Global Oil Price Changes, Drivers and Key Indicators With Reference To Africa Energy Security – Outlook for 2025 and Beyond

C S Amadi¹, K M Onuoha¹, J O Onwuka¹ &²

¹Department of Geology, University of Nigeria, Nsukka. ²Department of Geophysics, Federal University Oye-Ekiti. Email: chinamadi@yahoo.com, mosto.onuoha@gmail.com, julius.onwuka@fuoye.edu.ng

Contact: 08035357878

Abstract

Recent collapse in oil prices around the world from 2014 – 2016 and 2019/2020 has been reported as the most significant downward trend in the history of oil price glut. The COVID 19 pandemic caused additional fall to crude oil price expectedly, given the dynamics of demand and supply. Following world economic shut down, crude oil prices dipped to all time low. Global economies were heavily impacted by the crude oil price drop and Africa, which is known to be at the top of receiving end of fluctuating oil prices historically, once more suffered negative consequences. Africa energy security and sustainability becomes paramount following the continued negative impact of global oil prices change on the continent. Issues with crude oil transportation, storage and accessibility in Africa remains significant. Nigeria, whose economy is predominantly dependent on revenue from crude oil, witnessed another round of devaluation of the naira and with inflation in the negative direction due to the collapse in oil price. This paper focused on global energy security and sustainability in Africa. It explored the windows of opportunities in areas of transportation, storage and distribution of refined petroleum products and in advanced world and how Africa can adopt such methods. It looked at how Africa can take advantage of the advanced technology deployed in conventional petroleum development globally and in unconventional areas like nuclear, solar and wind energy. The results considered how Nigeria can be preserved from negative oil prices and the technologies available to boost her petroleum industry, particularly developments of unconventional resources beyond 2025 and sustainability of energy security within the polity. Suitable alternative and the sustainability of refined petroleum transportation and distribution is critical with reference to energy security in Africa.

Keywords: Energy Security, Drivers, Global Oil price

1. Introduction

This research focused on three objectives, on global oil price changes and impact on energy security and sustainability in Africa, with emphasis on Nigeria, and secondly on assessment of the geological impact of new petroleum basins discovery and the effect it has on energy
security and sustainability within Africa, and then evaluated the role of Nigeria towards sustainable energy security on the African continent. [4], [8], [9], [10] and [11]. Global oil price change and energy security with regards to supply and demand move along the same tide. World oil price has in recent times suffered negatively with all low time experienced between 2014 through 2016 and more recently in 2019 and 2020 following the COVID 19 pandemic effect, which witnessed world economy shutting down and oil prices dropping significantly to below $20 per barrel. [6], [7] and [9]. Finding easy fossil is becoming progressively difficult and made more challenging by the growth in world population, with a direct impact on consumption and pricing [1], [2], [3] and [11]. This big economies like USA and China, believe that sourcing alternative energy and storing them for the future is a sure means to energy security. On the other hand, energy exporters may be pushed to think the ability to find more petroleum discoveries as a guaranteed way of ensuring energy security and also looking for foreign buyers who may likely pay at agreed price. Hence, energy security could be conceptualized from both the demand and supply sides. Energy security assumes different meanings under different contexts as shown in [10] and [11]. Though, the fact remains that energy security remains a concern globally. [9], [10], and [11]. Africa Energy security is lower than the world average, though some of the African countries perform well in production but have not maintained overall consistency with regards to sustained supply. There are strategies to enhance energy security in Africa, with a focus on various segments such as petroleum production, refining and infrastructure protection. Other areas include awareness campaign against sabotage and role of community on access to petroleum producing fields. It is critical to bear in mind that inadequate petroleum access remains a development challenge. The attacks on petroleum infrastructures are not only physical but within the turn of the decade, petroleum infrastructure have seen a growing increase in cyber-attacks. The attacks on personnel of petroleum industry, physical assets, and in more recent times cyber-attacks on the soft asset of the petroleum industry has significantly impacted energy supply, distribution, operation and revenue generation across the industry, with a direct impact on economic development of the African continent. [12], Figure 1 showed the map of Sub-Saharan Africa and figure 2 showed the Global Liquid Fuels Production across the globe [13]. It is important that the highlighted factors which strategically revealed the need for the entire system is protection from the continuous attack to attain sustainable growth. Concerns over energy security are not limited to oil. [5], Power black-outs on both the developed economy of the East and West Coasts of the United States, in Europe, and in Russia, as well as chronic shortages of electric power in China, India, and other underdeveloped economies and developing countries; have raised worries about the reliability of electricity supply systems. [4], [8], [10] and [11]. The concern for developing countries is how changes in energy prices affect their balance of payments. For China and India, energy security now lies in their ability to rapidly adjust to their new dependence on global markets, which represents a major shift away from their former commitments to self-sufficiency. For Japan, it means offsetting its stark scarcity of domestic resources through diversification, trade, and investment. [10]. In Europe, the major debate centers on how to manage dependence on imported natural gas—and in most countries, aside from France and Finland, whether to build new nuclear power plants and perhaps to return to (clean) coal.
Thus, the true meaning of energy security remains unsettled, even after its manifold colorations have been accommodated. Energy sustenance involves meeting the needs and aspirations of the present generation, without compromising the ability of future generations to enjoy energy supply from fossil fuel or otherwise. [11], Sustaining energy security globally involves multi approach to solving energy challenge. [9], [11] and [15], This may include diversifying energy source away from fossil fuel to wind, solar and nuclear energy. These alternative energy sources must be affordable and readily available. The super economic powers like USA, China, Germany and Japan are already exploiting some of these energy sources. [9], [10] and [11], The African countries are seeing a glimpse of alternative source but have not been able to enjoy it to optimal level, due to cost of sustaining such advanced energy source.

Fig 1: Map of Sub-Saharan Africa [12]
For example, [13], Nigeria has both renewable and non-renewable fossil fuels, solid minerals, wind, hydro, and tidal wave and solar energy in abundance is a big player in crude oil and condensate exports. Being the sixth largest oil producing country in the world [14]; it still highly energy deficient in terms of her energy consumption needs [15]. Petroleum price fluctuations worldwide is known to affect most world economies, but can be viewed to have a special significant toll on the African economy. [9] and [10], With reference to Crude oil, Africa countries can be broadly divided into two main segments as into Crude oil exporting countries and Crude oil importing countries. Before this two broad classification, it is important to note that Crude oil is largely refined for consumption and imported into some of Africa’s crude oil exporting countries, with Nigeria topping the list. [9] and [11], Africa’s crude oil exporting countries include the following: Nigeria, Angola, Libya, Algeria, Egypt, Sudan, South Sudan, Equitorial Guinea, Gabon, Muaritania, Tunisia, Chad, Congo, South Africa and recently, Kenya and Ghana. About 20 countries in Africa are known to be producing crude oil, with some of the countries production not commercially viable, and therefore results in a huge dependancy on crude oil importation by most African countries numbering about 38. [6], [7] and [9], Generally, high oil prices triggers economic hardship in Africa because of the direct relationship between crude oil cost and local production of goods and services. Unlike European countries, were tax regime can be deployed to cushion the effect of increase in oil price. [10], The reverse is the case in Africa, as oil price is subsidized by the government of countries in Africa. As such, when oil prices surge up, the government is faced with huge dilemma as how to pass the effect of the new price change on the people. This is seen in reduction of subsidy with a direct increase in pump oil price. This has been the strategy and story for most African nations with exception of a handful. In other words, African countries who solely import petroleum would receive a direct negative impact of crude oil price increase on her economy, and sometimes leading to recession and economic instability. The expectation is that African countries like Nigeria and Angola who are giant exporters, should enjoy a positive impact following high crude oil price on their economies.
This is because the finished products are imported at high prices, thereby eroding the benefits that should have been enjoined by high crude oil price [7], [9] and [11].

2. Materials and Applied method

Data was collected predominantly from reviewed literature materials, analyzed tables and statistical data from oil and gas firms, regulators and different international energy organizations sources and national and international energy watchdog and general energy stakeholders’ resource materials to bring about a trend assessment for possible future oil price prediction [1], [2] and [3], [5]. The historical price chart and prediction table was studied for future global price of oil deployment and also the globally advance technology reports was examined and evaluated its effect on the African countries on sustainable energy delivery on the continent and export and identification of the factors in time past that contributed immensely to global oil price change while taking into consideration uncertainties such as wars and global pandemic such as COVID 19 [6], [7], [9] and [14].

Fig 4: EIA forecast suggest US Petroleum production will experience a steady growth into 2050 [14]
Fig 5: Crude oil price chart 2020 [14]

Fig 6: US natural gas production may not slow down due to low oil price, though may cut down by nearly 40%. [14]
Fig 7: Top five African countries by proven oil and gas reserves [15]

3. Results and data interpretation

3.1 Geological Discovery, Sustaining Energy Security in Africa and Focus on Nigeria

The data revealed that the availability of sufficient energy supplies at affordable prices over a tangible period [14] and [15], also showed that the Energy Security is the pillar at which every advanced world economy is built. Fossil Fuels (crude oil, natural gas and coal) are energy sources that play a very important role in the economy of virtually all countries [14] and [15]. [13], [14] and [15], showed Africa as having substantial reserves of fossil fuel resources. These include about 9.5 percent of the entire global proven reserves of crude oil, 8 percent of the natural gas reserves. Fossil fuel account for about 50 percent of the entire primary energy supply, and one-third of energy consumption excluding the contribution to electricity generation of Africa. Over 80 percent of Africa’s electricity is derived from fossil fuels. The evaluation revealed that Africa still faces energy challenges like; low access by many to modern energy, insufficient energy infrastructure, low efficiency and lack of institutional capacity to use these great resources and continuous attack on personnel and available physical infrastructures and recently growing cyber-attacks on energy companies which are areas of great concern to energy security and sustainability in Africa and to address these challenges needs robust strategies by the government and other stakeholders – Petroleum companies, local community and government security agencies. African crude oil and natural gas reserves has over 80 percent of it are domiciled in Northern and Western Africa. Libya records over 70 percent of the reserves in North Africa; while Algeria contributes 55 percent of natural gas reserves in West Africa. [16], revealed that Sub-Saharan Africa contains 62.6 billion barrels of proved crude oil reserves. The Middle East has 13 times that amount and Central and South America has 5 times that amount. Rapid population growth and increase in the standard of living of the society are the reasons for world’s energy crisis is caused as the data assessment in [14], [15], [16], and [17]. It is reported that by 2050 the population of Africa would nearly double from 1.3 billion people to 2.4 billion people. This number suggests that the demand of energy consumption may potentially follow the same trend.
While consumption is anticipated to more than double, production may potentially decline. Figure 5 reported according to [17] expects a huge decline in production from Africa. This is not healthy news for the continent because of the important role petroleum production plays on her revenue generation.

![World Historical and Projected Oil Production](image)

Fig 8: World Energy Annual Report in 2018[17] – Africa is lumped under the rest of the world

The second factor, which bothers on standard of living within the continent may likely experience a harrowing and painful decline in the quality of living generally in Africa. This calls for great concern not only in Africa, but the world globally. An Africa economic crisis is a world pandemic. With 2.4 billion people expected in Africa, with more than 40% of the population less than 20 years is a waiting hunger time bomb.

### 3.2 Result outlook of energy situation in Nigeria

The result of the energy situation assessment revealed that Energy Security in Nigeria is in a situation in which the nation and its citizens and businesses have availability and access to sufficient energy resources in abundance at reasonable prices for the foreseeable future, and free from any serious risk of disruption of service [16]. The assessment of the World energy consumption by energy source (1990-2040), [18] showed an upward trend of nuclear, renewables, natural gas and petroleum and other liquids while coal consumption by energy source is in between natural gas and renewable at a value of about 152 quadrillion British thermal units. Nigeria is one of the crude oil exporting countries, but yet it's lacking in major crude oil derivatives that are very necessary for supporting both industrial and domestic consumption. Some resources in Nigeria are mined while some are being extracted like; oil and gas, coal and uranium. While tidal, wind, solar, hydropower and biomass are harnessed from the Earth’s surface. Alternatively, Renewable Energy Resources fall under this category including solar, biomass, water, wind and geothermal energy. Renewable resource are limitless and self-replenishing. This area has remained untapped or mildly exploited due to factors like advance technology and concern with sustaining the supply renewable resource.
Figure 10 showed the result of the energy consumption by energy source where petroleum and other liquids are at its peak value globally and Nigeria inclusive. Figure 11 showcased the Quarterly results of OPEC crude oil production and call on OPEC (2015-2021) while the inventory draws are projected to be at about 29 to 30 million barrels per day from first quarter to fourth quarter of 2021, call on OPEC (amount that would balance global liquids markets), all highlighted the OPEC’s role in petroleum supply and global oil price determination would still be in the hands of few middle-east producing members and suggested an energy market opportunity for business for prospecting energy producers like Nigeria.

Fig 9: Renewable energy experiences the strongest growth, though petroleum continues to lead in terms of energy consumption [18]

Fig 10: Quarterly OPEC crude oil production and call on OPEC (2015-2021) [18]
Fig 11: World oil production and consumption are tracking self, with population growth and increased energy consumption triggering a strong push for alternate energy [18]

Figure 11 showed the results of EIA’s Quarterly world petroleum liquids production and consumption (2015-2021), having the inventory builds up when production exceeds consumption while the 2020 first quarter having largest quarterly decline in petroleum liquids consumption since 2003. [19] Africa has witnessed positive trend in the recent petroleum discoveries of great significance with her production though not a big player to global oil price when compare to the big players like USA, Russia and the Middle East nations. Figure 13 pointed at the Oil and gas discoveries in Africa from Tanzania of 125.7millions of barrels of oil equivalent ranking 19th and Angola’s 269.1millions of barrels of oil equivalent ranking 4th in global ranking for the biggest single findings in 2014 whereas North America is the largest foreign investor in African oil and gas is expected to come from as indicated by pricewater consults reports [20]. The Percentage of survey respondents who noted that uncertain regulatory frameworks are between from Namibia’s 2% to Nigeria’s 15% to South Africa’s 20% regulations present an obstacle to investors, while the expected average crude oil price over next three years in dollars a barrel 2015 from $61 to $65 which is on a downside in this 2020. Figure 14 Signified that Crude oil price outcome is negatively down due to the COVID 19 pandemic impacts of below $40 currently an all-time low, since 1991 gulf crisis oil price surge for both the West Texas Intermediate and Brent crude oil price basket [19].
Recent collapse in oil prices around the world from 2014 – 2016 and 2019/2020 has been reported as the most significant downward trend in the history of oil price glut. Africa energy security sustainability becomes paramount following the continued negative impact of global oil prices change on the continent. Issues with crude oil transportation, storage and accessibility in Africa remains significant. Nigeria, whose economy is predominantly
dependent on revenue from crude oil, witnessed another round of devaluation of the naira and with inflation in the negative direction due to the collapse in oil price. The paper has looked at global oil price fluctuation, demand and supply and the impact on oil prices and the African cum Nigeria aspect of oil supply security and with the below summary, as major part of the findings:

- Security of supply and security of demand are two sides of the same coin
- Global demand for oil as the leading energy source would change as emerging technology reposition alternative energy source in the future
- Africa would potentially grow her conventional energy, without significantly impacting global production
- Increased energy demand would be most visible in Africa following population explosion
- Nigeria may not find cheap conventional oil, but would remain relevant with reference to oil production and consumption in Africa
- Distribution of petroleum products across cities would be mostly by long haul train services, pipeline vandalism would cripple any effort of transporting and distributing petroleum by pipelines
- Solar energy would be a key energy source for all of Africa, with Nigeria being one of the leading champions with reference to consumption.

Reference

[1] Amadi, CS 2011: Evaluation of Shale Gas Potential in Texas Metro, NAPE Bulletin
[2] Amadi, C.S & Unomah, G I 2014: Defining Unconventional Resources, and their possibilities in Nigeria Petroleum Basins
[3] Amadi, C.S & Unomah, G I 2016: Shale Gas Evaluation Overview: US Experience and Implications for Nigeria
[4] Annual Energy Outlook 2019 with projections to 2050 - January 24, 2019 www.eia.gov/aeo
[5] Historical oil price change https://inflationdata.com/inflation/Inflation_Rate/Historical_Oil_Prices_Chart.asp
[6] Hurricane storms impact on crude oil price http://www.marketoracle.co.uk/Article6062.html
[7] The impact of higher oil prices on the global economy https://www.imf.org/external/pubs/ft/ oil/2000/
[8] World Oil 2018-2050: World Energy Annual Report (Part 2) DENNIS COYNE posted on 07/26/2018 http://peakoilbarrel.com/world-oil-2018-2050-world-energy-annual-report-part-2/
[9] The impact of high oil prices on the African Economies African Development Bank 2 (Typeset by SPI, Chennai) 122 of 233 July 29, 2009
[10] Nkiruka Avila, Juan Pablo Carvallo, Brittany Shaw, and Daniel M. Kammen 2017 - The energy challenge in sub-Saharan Africa: A guide for advocates and policy makers Part 1: Generating energy for sustainable and equitable development
[11] Emily Meierding 2019 - Energy Security and Sub-Saharan Africa
[12] U.S. Department of State, Oil and Natural Gas in Sub-Saharan Africa, August 1, 2013, U.S. Energy Information Administration Independent Statistics & Analysis. www.eia.gov
[13] U.S. Energy information administration and global trade tracker November 2019 data estimate Source: EIA, International Energy Statistics, Oil and Natural Gas in Sub-Saharan Africa, August 1, 2013, U.S. Energy Information Administration Independent Statistics & Analysis. [www.eia.gov](http://www.eia.gov)

[14] Crude oil price chart 2020. [https://inflationdata.com/articles/inflation-adjusted-prices/historical-oil-prices-chart](https://inflationdata.com/articles/inflation-adjusted-prices/historical-oil-prices-chart)

[15] Effect of external energy on atomic, crystalline and powder characteristics of antimony and bismuth powders. Tallapragada, et al., Nov 25, 2009 — October 2009, Issue 5, Bulletin of Materials Science volume 32, pages471–479, 2009

[16] Top five African countries by proven oil and gas reserves
[https://www.google.com/imgres?imgurl=http%3A%2F%2Finvestinggroup.org%2Fimg%2Fcharts%2Fchart-103.png&imgrefurl=https%3A%2F%2Finvestinggroup.org%2Fdata%2F103%2Ftop-5-african-countries-by-proven-crude-oil](https://www.google.com/imgres?imgurl=http%3A%2F%2Finvestinggroup.org%2Fimg%2Fcharts%2Fchart-103.png&imgrefurl=https%3A%2F%2Finvestinggroup.org%2Fdata%2F103%2Ftop-5-african-countries-by-proven-crude-oil)

[17] World Energy Annual Report in 2018, by Minqi li, 2018

[18] The assessment of the World energy consumption by energy source (1990-2040) by EIA, [www.eia.gov/todayinenergy](http://www.eia.gov/todayinenergy)

[19] John McCann Data source; PWC Review 2015

[20] Crude oil month future prices, by EIA’s CME Group and International Exchange, as compiled by Bloomberg L.P.; WTI= West Texas Intermediate. [www.eia.gov](http://www.eia.gov)