



Developing the Nigerian Steel Sector: The Economic and Industrial Implications

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Abstract

This paper has reviewed the performance of Nigeria's steel sector in comparison with global steel production and utilization. The potential of the steel sector to create jobs, stimulation of economic growth and industrialization was examined. It was found out that the top twenty economies of the world are steel producing countries except Switzerland that commenced steel production recently. Some challenges facing the Nigerian steel sector were highlighted to include low quality of iron ore, non-coking nature of the Nigerian coal, high sulphur and phosphorous contents of Nigerian ore, corruption and poor contracting strategy among others and possible solutions were suggested. The paper recommends that Nigerian government should make pragmatic and urgent effort towards the development of her steel industry, if sustainable development is to be achieved. This can be done by enacting appropriate steel development policies, creating conducive environment for investments, and exertion of appropriate political will to eliminate or minimize corruption in the steel and other sectors of the Nigerian economy.

1. Introduction

Steel is a high strength, formable, versatile and low cost material, used globally for variety of purposes, not limited to the automobile; building and infrastructure; domestic appliances; metal products; agriculture; military; energy; rails; and roads [1, 2]. Steel is incombustible; termites, mould and mildew resistance; including environmental friendliness when scraps are properly managed. Undoubtedly, steel is an essential material for industrialization, and key to wealth creation, in fact, its impact cannot be overstretched [3]. Steel is a necessary ingredient needed to actualize a sustainable future [4]. Ignoring the steel industry has been shown to come with a terrible prize, including social unrest, hence, developing countries such as China, Brazil, South Africa, India and Taiwan have embraced the fact that investment in this sector is crucial to development [5]. Despite its importance in pushing an economy forward, Nigeria has paid a very pathetic attention to steel production in the country [6], yet, it has been suggested that the revamping of the steel industry is very crucial to minimizing the rate of unemployment and social unrest that has invaded the country [7]; and more importantly, achieving a green economic recovery from COVID-19 [8]. The contribution of the steel industry to the Nigeria's GDP is very poor, despite the country having the largest GDP in Africa, estimated as US\$448.1 billion [9].

Naturally, Nigeria is endowed with abundance of raw materials necessary to drive its steel industry, this includes coal, limestone and natural gas estimated as 3 billion metric tonnes, 700 million metric

tonnes, and 187 billion standard cubic feet, respectively [10; 11]. However, steel consumption per capita has seen a miserable increase from 5 kg in 1968 to 10.3 kg in 2015 [12; 13], being lower than the 2015 global average put at 204.2 kg (8WSA, 2020b). Despite investing a whopping \$7 billion into this sector, the country is yet to have a significantly working steel industry since its conception [14, 15]. For instance, the Ajeokuta Steel Company has failed to take-off and the Delta Steel Company (DSC) including three other inland satellite rolling mills owned by the government in Katsina, Jos and Oshogbo are moribund and operating at low capacity. Reasons for the low performance of this sector in the country have been argued to include mismanagement, poor planning and political influence [10], yet, the country has ambitious blueprint that requires 12.2 million tonnes of steel to be produced annually by 2020, with Ajeokuta and DSC meeting 5.2 and 2 million tonnes, respectively [16]. Till date, the country meets its steel requirements by largely depending on imports from the West and Asia countries, thereby spending huge part of its foreign earnings in importing finished steel products. Attempts to privatize this sector only worsened the situation as monopoly was seen to be transferred to private companies [17].

Unless the contribution of the steel industry to wealth creation is clearly understood and deliberate efforts made to revive the sector, the hope of achieving sustainable development will remain an illusion, let alone recovery from the economic repercussion of the present spate of COVID-19. To this end, this study presents an over view of the development of the Nigeria's steel industry and the implications of steel production on achieving Sustainable Development Goal 8, i.e., Decent Work and Economic Growth, and further suggest the way to go.

1.1 Outlook of world steel industry compared with Nigeria

This section attempts to critically examine the production, consumption, trading and contribution of steel to national economy. Table 1 shows the countries with major production of crude steel from year 2013 to 2019, Table 2 presents the production of finished steel products by various regions of the world from year 2013 to 2019, Table 3 shows the exports of finished steel products in Africa, Table 4 presents the imports of finished steel products in Africa, Table 5 presents the major steel producing companies in the world, Table 6 shows the richest economy in the world,

In Table 1, the global top 30 countries producing crude steel were identified, with China occupying the first position at a production capacity of 996.3 million metric tonnes in 2019. After China, come India, Japan, and the United States, in that order. From the table, Egypt and South Africa are the only African countries that made it to the top 30 countries in crude steel production, occupying the 23rd and 27th positions, respectively. Although Nigeria is the most populated country in Africa, with the largest GDP in the region, yet, it is not seen anywhere among the top 30 producers of crude steel. This may likely be the reason why the country is among the least developed economy among its underdeveloped neighbours such as China and South Africa, especially on per capita income basis.

Table 1: Major producers of crude steel between 2013 and 2019 (million metric tonnes)

Country	PR	2013	2014	2015	2016	2017	2018	2019
China	1	822.0	822.8	803.8	808.4	870.0	920.0	996.3
India	2	81.3	87.3	89.0	95.6	101.5	109.3	111.2
Japan	3	110.6	110.7	105.1	104.8	104.7	104.3	99.3
United States	4	86.9	88.2	78.8	78.5	81.6	86.6	87.8
Russia	5	69.0	71.2	70.9	70.8	71.5	72.1	71.9
South Korea	6	66.1	71.5	69.7	68.6	71.0	72.5	71.4
Germany	7	42.6	42.9	42.7	42.1	43.3	42.4	39.7
Turkey	8	34.7	34.0	31.5	33.2	37.5	37.3	33.7
Brazil	9	34.2	33.9	33.3	31.3	34.4	35.4	32.2
Iran	10	15.4	16.3	16.1	17.9	21.2	24.5	25.6
Italy	11	24.1	23.7	22.0	23.4	24.1	24.5	23.2

Taiwan	12	22.3	23.1	21.4	21.8	22.4	23.2	22.0
Ukraine	13	32.8	27.2	23.0	24.2	21.3	21.1	20.8
Vietnam	14	5.5	5.8	5.6	5.3	11.5	15.5	20.1
Mexico	15	18.2	18.9	18.2	18.8	19.9	20.2	18.5
France	16	15.7	16.1	15.0	14.4	15.5	15.4	14.4
Spain	17	14.3	14.2	14.8	13.6	14.4	14.3	13.6
Canada	18	12.4	12.7	12.5	12.6	13.6	13.4	12.9
Poland	19	8.0	8.6	9.2	9.0	10.3	10.2	9.0
Saudi Arabia	20	5.5	6.3	5.2	5.6	4.8	8.2	8.2
Belgium	21	7.1	7.3	7.3	7.7	7.8	8.0	7.8
Austria	22	8.0	7.9	7.7	7.4	8.1	6.9	7.4
Egypt	23	6.8	6.5	5.5	5.0	6.9	7.8	7.3
United Kingdom	24	11.9	12.1	10.9	7.6	7.5	7.3	7.2
Netherlands	25	6.7	7.0	7.0	6.9	6.8	6.8	6.7
Indonesia	26	2.6	4.4	4.9	-	5.2	6.2	6.4
South Africa	27	7.2	6.4	6.4	6.1	6.3	6.3	5.7
Australia	28	4.7	4.6	4.9	5.2	5.3	5.7	5.5
Slovak Republic	29	4.5	4.7	4.6	4.8	5.0	5.2	5.3
Sweden	30	4.4	4.5	4.4	4.6	4.9	4.7	4.7

Sources: (WSA, 2016[13], 2017[18], 2019[19], 2020b[8]); PR represents present rank

Table 2 shows the finished steel products by region. From the table, the continent of Asia dictates the production of finished steel products at an unprecedented 78 % in 2019, while Africa is at the bottom end, contributing barely 2 % of total finished steel products in the same year, out of which, South Africa and Egypt are the major producers of the finished steel products, see Table 3. Going by what is available in the public domain and presented in Table 3 and Table 4, Nigeria is a net importer of finished steel products. In Table 3, the amount of semi-finished and finished steel product exported from Nigeria between 2011 and 2015 was within the range of 0-19 thousand metric tonnes, while the import of semi-finished and finished steel products which are in the form of rail track materials, wire rod, plates, galvanised sheet, castings, forgings, drawn wire, concrete reinforcing bars, wheels and axles, steel tubes and fittings, tin mill products, etc., within the same period was put at 1.7-2.2 million metric tonnes, further suggesting that Nigeria is yet to tap from the abundant wealth of its steel industry.

Table 2: Finished steel products by region (million metric tonnes)

Country	2013	2014	2015	2016	2017	2018	2019
European Union	142.4	149.0	154.3	158.1	164.0	168.0	158.7
Other European	36.9	37.0	40.1	40.6	42.4	37.4	33.9
CIS	60.2	57.7	52.4	51.1	54.4	55.7	58.8
NAFTA	131.1	146.2	133.9	130.7	138.3	140.6	135.0
Central & South America	51.7	49.3	46.1	40.2	42.3	44.0	42.3
Africa	36.4	37.4	38.7	37.6	34.6	36.3	36.4
Middle East	52.7	54.5	53.8	53.1	53.2	49.8	48.7
Asia	1026	1013	979	1002	1098	1170	1247
Total	1537.4	1544.1	1498.3	1513.4	1627.2	1701.8	1760.8

Source: (WSA, 2020b) [8]

Table 3: Exports of semi-finished and finished steel products in Africa (thousand metric tonnes)

Country	2011	2012	2013	2014	2015
Algeria	11	23	15	4	5
Cameroon	3	0	0	0	12
Egypt	1425	847	1958	1153	172
Ghana	2	2	1	0	1

Ivory Coast	1	1	0	0	0
Kenya	1	0	1	0	1
Libya	92	47	9	3	13
Morocco	169	141	92	47	42
Nigeria	5	5	0	19	6
Senegal	1	0	0	0	0
South Africa	2567	2216	1888	2339	2190
Sudan	1	0	0	0	0
Tanzania	1	1	0	1	-
Tunisia	160	99	70	84	53
Other Africa	43	59	54	63	28
Africa	4481	3440	4089	3712	2552

Source: (WSA, 2016) [13]

Table 4: Imports of semi-finished and finished steel products in Africa (thousand metric tonnes)

Country	2011	2012	2013	2014	2015
Algeria	3947	4723	5126	5975	6300
Cameroon	158	234	233	269	281
Egypt	2574	3654	4237	6167	7881
Ghana	779	716	699	767	889
Ivory Coast	191	205	266	301	345
Kenya	1207	949	1308	1333	1708
Libya	154	746	967	610	419
Morocco	1421	1294	1641	1670	2019
Nigeria	1762	1753	2193	1955	1677
Senegal	403	368	313	386	419
South Africa	1259	1108	1759	1418	1699
Sudan	400	426	387	310	507
Tanzania	443	411	726	602	667
Tunisia	997	810	886	955	1098
Other Africa	3541	4203	4701	4973	5219
Africa	19235	21602	25441	27692	31128

Source: (WSA, 2016) [13]

In Table 5, the major steel producing companies in the world are shown. Most of these companies are born mostly in Asia, Europe, and the United states. Apart from Egypt and South Africa, which are the major dealers of steel in Africa, no other Africa country has a domicile steel producing company that is competitive globally. At a very low exporting and high importing rates, it is very possible that the Nigeria steel producing companies and facilities are not functional to full capacity. This has severe implication on unemployment, social unrest, standard of living, sustainable future and many more. This again suggests why other industries in the country are not competitively functional. For instance, power generation, transmission and distribution are very weak; manufacturing sector is failing; the automotive industry is not functional; the national armoury is very weak; and the rail facilities are dilapidated until the very recent huge investments by the federal government to revamp the rail transport, however, this huge loans that have been plugged into the revamping of the railway system could have been averted if the country's steel industry was functional.

Table 5: Top thirty (30) steel production companies in the world (million metric tonnes)

Company	Rank	2019 figures
ArcelorMittal	1	97.31
China Baowu Group	2	95.47
Nippon Steel Corporation	3	51.68

HBIS Group	4	46.56
POSCO	5	43.12
Shagang Group	6	41.10
Ansteel Group	7	39.20
Jianlong Group	8	31.19
Tata Steel Group	9	30.15
Shougang Group	10	29.34
Shandong Steel Group	11	27.58
JFE Steel	12	27.35
Valin Group	13	24.31
Nucor Corporation	14	13.09
Hyundai Steel	15	21.56
IMIDRO	16	16.79
JSW Steel	17	16.26
SAIL	18	16.18
Benxi Steel	19	16.18
Fangda Steel	20	15.66
NLMK	21	15.61
Baotou Steel	22	15.46
China Steel Corporation	23	15.23
Techint Group	24	14.44
Liuzhou Steel	25	14.40
Rizhao Steel	26	14.20
U.S. Steel Corporation	27	13.89
EVRAZ	28	13.81
CITIC Pacific	29	13.55
Gerdau	30	13.13

Source: (WSA, 2020b) [8]

In Table 6, the richest economies in the world are presented. Most of these economies are seen in America, Europe and China. The success of these economies is largely tied to the development of the steel industry in these climes. Although Nigeria made it to the list of 30 richest economies in the world, particularly occupying the 26th position, yet, her steel industry unlike other countries in the list is moribund. The major source of the Nigerian economy has been hinged on the exportation of oil and gas, with this sector contributing about 86 % of the country's total foreign earnings [20]. This could also have contributed to why the country couldn't achieve its vision 20:2020 target, i.e. to be enlisted among the 20 richest economy of the world by 2020. Moreover, crude oil cannot be considered a sustainable resource because it is not renewable, unlike steel that can be recycled. Although Nigeria is the richest economy in Africa, but its economy per capita is very low, not to mention, its low human development index (HDI) of 0.539 ranking 161 and 28 globally and in Africa respectively, when compared to other Africa countries such as Egypt with HDI of 0.707 occupying 116th and 8th positions in the world and Africa respectively; and South Africa having HDI of 0.724 that places her on the 7th position in Africa and 114 in the world [21]. This again is obvious as these countries are among the major producers of steel globally, with their economy performance in tandem with what is obtainable among the top economies and the top steel producers globally. The prosperity of the advanced nations is a reflection of their capacity to produce both crude steel and finished steel products. That Nigeria with its large economy in Africa is not found among the top steel producers is an anomaly that has a lot to say about the nation's future sustainable development strides. Moreover, if urgent attention is not paid to the steel sector and other aspects of the Nigerian economy, it is very likely that the country may drop in its economy position globally and plunge into deep recession, even as the world is embracing a green recovery from the overwhelming effect of COVID-19.

Table 6: Richest economy in the world (billion US\$)

Country	PR	2013	2014	2015	2016	2017	2018	2019
United States	1	16,785	17,522	18,219	18,707	19,485	20,529	21,428
China	2	9,570	10,476	11,062	11,233	12,310	13,895	14,343
Japan	3	5,156	4,850	4,389	4,923	4,867	4,955	5,082
Germany	4	3,733	3,994	3,361	3,467	3,666	3,950	3,846
India	5	1,857	2,039	2,104	2,295	2,653	2,713	2,875
UK	6	2,786	3,064	2,929	2,694	2,666	2,861	2,827
France	7	2,811	2,852	2,438	2,471	2,595	2,788	2,716
Italy	8	2,141	2,159	1,836	1,876	1,962	2,086	2,001
Brazil	9	2,473	2,456	1,802	1,796	2,063	1,886	1,840
Canada	10	1,847	1,804	1,556	1,528	1,650	1,716	1,736
Russia	11	2,292	2,059	1,364	1,277	1,574	1,670	1,700
Korea	12	1,371	1,484	1,466	1,500	1,624	1,721	1,642
Spain	13	1,355	1,369	1,195	1,232	1,313	1,420	1,394
Australia	14	1,576	1,468	1,352	1,209	1,330	1,434	1,393
Mexico	15	1,274	1,315	1,171	1,078	1,158	1,221	1,258
Indonesia	16	913	891	861	932	1,016	1,042	1,119
Netherlands	17	877	891	765	784	834	914	909
Saudi Arabia	18	747	756	654	645	689	787	793
Turkey	19	951	934	860	864	853	771	754
Switzerland	20	689	709	680	671	680	705	703
Poland	21	524	545	478	472	526	587	592
Thailand	22	420	407	401	413	456	507	544
Sweden	23	587	582	505.1	515.7	541.0	555.5	530.8
Belgium	24	522	535	462.1	475.9	503.8	542.7	529.6
Argentina	25	552	526	594.7	557.5	642.	519.9	449.7
Nigeria	26	515	569	494.6	404.7	375.7	398.2	448.1
Austria	27	430	442	381.8	395.2	418.3	455.5	446.3
Iran	28	460	433	385.0	418.0	445.3	-	445.3
UAE	29	390	403	358.1	357.0	385.6	422.2	421.1
Norway	30	523	498	385.8	368.8	398.4	434.2	403.3

Sources: (WB, 2020) [22]; PR represents present rank; US\$B represents billion US dollars

2.0 Need to Revitalize and Develop the Steel Sector

The main reason for this advocacy, for the revitalizations of the Nigerian Steel sector, is based on: the strategic nature of the industry to industrial development. Understandably, an industry is said to be strategic, if it encourages the birth of other industries around and beyond it, because of the services it needs and those it can provide. In order words its viability is measured by the factor of this and not the simple economic theory of profit and loss on an isolated scale. For this reason, strategic industries worldwide enjoy a level of state subsidy, directly or indirectly. Most of the developing nations' steel plants are government owned e.g. China and India. Steel Authority of India Ltd. (SAIL), government owned establishment, manages and operates five of the major steel plants in India with an annual capacity of 30million tons of steel [23]. The present day Mittal Steel of South Africa was established in 1928, as a state company known as South Africa Iron & Steel Industries Corporation [Iscor], therefore, the suggestion that we need private sector participation for meaningful development does not hold. Like the South African experience, the government must establish the industries before the call for private entrepreneur participation. For us to attempt to move in the direction of industrialization and tackle the problem of unemployment which is begging for attention our steel industries must be operational.

Environmental problem- our cities are awash with improvised scrap yards, due to the very low utilization of abandoned or scraped vehicles and other machineries which ordinarily would have been consigned to the steel plants as raw materials, for steel production.

Steel is a major driver of the global economy as the industry has in its employment, over two million people at the global level. It also boosts of about two million contractors and four million persons in supporting industries [24]. The sector provides sustainable employment to the economy through the up-stream, down-stream, and spin-off industries it creates.

2.1 Up Stream Industries

The multiplier effect of a gigantic investment of the magnitude of a steel plant can best be seen in a number of industrial enterprises that would thrive around it.

The National Iron Ore Mining Company Limited, Itakpe was conceived purely as an upstream industry to Ajaokuta Steel Plant. It is to provide the primary raw material input –Iron Ore – to Ajaokuta. It is in itself a major investment, incorporating the Mining outfit, Beneficiating plant, workshops and a few auxiliary units.

The Nigerian Mining Corporation is to mine the lime stone, and dolerite. These are activities that would last deep into the next century, involving all the developments associated with perennial industrial activity of that nature.

2.2 Ancillary Industries

These are basically small and medium scale industrial units that have the versatility to manufacture small units of spare parts, consumables, and construction materials etc, built around a major industry. They provide service parts and consumables to the major industry and the major industry provides the market and to some extent some raw material inputs.

2.3 Down Stream and Spin-off Industries

These industries depend on the products and by-products of the Steel Plant for their raw material inputs, but may not necessarily depend on the plant for their market. Like the ancillary industries, the private sector is best suited to operate this type of industries [25].

Some of the more important medium and small scale downstream and spin-off industries are:

1. Fertilizer Plant
2. Graphite electrode plant.
3. Tar distillation plant.
4. Benzene plant
5. Air conditioning and Ventilation equipment
6. House-hold appliances manufacturing units
7. Steel doors and windows manufacturing units

In fact, the chain of development can be linked to steel as shown as follows:

Steel → Manufacturing/Industrialization → Development

Steel production stimulates manufacturing and rapid industrialization which brings about development.

3.0 Challenges Facing Nigeria's Steel Industry

Though the Nigerian steel industry is very crucial to the country's economy, stakeholders have identified the challenges confronting the industry as: low quality of iron ore with low total iron content (<64%) and high gangue content (4%) which is greater than 3.5% bench mark for use in the direct reduction process; the coals are non-coking and high moisture content; high sulphur and phosphorus content in ore ; erratic power supply; importation of raw materials ; the

inconsistent policy framework, corruption and poor contracting strategy led to the failure of the iron and steel sector in Nigeria [16, 26, 27, 28].

3.1 The way forward

The intervention of government through the provision of power and raw materials, rail ways, good roads, and minimized interest rates on bank loans will help turn around the Nigerian steel industry [29].

More research geared towards the improvement of our local raw materials should be encouraged. Some researches in this direction have been conducted with encouraging results. For example, Asuke [30] studied the dephosphorisation of Koton Karfe iron ore by acidic leaching and reported that phosphorous content can be reduced by acidic leaching technique. Thomas and Yaro studied the beneficiation of Agbado Okudu iron ore deposit and recommended that it is possible to upgrade it to standard concentrate using gravity and magnetic separation techniques [31, 32].

The quality of our coal can be upgraded to a level that it can be blended with imported coking coal for the Ajaokuta blast furnace when completed. This partial substitution will reduce the cost of importing all the coke for the blast furnace.

The steel plants, when completed should be commercialized by selling out about 80% of its shares to the private sector with government holding not more than 20% for regulatory purposes. Hence, DSC should be reactivated and this model should be applied to run it.

There is need for coordinated efforts among the relevant government agencies in order to fully develop the various iron deposits in Nigeria. This will make the over 1 trillion tonnes predicted iron ore readily available as feedstock for Ajaokuta and Aladja iron and steel plants, and other steel plants [32].

The Steel sector requires educated, highly skilled and experienced managers, and less government interference in the name of federal character in appointing persons to management positions.

Being that, our steel plants have been shut down for quite some time, the Steel sector have experienced migration and retirement of trained hands, therefore, retraining must be considered.

A strong commitment on the part of the government, because, the problem of the government owned Steel sector since inception has never been on the feasibility studies, nor willingness of foreign partners, but the lack of willingness of the government.

4.0 Conclusion

The steel industry is one of the drivers of economic advancement. Majority of the developed economies of the world have advanced their steel production in an unprecedented manner, with steel production contributing largely to their foreign earnings and gross domestic product. Although Nigeria is enlisted among the thirty largest economies in the world, but sadly, its low per capita income trailing at the lower end of the global per capita income spectrum, has denied it a meaningful place in the community of wealthy nations. This study has shown the evidence that the moribund state of the steel industry in the country is largely responsible for this occurrence. Notwithstanding, the country is blessed with enormous raw materials to drive the production of steel which will not only serve the countries steel needs but also make it a net exporter of semi-finished and finished steel products. The COVID-19 has further shown that economies can develop sustainably without depending too much on the oil and gas sector, hence, countries are channelling much efforts on green economy recovery as obvious in various commitments and policies that will assist in cutting down on anthropogenic footprint of carbon. The implication of this on a mono-cultural economy such as Nigeria is that if deliberate efforts are not taken to redirect the country's economy from its large dependence on the oil and gas, the country will very likely plunge into deep recession. Therefore, it is crucial to revisit the country's steel industry with a view of enacting sustainable policies, creating conducive environment for investments and engaging in strong political actions to implement the establish policies.

The Steel industry is often considered an indicator of economic projects, because of the critical role played by steel in infrastructural, technological and overall economic development.

Employment is intimately related to technology both quantitatively and qualitatively. The third world which Nigeria is, urgently needs more jobs. In the third world, employment of any kind is advancement over no employment since it provides income, however modest. Creating employment is therefore the best way to reduce poverty. This can only be achieved through industrialization of which the Steel sector holds a commanding role.

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