasons among others are policy inconsistency, negligence of iron sector, inadequate funding and lack of political will among our leaders. Over dependency on oil sector and the negligence of the iron and steel and manufacturing industry contributed immensely to industrial and technological backwardness, economic crisis and economic

predicament like high rate of poverty, unemployment, inequality and fall in living standard in Nigeria. Ajaokuta Steel Complex alone is capable of bringing industrial revolution which would metamorphose into industrial and economic development in Nigeria. This would reduce the rate of poverty, unemployment and inequality. The Nigerian economy has performed far below expectation since independence in 1960 due to unfortunate negligence and policy inconsistency in iron and steel sector as the driven sector to the Nigeria's industrialization and economic development. However, low level of the development of technology and industrialization had contributed a great deal to Nigeria's poor economic performance and undermined the process of achieving economic development. Therefore, the development of the iron and steel industry is the bedrock of sustainable industrialization and economic growth. Iron and steel is crucial and imperative for industrial revolution and advance technology. The high level of social and economic prosperity of a country is closely related to high level of advance technologies, machines and mass production. Advance technologies and industrialization aid and improve productivity, health, power, education, transportation, science, agriculture, and housing and information industry. Iron and steel sector development is very crucial in respect of economic growth and development in Nigeria.

Lack of available of iron and steel continue to reduce drastically the provision of raw materials and capital goods to manufacturing industries in Nigeria. However, industrialization and economic development become a mirage in the country. Unfortunately, the development of the sector is constrained by lack of adequate funding and attention, lack of political will among leaders and above all corruption. 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 due to corruption and mismanagement. Lack of technologically-drive solutions to Nigeria's economic problem is one of the major reasons for Nigeria's development crises and seeming inability to escape from the clutches unemployment, poverty, and inequality and fall in living standard. Poor performance of iron and steel sector led to poor development of science and technology in the country. Lack of material resources and capital goods to develop industry, which is capital-intensive serve as constrain for industrialization and economic development efforts of Nigeria. The low level of the development of technology and industrialization has vehemently contributed to Nigeria's poor economic performance and predicament. Therefore, the development of iron and steel sector would

facilitate industrialization and economic development. The objectives of this study are: to determine the nature and scope of iron and steel industry; to examine and assess the contributions of iron and steel industry on industrialization and economic development with special reference to Ajaokuta Steel Complex in Nigeria; to examine the challenges and suggest appropriate measures that could improve the development of iron and steel sector.

Methodology

The study is limited to Ajaokuta Steel Complex. The study adopts secondary source of data collection for overall understanding of the subject matter. Literature was gathered from works of scholars in the area of investigation under review which comprised of textbooks, magazines, seminar papers, newspapers, international and national academic journals, write ups, internet, webs and other materials relevant to the study were consulted. The research has also made use of government reports from Ajaokuta Steel Complex, Central Bank of Nigeria and National Bureau of Statistics. However, tables were utilized in data presentation and analysis.

Conceptual Clarifications

Industrialization

Anyanwu, et al (1997,p.33) sees industrialization as the process of building up a nation's capacity to convert raw materials and other inputs to finished goods and to manufactured goods for other production or for final consumption. Industrialization is progressive ability of a people to harness human and materials resources for production of goods and services. This definition shows the link between industrialization and economic development. Because mass production of goods and services is a key component of economic development. Adedugbe, (2004) cited in Orungbami, (2019) perceived industrialization as the process of harnessing human and materials resources, with increasing application of science and technology to the production of goods and services. This definition also linked industrialization with globalization and economic development. Duru & Agba, (2005) cited in Ernest, (2011) industrialization deals with the utilization of the principles of applied science to build up a country's capacity to transform raw materials and manufacture intermediate and capital goods for

consumption or further production. Capacity to transform raw materials enhanced industrialization while dynamic increased in manufacturing capital goods facilitate economic development as well as utilization of science enhanced advance technologies and globalization. In nutshell, Industrialization is the progressive ability of a country like Nigeria to effectively harness human and materials resources for the production of goods and services.

Economic Development

Jhigan, (1980) argues that economic development can be defined in terms of an increase in the economy's real national income over a long period of time i.e. an increase in the capacity of an economy to produce goods and services compared from one period of time to another. The concept is related to qualitative changes in economic wants, incentives, institutions, productivity and knowledge or the upward movement of the entire social system. Baran, (1957) sees economic development as an increase over time in per capita output of material goods. Rodney, (1972) defines economic development as a process where a society develops economically as its members increase jointly than the capacity for dealing with environmental. Economic development entails increased in wealth of a nation through expanded production of goods and services. It includes the rise in agricultural production, manufacturing and construction as a result of industrialization, introduction of greater skills, technologies and machines. However, economic development is increased economic efficiency, expansion of national economic capacity and technological advancement, dynamic increase in per capita income and output in a nation. Therefore, no nation can achieve economic development without industrialization and there is no globalization without industrialization which is the engine room of technological advancement. This shows the interrelation and interdependent between industrialization and economic development.

Globalization

International Monetary Fund, (2000) cited in Wader & Abubakar, (2003) sees globalization as the rapid integration of economies worldwide through trade, financial flows, and technological spill over, information networks and cross-cultural current. Therefore, globalization is about technological spill over, sophisticated machines and increased capital and manufacturing goods which are the products of industrialization.

Industrialization is the bedrock of technological interdependent and interrelation and interconnectivity within and outside the country. Because globalization is universalization of technological interdependent, interaction, interrelation and interconnectivity aided by industrialization and economic development. Nigeria can only benefit from globalization, if industrialization and technological advancement are achieved. Globalization is characterized by the generation of increasingly sophisticated technology, industrialization, scientific discoveries and creation of new ideas. Globalization is the spread of communication production, industrial development and connection of technologies and machines among nations. Therefore, there are direct linkages between globalization and industrialization, as well as development of iron and steel sector with industrialization. Development of iron and steel sector generate industrialization. And industrialization facilitate economic growth and development. A country with economic development and industrialization would benefit more from globalization.

Iron and Steel Industry in Nigeria: A Brief Historical Overview

Planning for the Nigerian Steel Industry started around 1958. The starting point was the search for appropriate local technological inputs. This led to the emergence of Iron Ore which was located at Agbaja, Itake and Udi; suitable Limestone at Jakuru; Coal deposits at Enugu; Coke-able was struck at Lafiya. This was as a result of the fact that government realized that iron and steel industry is the bedrock of industrialization and economic development. The steel project finally took off in the 1980s during the fourth development plan when the Jos, Katsina, Oshogbo and the Delta Steel/Rolling Mills were all commissioned. In 1967 a UNDP survey identified Nigeria as a potential steel market. This led to the signing of a bilateral agreement between Nigeria and USSR. In 1970 a contract was awarded to Tiajprom Export (TPE) of USSR to establish iron and steel plant in Nigeria. The contract of the Ajaokuta Steel Complex was finally awarded in 1970. In April 1971, the Nigerian Steel Development Authority (NSDA) was established with responsibilities of supervision of steel programme; planning, construction and operation of steel plants; carrying out geological surveys; market surveys/studies; metallurgical research and training. Unfortunately, the politicization of iron and steel industry led to the dissolution of NSDA by federal government in 1979 and subsequent emergence of several steel and iron organizations such as:- Ajaokuta Steel Project, Ajaokuta; Delta Steel

Company, Ovwian - Aladja; Jos Steel Rolling Company, Jos; Katsina Steel Rolling Company, Katsina; Oshogbo, Steel Rolling Company, Oshogbo; National Iron Ore Mining Company, Itakpe; National Steel Raw Materials Exploration Agency, Kaduna; National Metallurgical Development Centre, Jos and Metallurgical Training Institute, Onitsha. The Nigerian Public Steel Sector is charged responsibility of producing critical industrial raw materials such as: - Cast Iron (different categories); Rods and Bar (both high tensile and mild steel varieties); Wires; Structural Steels (light, medium and heavy structural); Flat Sheet Steel (plain, and galvanized); Stainless and other special alloy Steels; Rails and Pipes; Plates.

The Role of Ajaokuta Steel Complex in Nigeria's Quest for Industrialization and Economic Development

Industrialization has been associated with ability to produce consumer and capital goods which enhance domestic self-sufficiency and reduce foreign exchange drainage and heavy dependency on foreign goods; and ability to promote employment generation and local manpower development. Hence increase in per capital income, purchasing power and potential to invest and re-invest which would improve productivity and economy, thus economic development. Therefore, there is a direct link between sustainable industrialization and economic development. According to Manufacturing Association of Nigeria, (MAN) cited in Orungbami, (2019) in 2010 the total manufacturing output in the industrial sector in Nigeria was ₦6.84 trillion. It increased over the following two years by ₦1.3 trillion or 19.37%, in 2011 to reach ₦8.17 trillion and ₦1.65 trillion or 20.22% in 2012 to reach a total of ₦9.82 trillion. Iron and steel industry was first conceptualized in 1958 when the idea was conceived by Nigeria's National development planners with reference to economic advantages of larger – scale steel production which would facilitate industrialization and economic development. From 1967 the significant progress was made towards the establishment of iron and steel plant in Nigeria following the involvement of USSR in management and operation more especially Ajaokuta Steel Complex. In April 1971, the Nigerian Steel Development Authority (NSDA) was established by military decree (No. 9 of April 14). This is the first formal body to be charged with the supervision of steel programme in Nigeria, to also planning construction and operation of steel plants. NSDA was dissolved by federal government in 1979 and it metamorphose into several steel organizations such as Ajaokuta Steel Complex, Delta

Steel Company, Katsina Steel Rolling Company and may others as presented in the table 1.

Table 1: Iron and Steel Companies in Nigeria

SN	Plant Locations	Type of Plant	Iron-Making Process Capacity Per year	Casting Process	Rolling Capacity Per Year	Products Mix
1	**Ajaokuta Steel Co. Ajaokuta**	Inter-grated Public	Blast furnace capacity 1.35m tons	3 no. 4-stand for blooms	540,000 tons long products	Bars, rods, light sections
2	**Alliance Steel Co. Ibadan**	Rolling Mill	-	-	20,000 tons long products	Bars
3	**Allied Steel Co. Onitsha**	Rolling Mill	-	-	20,000 tons long products	Bars
4	**Asiastic Manarin Industry. Ikeja**	Rolling Mill	-	-	60,000 tons	Bars and sections
5	**Continental Iron & Steel Co. Ikeja**	Mini Mill	-	-	150, 000 tons	Bars, Sections
6	**Delta Steel Co. Ovwien/Aladja**	Inter-grated Public	2 midrex 600 series direct reduction furnace capacity 1.02 m	3 no. 6 – strand billets	320,000 tons long products	Bars, rods, section
7	**Federated Steel Ind. Otta**	Mini Mill	-	-	140,000 tons	Bars, sections
8	**General Steel Mill, Asaba**	Mill-mini	-	-	50, 000 tons	Bars
9	**Jos Steel Rolling Co. Jos**	Rolling mill public	-	-	210, 000 tons	Bars, sections
10	**Ktsina Steel Rolling Co. Katsina**	Rolling mill public	-	-	210,000 tons	Bars, rods
11	**Kew Metal ind. Ikorodu**	Mini mill	-	-	20, 000 tons	Bars, sections
12	**Kwara Commercial Metal, Ilorin**	Rolling mill	-	-	40,000 tons	Bars
13	**Mayor Eng. Co Ikorodu**	Rolling mill	-	-	220, 000 tons	Bars, sections
14	**Metcombe Steel Company Owerri**	Rolling mill	-	-	10,000 tons	Bars sections
15	**Nigeria Spnish Eng. Company Kano**	Mini mill	-	-	100,000 tons	Bars
16	**Niger Steel Co. Enugu**	Mini mill	-	-	40,000 tons	Bars, sections
17	**Oshogbo Steel Company Oshogbo**	Rolling mill	-	-	210, 000 tons	Bars, Sections
18	**Qua Steel Products Ekiti**	Rolling mill	-	-	60,000 tons	Bars sections
19	**Selsa metal Otta**	Rolling mill	-	-	100,000 tons	Bars
20	**Union Steel Company Ilorin**	Rolling mill	-	-	20,000 tons	Bars
21	**Universal Steel Co. Ikeja**	Mini mill	-	-	80,000 tons	Bars, sections
22	**Baoyao Futurelex, Abuja**	Rolling mill	-	-	20,000 tons	Bars

Source: Mohammed, 2002.

The tables 1 & 2 shows the iron making capacity, casting process, rolling capacity and products mix of various iron and steel facilities in Nigeria. The capacity to produce, utilize and process these raw materials like bars, rods, sections determine the ability of a country like Nigeria to achieve industrial and economic development. These are the raw materials that facilitate industrial revolution. As rightly observed by Ocheri, et al (2017) the importance of steelmaking to national economy is not restricted to its immediate or direct application. For its smelting alone, it triggers off a series of economic activities for its input raw materials and energy such as:- Iron ore: Mining, transportation, beneficiation, preparation; Coke: Coal mining, sizing and preparation, coking in coke ovens; Lime stone: Quarrying and calcimine; Oxygen: Manufacture of oxygen and lances for steel refining; Refractory Bricks: Clay preparation and firing; Additives; Manufacture of nozzles; Air and fuel: Pre-heating and atomizing of oil and gas; Energy: Power construction, generation and distribution, services, etc. Added to these large scale economics and industrial activities associated with the raw materials used for steel making, are ancillary downstream foundry, machining, fabricating and processing industries, as well as extensive services such as transportation and supplies which are given a big boost. Statistical evidence indicates that the production of raw steel is attended to by over twenty types of ancillary industries and associated economic activities. These are raw materials, capital goods, machines and services that would enhance industrial development and facilitate industrialization and economic development in Nigeria.

The indispensable role of industrialisation as a bedrock of economic growth and development in Nigeria cannot be overemphasized. This is because increase in the harness of existing resources and raising the value of crude products and raw materials depend mainly on the existence of industries capable of transforming them into useful intermediate and final goods. Unfortunately, low industrialisation has made a large chunk of the societal resources idle, underutilized, and improperly utilized; consequently, giving rise to low growth rate of Gross Domestic Product (GDP) and at the same time heightened unemployment rate. Intuitively, it can be pointed out that notwithstanding the GDP level of the country today, enough industrialisation would have doubled it putting the country in a better economic status. For instance, World Bank, (2012) and NBS, (2010) point out that while the growth rate of Nigeria's gross domestic product (GDP) has slightly risen in recent years from 6.2% in the 1970s to about 7.6% in 2010s, the national unemployment

rate had also been increasing in double digits from 17% in 1999 to about 24% in 2011. This is because of inability to industrialise so as to produce more foods, goods, services and other basic needs commensurate with the growing population. Hence, unemployment, low income generation and lack of investment funds persistently raise the poverty level which plays a great role in rating Nigeria as one of the poorest countries of the world. (Ogbonna, B.M. & Uma, K.E., 2017). To industrialize, there is the need to have a sound industrial base. This would provide the solid foundation on which the industrial super-structure will be built. This industrial base is nothing other than a well-developed iron and steel industry that will be producing critical industrial raw materials, capital goods and sophisticated and advance machines for sustainable industrialization and economic development. As rightly, observed by Orungbami, (2019) that Nigeria's quest for industrialization is traceable to 1960 immediately after independence. The indigenous government that took over from British made several efforts at industrializing the country, this was reflected in the Import Substitution Strategy, Indigenization Policy and the various development plans such as the First National Development Plans of 1975-80 and so on. During the Third National Development Plan two iron and steel plants at Ajaokuta and Aladja and three rolling Mills at Katsina, Oshogbo and Jos were established by the Nigerian government. There was a remarkable development of the iron and steel industry in Nigeria. If these steel plants were effectively managed and adequately funded, Nigeria could have achieved industrialization like Asian countries. As Mohammed, (2008) puts it, countries such as Japan, South and North Korea, and China, were able to make use of their comparative advantage in iron and steel development to achieve industrialization. It is expected that effective industrialisation will go a long way to eradicate or ameliorate unemployment, reduce crimes, reduce inequality, cut down high level of poverty and infrastructural decay which have been a serious developmental and growth problem in Nigeria. Lack of capital and required industries to harness endowed resources have in different ways been a stumbling block for advancement and progress in Nigeria.

Ajaokuta Iron and Steel Complex (AJSC)

Ajaokuta Iron and Steel Complex the bedrock of Nigeria's industrialization popularly known as a steel mill is a gigantic steel mill in Nigeria, located in Ajaokuta, Kogi state, Nigeria, which is built on a 24,000 hectares (59,000 acres) site starting in 1979. It is the largest steel mill in Nigeria, and the coke oven and by-products plant are larger than all

the refineries in Nigeria combined. The first phase of AJSC was envisaged to produce 1.3 million tonnes of iron and steel, 2.6 million tonnes at second stage and 5.2 million tonnes of iron and steel annually from the required 12.0 million tonnes for industrialization in Nigeria. The first stage of AJSC was carried to 98% technical completion by the Tiajprom Exports (TPE) of Russia. The AJSC finishing products were finishing mill, wire rod mill, rod and bar mill, medium section and structural mill.

According to Mohammed, (2002) cited in Ernest, (2011) if phase 1 of Ajaokuta is completed 1.3 million tonnes of liquid steel would be produced and the following economic benefits would be derived:- 1) Employment of 10,000 workers in the plant. 2) Employment of not less than 20,000 Nigerians in the raw materials industries providing feed-stock to the plant. 3) Employment of not less than another 30,000 Nigerians in the industries that use the products of the plant. 4) Conservation of foreign exchange used for importation of steel products annually. 5) Contribution of not less than 30% of the inputs to the automotive industry in Nigeria, in the first instance. 6) Ajoakuta Steel Plant has the capacity to meet most of the National Requirements of Chemical and Tar (as by-products of the steel production process) and Refraction Bricks, using locally available raw materials and the Alumino-Silicate Refractory Plant. 7) Exporting raw materials and capital goods to ECOWAS sub-region and Africa countries at large. 8) Most industries in Nigeria have problem sourcing for their machinery and spare parts.

The Ajaokuta Steel Company's well-equipped engineering works complex can assist to a large extent to the attainment of industrialization and economic development in Nigeria. Ajasteel, (2006) cited in Ocheri, et al (2017) noted that Ajaokuta Steel Company Limited generated $74 million in foreign exchange for the sales of 128,000 metric tonnes of rolled products. This would serve as great source of revenue and foreign exchange earnings to Nigeria. According to the report, ribbed bars were exported to four West African countries as follows: 3,800 metric tonnes to Mauritania, 3,400 metric tonnes to Cote d'Voire, 1,050 metric tonnes to Benin Republic and 600 metric tonnes to Mali. In the same vain The Ajaokuta Steel Company Limited supplied Power Holding Company of Nigeria (PHCN) with 65 MW of Electricity. Other beneficiaries of the company's 85 MW of electricity generated from the Independent Thermal Power Plant (TPP) include, Lokoja, Okene as well as Benin city and its environs. In another report (Ajasteel, 2006) 50,000 megawatts have been exported from the Ajaokuta Steel Company Catchment Power

Company to Power Holding Company of Nigeria (PHCN) to service electrical strength in Okene, Lokoja, Itakpe and Ajaokuta villages since 2005 to 2007. Further a concessionary agreement process had commenced between Ajaokuta Steel Company Management and the Management of Obajana Cement Factory to export 147,000 megawatts of electricity to the cement industry. Ajaokuta Steel plant estimated gross revenue of ₦20.10 billion was expected to have accrued to the plant annually from the sale of its products and services at the first phase. This analysis shows the contributions of AJSC to the industrialization and economic development in Nigeria. However, the table below shows the products and capacity of AJSC which demonstrates its contribution to Nigeria's industrialization and economic development.

Therefore, if a developing country like Nigeria would sustain and utilize (AJSC) effectively it would definitely go a long way in facilitating industrialization and industrial development in the country. Nigeria would be self-sufficient and reliance on local source of industrial goods, capital goods and machines spare parts for industrial productivity. In recent time president Muhammad Buhari signed a bilateral agreement with Russia in Africa-Russia summit on 22nd October, 2019 of 1.5 billion dollars for the revival of Ajaokuta Steel Company. This is an excellent development in an effort of bringing (AJSC) back to production. If this effort sustained and well implemented it would revive the production and services of (AJSC). This would enable the country to achieve industrialization, facilitate economic development and benefit more from globalization. No nation can achieve industrialization and economic development without effective and sufficient production and utilization of iron and steel.

A three-phase development programme of (AJSC) comprised of 1st phase to produce 1.3 million tonnes, which would be expanded to 2.6 million tonnes incorporating the flat sheet production in the 2nd phase, and the 3rd phase to increase to 5.2 million tonnes per annum. If Ajaokuta Steel Project is completed, well managed and funded, all the necessary parameters are put in place, it will serve as the backbone of industrialization of our great country. It was also observed that the steel industry will contribute to all facets of the economy.

Table 2: Ajaokuta Steel Complex Current and Comprehensive Output Analysis per Annum.

1	**Sinter Production Plant Capacity:**	2,610, 000 tonnes per annum
2	**Coke-oven and by-products Capacity:**	Coke: 880, 000 tonnes per annum Tar: 48, 000 tonnes per annum Ammonium Sulphate (Fertilizer): 12, 000 tonnes per annum Coke oven gas: 210 240, 000 million per annum Steam: 350, 000 tonnes per annum
3	**Blast Furnace Capacity:**	Liquid Steel: 1, 300, 000 million per annum Continuous Casting Machine: 1, 813, 000 tonnes per annum
4	**Finishing Mills Capacity:**	1, 290, 000 tonnes per annum
5	**Billet Mills Products:**	Billets: 100 × 100 mm 150 × 150 mm
6	**Medium Section and Structural Mill Capacity:** **Products:**	500, 000 tonnes per annum T Beam: 80 mm × 300 mm Channel: 80 mm × 300 mm Equal Angles 70 × 70 mm, 130 mm × 130 mm Un Equal 50 × 80, 100 × 160
7	**Light Sectional Mills Capacity:** **Products**	400, 000 tonnes per annum Plain and ribbed – Bars 10 mm to 30 mm Squares – 10 mm to 30 mm Hexagon - 10 to 14 mm, 20 to 26 mm Angles 25 × 25 mm to 50 × 50 with thickness between 3 and 6 mm Channel 30mm to 40 mm
8	**Wire Rod Mill Capacity:**	130, 000 tonnes per annum Wire rods 5.5 mm to 12.5 mm Re – Bars 6.0 mm to 12 mm

Source: Ajaokuta Steel Complex, 2019

Table 2 shows the current and comprehensive presentation and analysis of AJSC capacity and products per annum. Sinter production 2.6 million tonnes, coke-oven and by-products approximately 2.12 million tonnes, blast furnace approximately 3.2 million tonnes, billet mill approximately 32, 500, medium section & structural mill 500, 000 tonnes, light sectional mill 400, 000 tonnes, wire rod mill 130, 000 tonnes per year. These are the raw materials that are utilized effectively and sufficiently to attain to industrialization and economic development. The analysis are: Mild or Low-carbon steel (billets) - Rolling mills – Rounds production rods and bars-rolled from ingots or billets for civil works, construction and building industry and general engineering fabrication including furniture. (Medium-to High carbon steel (billets, slab and bloom) – Pipe manufacture and tubes made by extrusion or piercing also used in construction and furniture. Channels and angles for heavy works construction, derricks, etc. Also strip mills for flats, plates and sheets rolled from slabs, construction and fabrication of vessels, tanks and reservoirs, truck bodies and trailer trays; silos, drums and various containers;

cabinets and general furniture; railway rolling stock; cold strip mills for cold rolling of sheets for cabinets and higher quality vessels and containers. Low carbon alloy steel (slab bloom): Flat sheets usually cold rolled from slab and bloom for the construction and fabrication of reactor vessels, car bodies and high quality silos, and various domestic utensils. High-carbon alloy and special alloy steel (Slab): Quality (Special) steel manufacture: Stainless steels for laboratory and hospital instruments, high quality goods and anti-corrosion and heat-resisting vessels and parts; austenitic steels for petrochemical company and equipment, manganese steels for rails and cables and other parts of rolling stock. Tungsten and vanadium steels for special ordinance equipment and tools and nuclear reactor vessels; chromium, molybdenum steels for oil drilling. Scrap and Foundry Steel (Ingots, Billets): Steel Foundries for making castings and forgings leading to the manufacture of implements, automotive and machine parts and household items. Machine tools manufacture from heavy castings whence fabrication of agricultural implements, appliances, company machinery and parts and major ordinance equipment. By-Products: (a) Coke Ovens - Application to industry as from - coke; also tar and tar felt for insulation, benzoyl, pitch, naphthalene, ammonia, sulphur; highway and macadam. (b) Slag: Application to fertilizers; clinker for cement industry and highway 'macadam' (Ocheri et al, 2017). In nutshell, these are some the services, raw materials and capital goods produce and generated from AJSC. However, these are the raw materials and capital goods which are required for building manufacturing companies, advance technology, sophisticated machines and productive industries that can facilitate industrial and economic development in Nigeria.

This analysis confirmed the capability and unique nature of AJSC as one of the major steel companies that can generate raw materials and capital goods that can lead to industrial revolution and subsequent industrialization and economic development in Nigeria. If a country like Nigeria can produce substantial amount of these products, utilize efficiently and steady, it would therefore help the country to achieve industrialization and economic development.

The Iron and Steel Industry will continue to serve as stimulus to economic development and boaster to industrial development of Nigeria. As rightly observed by Ocheri, et al (2017) it is generally known that present material civilization has been largely due to man's knowledge and application of metals. Without metals, there would be no railways, aero-planes, automobiles, ships, turbines, electric motors and generally no electrical

power. There will be no modern bridges or massive oil rigs and the little but important things of life from simple razor blades to knives and forks and the printed newspaper would be essentially lacking, perhaps, a few of these could be fashioned from wood, but they may not go very far. It's also widely recognized that central to all these metallic inventions, innovations and motive power, is the particular class of metal known as "STEEL". Ajaokuta Steel Plant estimated gross revenue of ₦20.10 billion expected to have accrued to the plant annually from the sale of its products and services at the 1st phase. This is a great source of revenue to the government and would boost foreign exchange earnings and Gross Domestic Product. These are some of the requirements of economic growth and development. These no doubt that the development of iron and steel sector in Nigeria would enhance the production of raw materials and capital goods, economic productivity, Direct Foreign Investment (DFI), foreign exchange earnings, domestic production, Gross Domestic Product (GDP), per capita output, economic growth and development in the country. If Ajaokuta Steel Complex can function well, it can supply the whole African countries raw materials and capital goods that they may require. As rightly, observed by (Duru & Agba, 2005) cited in Ernest, (2011) that steel development is pivotal to industrialization since it is considered as the main vehicle for the production of consumables and capital goods, military hardware, intermediate products for other industries, fabrication of machines and tools, generation of employment, development of operating, maintenance and managerial skills fundamental in other industrial establishments and generation of foreign exchange earnings in Nigeria.

Conclusion and Recommendations

It can be concluded that steel and iron industry played significant role in transformation of the agricultural sector from the mere production of raw materials to the conversion of the raw materials to intermediate or finished products for export and domestic consumption. Transportation is one of the very important linkages of the steel industry. For instance a 1.3 million tonnes/annum capacity steel company will require the movement of over 5 million tonnes of raw materials and products. It can be observed that many health care delivery equipment and facilities are steel based. For example, scissors, bowls and dishes, trolleys, beds, chairs and some operating and diagnostic tools are steel based. Modern military armaments and ammunitions are all based on steel. There is no doubt that actualization of the Steel company will bring about technology transfer to the country. More and more foreign investors would be attracted.

Unfortunately, the Nigerian iron and steel sector has been experiencing serious challenges such as poor funding, poor planning and implementation, political influence, corruption, mismanagement and political considerations to influence plant location rather than rational economic consideration. Therefore, to improve and sustain iron and steel companies the following recommendations are made:-

i. Government should be committed to good governance in the sector which would ensure societal participation, accountability, responsiveness, transparency and equity in the management of iron and steel companies. Therefore, the management and administration of the sector requires transparency, accountability and responsiveness for the sector to developed and facilitate industrialization and economic development.

ii. Sufficient and effective utilization of funds: Government should make adequate funds available to all iron and steel companies to improve their performance and productivity. This would guarantee industrialization and facilitate economic development in Nigeria.

iii. Adequate attention: Almost all the iron and steel companies in Nigeria suffered serious negligence by government which attributed greatly to their failure. Government should give adequate attention as a matter of urgency to the iron and steel sector.

iv. Political will and government commitment: There should be high level of political will, commitment and seriousness on the part of Nigerian leaders and elite. If the Asian countries can industrialize through the indigenous iron and steel, Nigeria can do the same, if our political class can champion the cause of iron and steel as one of the solutions to industrialization and economic development.

v. Adequate commercial loans on low interest: government should provide and encourage soft loans on single digit to private and public iron and steel companies. This would go a long way in improving their financial capability, productivity, utilization and marketing of their capital goods.

vi. Power sector must revive: Power sector (electricity) is very critical to the economic, industrial and technological as well as iron and steel development. Therefore, government should make power supply steady and available to all sectors of the economy. This would go a long way in improving the iron and steel sector and facilitate industrialization and economic development in Nigeria.

vii. Imperialist tendency: As observed by many scholars and writers that there has been so many external influences in the iron and steel sector in Nigeria more especially Ajaokuta Steel Company. These influences have been positive and negative. A country like Russia has had positive interest and impact on Nigeria iron and steel sector while West countries particularly USA through IMF/World Bank has negative intention and impact on the sector, they are calculating the markets Nigeria would secure in Africa and third world nations at large. This could block their markets in the continent.

viii. Policy consistency has been a major bane of Nigeria's iron and steel sector which undermined industrialization. There should be a unified public policy, good and well formulated and implemented policy on iron and steel industries.

ix. Globalization is technological, ideas and information interdependent and interaction: Nigeria should establish relationship with countries that would help to develop her iron and steel sector. Russia has proved to be helpful in iron and steel sector and are ready to make it reality. In recent time president Muhammad Buhari signed a bilateral agreement with Russia in Africa-Russia summit on 22nd October 2019 of 1.5 billion dollars for the revival of Ajaokuta Steel Complex. This is a great development in an effort of bringing (AJSC) back to production. It hoped that the agreement would yield positive development.

x. Continuity, government should have most viable strategies and measures for ensuring the sustainability and continuity of all iron and steel companies. This would go a long way in achieving industrialization in Nigeria.

xi. Effective monitoring mechanism should be put in place to monitor the performance and challenges of all iron and steel companies in Nigeria. This would improve the performance and productivity of the iron and steel industry and of course facilitate the attainment of industrialization and economic development in the country.

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