

## Alternative Energy Sources – Implication for the Nigerian Economy

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**Abstract:** Since the discovery of oil in commercial quantity in Nigeria in 1956 and the oil boom of 1970s, oil has dominated the economy of the country. In Nigeria, oil accounts for more than 90 percent of the country's exports, 25 percent of the Gross Domestic Product (GDP), and 80 percent of government total revenues. Therefore, any volatility in the price or quantity of oil usually has grave and devastating consequences on the economy and government fiscal operations. For instance a US\$1 increase in the oil price in the early 1990s increased Nigeria's foreign exchange earnings by about US\$650 million (2 percent of GDP) and its public revenues by US\$320 million a year. It is obvious that Nigeria's near-total reliance on oil production for income generation clearly has serious implications for the economy. Indeed of greater concern today is the concerted efforts of the western developed nations, the United States and China to sway their economies away from oil to other alternative energy sources. The United States and China – the two largest consumers of oil, have been particularly very aggressive in the quest to minimize their dependence on fossil fuel in the near term and to do away with fossil fuel generally in the long term. This aggressive search for alternative energy sources could have catastrophic consequences for the Nigeria economy unless the country prepares itself in advance. In this paper, we reviewed the possible implications of alternative energy sources on the Nigerian economy and the tactical options open to the country to insulate its economy from the backlash that will result in a world without fossil fuel. Among other things, the authors recommended that the country should begin now to explore other natural endowments with great export potentials. The country should also re-invest heavily in agriculture; in manpower and infrastructural development. In addition, the country should begin now to save more aggressively a large chunk of today's huge earnings from oil exports for future generations and the rainy days that obviously lie ahead.

**Keywords:** Alternative Energy, Oil, Fossil fuel, Economic Development

### INTRODUCTION

Nigeria is naturally endowed with abundant human and mineral resources [1]. But these obvious potentials have not been fully exploited and as a result, the country is still wallowing in poverty. Moreover, the structure of the Nigerian economy is oriented towards two primary production activities - agriculture and mining (including crude oil & gas). According to the National Bureau of Statistics [2], primary production accounts for about 65 percent of the real gross output and over 80 percent of government revenues. Also, primary production activities account for over 90 percent of foreign exchange earnings and 75 percent of employment. In contrast, secondary activities comprising manufacturing, building and construction, which traditionally have greater potential for broadening the productive base of the economy and generating sustainable foreign exchange earnings and government revenues account for a mere 4.14 percent and 2.0 percent of gross output respectively. Services or tertiary activities which depend on wealth generated

by the productive sectors for their operations comprise about 30 percent of gross output [3].

According to Sampson [3], the current structure of the Nigerian economy skewed towards primary production and extraction does not support inclusive growth and employment generation. The sectors driving growth in the economy have weak sectoral linkages with other sectors of the economy and are not high job-creating sectors. For instance, the oil and gas industry is capital intensive (not labour intensive) and generates very little employment – estimated at 4 percent. The lackluster performance of the manufacturing sector over the years for instance, reflects a conspiracy of several growth-inhibiting constraints principal amongst which is dilapidated infrastructure, and the effect of the infamous resource curse or Dutch disease.<sup>1</sup> Whereas the manufacturing

<sup>1</sup>Three major lines of argument have been employed in the theoretical literature to explain the resource curse - the tendency of

sector is the main engine of growth and catch up for developed and developing economies respectively, it has remained comatose in Nigeria for too long. Manufacturing has the highest multiplier effects of all the sectors in any economy because of its forward and backward linkages with other sectors of the economy. It is the major source of productivity gains and foreign direct investment, a major investment inducer, a prime creator of jobs and employer of labour. It is also the driver of research and innovation.

The near total dependence of Nigerian economy on oil has dire implication for the economy. For example, in 2013, the stock of the nation's external reserves and Excess Crude Account<sup>2</sup> witnessed various degrees of decline as a result of fluctuations in the price and quantity of oil. The CBN report [4] shows that the gross external reserves as at December 31, 2013 stood at US\$42.85 billion, representing a decrease of US\$0.98

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natural resource abundance/dependence to stultify growth and development. One line follows what has come to be known as the *Dutch disease*. The second focuses on the *volatility effect* of natural resource export-dependence ([5]; [6]; [7]; and [8]), while the third discusses the *rent-seeking effects*. The rent seeking views assert that resource-dependence (especially oil) often lead to a vicious development cycle whereby all actors (public and private, domestic and foreign) have overwhelming incentives to seek links with the state in order to share in the resource pie. This incentive for rent-seeking penalizes productive activities, distorts the entire economy and hinders economic growth. In a dynamic setting, this may produce a *voracity effect* [9]. The *Dutch disease* thesis asserts that an increase in resource-based revenues (due to a boom) leads to an appreciation in the local currency, increases the capacity of the country to import *tradables* and also enlarges the demand for other goods and services, including *non-tradables* which must be produced locally. This forces a structural adjustment in the domestic economy as resources are diverted out of the non-resource tradable sector (represented by manufacturing) into the production of *non-tradables*. Thus typically, resource booms lead to the contraction of the non-resource (manufacturing) sector [10].

<sup>2</sup> The Nigerian Sovereign Investment Authority Act, 2011 [11] which establishes the Nigeria Sovereign Investment Authority (NSIA) has the principal aim of building a savings base for Nigerian citizens, enhancing the development of Nigerian infrastructure and providing stabilization support in times of economic stress, among others. The NSIA as the governing authority is empowered to make regulations and policies as it may determine to be most effective to achieve the objective of the fund. It also has the power to invest in equity, debt, private equity, real estate, infrastructure, fixed income securities and all other asset classes at the international and domestic level. Thus, the portfolio scope of the fund is subject to the assessment criteria, policies and procedures developed from time to time by the NSIA on the advice of its external asset managers. The Act requires adherence with the Generally Accepted Principles and Practices developed by the International Working Group of Sovereign Wealth Funds, otherwise known as the Santiago principles. The Act reflects the legal propriety of the Nigerian Sovereign Wealth Fund and is aimed at ensuring management independence and accountability, corporate governance, and transparency in the fund's transactions [11].

billion or 2.23 percent compared with US\$43.83 billion at end-December, 2012. The excess crude account (ECA) also declined within the period. Earlier in the first quarter 2013, external reserves had climbed to its highest level in more than four years, hitting around US\$48.57 billion in May. The drop in both the stock of external reserves and the ECA are attributable to a number of factors. First was the slowdown in Portfolio and Direct Foreign Investments (FDIs) flows in the fourth quarter 2013, which prompted increased funding of the foreign exchange market by the CBN to stabilize the national currency. Secondly, a drop in oil revenue inflow owing to decline in oil output – due to oil theft and pipelines vandalism at various times in 2013 which resulted in the loss of about 300,000 – 400,000 barrels per day. Thus, this 'quantity shock' led to depletion in both accounts – the external reserves and the ECA.

From the foregoing, it is apparent that the near-total dependence on oil of the Nigerian economy over the years portends serious danger to the sustainability of the Nigerian economy in the long term. Moreover, the concerted efforts of the advanced economies – who are the major users of oil, to look for alternative source of energy portends even greater danger to the Nigerian economy. In this paper, analytical spotlight will be placed on the dangers that alternative energy source portends for the economy of Nigeria. The rest of the paper is structured as follows: section 2 reviews the historical emergence of oil as a major revenue source for the Nigerian economy while section 3 focused on the renewed efforts of advanced nations to sway their economies away from fossil oil to other alternatives. Section 4 reviews the implication of these efforts in alternative source of energy to the Nigerian economy and what government must do to avert an impending economic catastrophe. Section 5 concludes and summarizes the paper.

## EMERGENCE OF OIL AS THE MAINSTAY OF NIGERIAN ECONOMY

Since the 18<sup>th</sup> century when the world experienced an industrial revolution till date, fossil fuel has become indispensable in the lifestyle of humans. And every industrial discovery that had been made since then had been built to run on fossil fuel. It is obvious that without fossil energy today, industrial machines would not work; airplanes would not fly; automobiles would not move; neither would trains and other modern means of transportation. Businesses would also be grounded and the world would practically be brought to a halt – economically, socially and

industrially. Such a world is, to put it mildly, inconceivable [3]. Fossil fuel has in the last two hundred years or more become the grease that lubricates the global economic engine and dictates the pace and direction of economic activities [12]. It is no wonder that the commodity has been aptly described in some quarters as the 'black gold'. For Nigeria, it is more than a black gold – it is the goose that lays the golden egg and one that the economy depends almost entirely [13]. For instance, over the last 44 years, Nigeria has received over \$1,300 billion in oil revenues after deducting payments to the foreign companies [14], [15]. Yet the country is marred in poverty. In 1965 when Nigeria's oil revenue per capita was about US\$33, per capita GDP was US\$245. However, in 2012 when oil revenue grew to US\$725 per capita, per capita GDP remained at the 1965 level, implying that oil revenue accumulated over the 44 year period between 1970 and 2013 did not add value to the standard of living of Nigerians [15]. Nigeria's per capita GDP (in PPP terms) was US \$1,113 in 1970. It is estimated to have fallen to US\$1,084 in 2000, a figure which places the country among the fifteen poorest in the world. The percentage of Nigerians living below the United Nation's US\$1 per day absolute poverty line have risen from 27 in 1980 to 66 in 1996, and 70 in 2000 and have fallen marginally to 68% in 2012 [16]. At the same time, income distribution has deteriorated sharply with more and more people pushed towards poverty and towards extreme wealth. With a Gini index of 50.6 in 2010-2011, Nigeria's richest 10 percent controls 40.8 percent of the country's wealth and the poorest ten percent only a negligible 1.6 percent whereas in 1970 the top 10 and bottom 17 percent of the population earned the same amount of income [15].

The Nigerian economy has also been substantially unstable, a consequence of the heavy dependence on oil revenue, and the volatility in prices. The oil boom of the 1970s led to the neglect of non-oil tax revenues, expansion of the public sector, and deterioration in financial discipline and accountability. In turn, oil-dependence exposed Nigeria to oil price volatility which threw the country's public finance into disarray [3]. According to [15], waste and 'Dutch disease' manifesting in rapid capital accumulation and negative Total Factor Productivity (TFP) characterized Nigeria's 53 year post-independence development experience. While capacity utilization averaged about 77 percent in 1975, it had declined to about 50 in 1983 and until very recently has languished at about 35 percent since the mid 1980s.

Moreover, since oil revenue dominates Nigeria's Federation Account, the sharing of oil rents govern intergovernmental fiscal relations in the country with an on-going tension between agitations by oil producing states for greater share of resources and demands for redistribution from other regions, particularly relatively less endowed ones. Also the history of successive revenue allocation arrangements in Nigeria has been most unstable and accompanied by distrust, inadequate information flows, a lack of transparency, and uncertain accountability [17]; [18]; [19]; [20]. Indeed the present intergovernmental fiscal arrangement prevailing in Nigeria generates a large vertical imbalance in favour of the centre while allocations to the states do not depict any clear pattern of redistribution between regions or any correlation with relative needs. While in theory the arrangement takes into account the effort of each state to mobilize internal revenue, in practice, an equal weight is given for this variable in allocations. Thus, apart from failing to create an incentive to increase states' efforts at revenue generation, the federation account transfer does not appear to have any significant equalization effect. Oil-availability has also fundamentally altered governance in Nigeria. Like most other oil-producing countries, Nigeria has suffered from poor institutional quality stemming from oil, a factor which has contributed to lower long run annual growth of 5 percent [15].

### **Resurgence of Efforts at Alternative Energy Source**

For too long, several emerging and low income economies have been run on proceeds from crude oil exports.<sup>3</sup> Many of them including Russia, Saudi

<sup>3</sup> Aside Canada and the United States, all the other countries in the list of the world's top crude oil producers are developing economies – Saudi Arabia, Iran, Iraq, Nigeria, Kuwait, Libya, United Arab Emirate, and several others. And these developing oil exporting countries are highly dependent on crude oil earnings for their economic survival. In some instances, crude oil revenues account for up to 80 to 90 percent of their total export earnings. Huge reserves of fossil energy have become a revered and effective socio-economic and diplomatic weapon in the hands of the discerning wielders, and an effective management of earnings from these resources has changed the socio-economic fortunes of several nations, almost overnight. A typical example is the United Arab Emirate which within few decades was transformed from a backward, insignificant desert country to a country that today hosts some of the world's best architectural masterpieces – all thanks to the billions of dollars of annual earnings from crude oil exports. In fact, several of the oil producing developing nations are rated among the fastest growing economies of the world as they leverage their relatively huge fossil energy commodities earnings to build strong socio-economic and physical structures.

Arabia, Iran, Iraq, United Arab emirate, Kuwait and Nigeria have depended heavily on crude oil revenue for the development of much needed infrastructure and management of public services as they strive to catch up with their highly developed western counterparts [3]. And with oil proceeds, several of them have been able to reverse or ameliorate high rate of poverty in their countries; create jobs for their teeming youths; and build healthcare facilities and other needed social infrastructures. Some of them have also been lifted from their previous low income economic status to medium income ones – thanks to their highly-in-demand oil and gas resources [21]. Several of these countries have set medium and long term strategic economic and developmental visions for themselves, benchmarked on their actual and projected favourable earnings from current and future crude oil sales. In fact, if the oil resources continue to flourish at the current rate (unhindered), in the next few decades, some of the low income oil exporters today would have moved up to occupy a position in the list of the biggest economies of the world.

But the story is about to change. Responsible for this impending change is the bad name that crude oil, coal and natural gas had earned in the international arena, especially owing to their proven negative impact on the human environment [22]. According to the United States' Environmental Protection Agency (EPA) quoting from [12], "the largest source of greenhouse gas emissions from human activities in the United States is from burning fossil fuels for electricity, heat and transportation". The continued consumption of fossil fuel has been identified as posing dangers to human health, the natural environment and the wellbeing of unborn generations. Up to date, fossil fuels (coal, oil and natural gas) have been the main source of energy, meeting three-quarters of total world energy needs [23]. However, rising concerns about the security of energy supplies have led to a global search for alternative energy sources. Sustainability is a key factor influencing the long-term viability of any energy resource, and it comes as no surprise that it is at the forefront of the global campaign to abandon the use of fossil fuels. The drive for sustainable energy is not propelled by concerns over energy security alone. Fossil fuels have been a major cause of adverse environmental and social consequences such as climate change, air pollution and mining accidents [24]; [25]; [26] and [27].

Renewable energy<sup>4</sup> constitutes a panacea of sorts, offering solutions to every one of the problems posed by the use of fossil fuels and other conventional energy sources [28].

Very many reasons have been given for the growing outcry against fossil fuel consumption (coal, natural gas and of course, crude oil). But chief among these today is the fact that fossil energy releases carbon dioxide into the atmosphere when it is burnt. This released carbon (a type of greenhouse gas) traps heat and makes the planet warmer than it should be, causing climate, global warming and severe damages to the human eco-system.

Indeed very few exporting countries including Nigeria produce a variety of crude oil called 'light sweet crude'. This variety of crude is in high demand in the global commodities market because it is, among other magnificence features, low in carbon and therefore poses lesser damage to the human environment. But this still does not make the country immune from the growing 'fossil fuel most-go' campaign that is intensifying around the world, especially in the most industrialized nations. Unfortunately, these industrialized nations are the biggest and most important customers of crude oil exporting countries.

The United States President Barrack Obama in his speech captioned "Oil & Alternative Fuels" quoting from [29], stressed the point when he said that "the issue of climate change is one that we ignore at our own peril. There may still be disputes about exactly how much we are contributing to the warming of the earth's atmosphere and how much is naturally occurring, but what we can be scientifically certain of is that our continued use of fossil fuels is pushing us to a point of no return. And unless we free ourselves from a dependence on these fossil fuels and chart a new course on energy in this country, we are condemning future generations to global catastrophe" With these new

<sup>4</sup> Renewable energy sources, commonly referred to as 'renewables', include solar energy, wind energy, biomass, hydro (water), geothermal energy and tidal energy. Several definitions of renewables have been proffered. [30] define renewable energy as 'energy obtained from the continuous or repetitive currents of energy recurring in the natural environment'. [31] remarked that renewables produce 'energy flows which are replenished at the same rate as they are used'. Whatever the definition, the concept remains the same: renewable energy sources, in contrast to fossil fuels, are environmentally friendly, ubiquitous, self-replenishing, infinite, and consequently considered world-wide as the way of the future.

realities on the negative impact crude oil production and consumption has on the environment, the developed economies which are the biggest consumers of crude oil have started to search frantically for alternatives to fossil energy.

Moreover, aside from the concern for the environment, there are other numerous reasons why the western developed nations and several other developing economies are now anxiously searching for more 'sustainable' energy options. Some of them as articulated by [3] include:

**1. High cost of crude oil** – From an average of about \$30 per barrel ten years ago, the price of crude oil had in July 2008 risen to about \$147 before falling to the current levels of around \$100 – 120 per barrel. For economies like the United States and China that import billions of barrels per year, this is indeed a huge spending burdens which is ultimately passed on to the end consumers – households. In fact, in the United States, energy spending constitutes one of the highest priced items in the monthly expense list of households. Households in that country spend about 4 percent of their total monthly pretax income on gasoline purchases.

The US Energy Information Administration (EIA) reported that in 2012, an average US household spent an estimated \$2,912 on the purchase of gasoline. If this sum is multiplied by the total number of US households (estimated at about 115,031,000 as at December 2012), it means that the country's households spent over \$334 billion on just gasoline consumption alone that year.

**2. Incessant Supply Disruptions** – Another reason why the western developed nations are struggling to break away from the age long dependence on crude oil consumption is the uncertainties that surround its supply. Because crude oil is predominantly produced and exported by the developing economies, some of which are prone to periods of social, political and civil unrests (for example, the recent Arab Spring, the Gulf wars, the Israelis-Hamas crisis and several others), crude oil availability and supply is never fully guaranteed, leaving the consumer nations perpetually at the mercy of the net exporters and their national circumstances at different points in time.

**3. Erratic Price Movements** – Another problem with crude oil dependency is that the prices of the commodity are hardly ever stable over time. The

world has witnessed countless instances of major sudden upswings and down-swings in the pricing of crude oil - developments that have resulted in severe economic distortions and in some instances, had been partly blamed for regional and global economic recessions. The global economic crisis that occurred between 2007 and 2009 for example, was blamed partly on indiscriminate and uncontrollable spikes in the prices of crude oil. Any sharp rise in crude oil prices results in a sharp cut in the disposable income of global households, reduced savings, standard of living and increasing the cost of living in households around the world. Experts have also calculated that such spikes trim down global growth prospects anytime they happen.

**4. The Fear of Peak Oil** – Experts have warned that global crude oil reserves and production may have peaked as far back as in the 1960s and may already have entered a period of terminal decline [32]. In other words, any time from now, crude oil reserves may begin to dry up, leaving the world struggling with an unprepared withdrawal symptom. If this actually happens, every country of the world, developed or developing would be in serious crisis since no one country today can boast of having found a viable, sustainable source of renewable energy that could replace crude oil. So, one of the reasons why countries of the world are beginning to 'withdraw' from their over-dependence on crude oil is to be able to find ways to adjust to a possible world where there would be no more crude oil. Since none of them would like to be caught unawares, countries have tasked their best brains, researchers, scientist and industrialists to work out ways to move from fossil to renewable energy sources which would be clean, environmentally friendly, cost effective (at least, in the long term) and sustainable.

**5. Climate Change and GHG** – Another reason why the world is waging a war against crude oil usage is the negative impact the fossil has on the human and natural environment [33], [34] and [35]. Carbon emission from fossil fuel is known to pollute the environment and cause the much dreaded global warming. Reducing global consumption of fossil fuel is a crucial countermeasure for global warming. In fact, this has become the most important reason why the 'crude oil must go' campaign is being waged around the world, championed by the OECD countries. And it will not be long before the developing economies of the world join fully in this campaign. China, South Korea and several other developing economies are already in the forefront of the struggle to find alternatives. This has resulted in the ambitious search for renewable energy sources that are

environmentally friendly and less costly in the long term.

Zee News (India) in a report quoting from [36] “Carbon emissions from fossil fuels to impact global warming” published on August 06, 2013, cited the outcome of a new study by Richard Zeebe at the University of Hawaii on the impact of fossil fuel on climate change. According to this report, ‘over the past 250 years, human activities such as fossil fuel burning have raised the atmospheric CO<sub>2</sub> concentration by more than 40% over its pre-industrial level of 280ppm (parts per million). In May 2013, the CO<sub>2</sub> concentration in Earth’s atmosphere surpassed a milestone of 400ppm for the first time in human history, a level that many scientists consider dangerous for its impact on Earth’s climate. The globe is likely to become warmer in the near future and probably a lot warmer in the distant future.

Experts have repeatedly warned that climate change and global warming have the potential to destroy the earth and its biodiversity, reduce water quality and availability, destroy the soil and agricultural productivity and if left unchecked, render the earth uninhabitable for humans and other living organisms. This fear is perhaps the single most important reason why the world is now striving so hard to reduce the consumption and heavy dependence on crude oil.

## **MEASURES TO RID THE WORLD FROM FOSSIL FUEL DEPENDENCE**

The western developed nations had in the last few decades conceived initiatives that would adequately prepare them for a crude oil-free world. The objective seems to be, to achieve a lifestyle that is similar to the pre-industrial age when fossil energy (petroleum, coal, and natural gas) had not become an indispensable part of our every day existence [3].

Some of the measures being taken to rid the world of crude oil include a campaign to drastically reduce fossil energy consumption. Individuals, communities, businesses and even governments are being educated on the ecological and economic disadvantages of a continued over-reliance on crude oil. The impact of the burning of fossil on the natural and human environment is being preached with the dangers of climate change and atmospheric carbonation as the

major weapons of fear that are being unleashed. Some other initiatives include:

### **1. Adoption of Transition Town Initiative**

Several communities in Europe and America are beginning to adopt the Transition Town Initiative.<sup>5</sup> Transition Towns endeavor to achieve self sufficiency and break away from over-dependence on fossil fuel usage. Today, there are thousands of Transition Towns around the world, located mostly in western countries, and with the mandate to change people’s way of life to one that is free from the traditional dependence on fossil fuel and make the natural environment cleaner and greener.

In addition to Transition Town initiatives, businesses are being encouraged and (in some instances) regulated to reduce their carbon imprint on the natural environment. Some of the ways this is being achieved is by reducing their consumption of fossil and devising energy saving business policies and practices. The introduction of the controversial carbon credit, which in layman’s language is a way of rewarding or sanctioning environmental friendly or unfriendly practices, is another measure being taken by the western economies to compel businesses to go ‘green’.

### **2. Development of Renewable Energy**

Governments and businesses are also being encouraged to invest in the development and production of renewable energy including wind, thermal (sun), hydro (water) and other forms of sustainable energy. In several countries, policies and practices are being put in place to ensure a calculated reduction in fossil energy usage and an increase in the proportion of renewable energy in the total national energy mix cover within a specified period of time (IEA, 2009). Some countries are already implementing rewards and penalty systems for compliance with or defiance of laid down renewable energy and environmental enhancement policies.

### **3. Development of Ethanol**

The development of ethanol from food commodities and recycled waste is also gaining prominence around the world, even though this had come with severe criticisms, especially owing to the

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<sup>5</sup>Transition Town is an initiative that was conceived by the Irish man and permaculture instructor, Rob Hopkins, between 2005 and 2006 as part of his students’ project work. The whole concept is borne out of the need to adapt to a world threatened by two major phenomenons – the Peak Oil and climate change. And these twin problems are fallouts of man’s over-reliance and over-consumption of fossil energy in his everyday life.

impact of the technology on food price and availability, among other sustainability concerns. Researches' are also ongoing on the possibility of using water and other non fossil commodities to power automobiles and other industrial and domestic machines, all in the bid to find a way around what has become a problematic fossil fuel production and consumption pattern.

#### 4. Development of Shale Oil

The global media had been replete with news about the increasing focus of the United States on the exploitation of its shale oil reserves<sup>6</sup>. The world is estimated to have shale oil resources that could yield up to the equivalent of almost 2 trillion barrels (about 400 billion cubic metres) of oil, deposited in about 600 locations around the globe. This is almost twice the estimated total global crude oil reserves of 1.3trillion barrels. The United States holds the world's largest shale oil reserves with an estimated yield equivalent to about 1 trillion barrels (160 billion cubic metres). China also has a major shale oil reserve that could yield up to 4 billion metric tons.

Despite growing fears among oil producing developing economies on how shale oil exploration in the west could displace the demand for crude oil, shale oil production and consumption is as 'unsustainable' as crude oil for several reasons. To start with, shale oil production and consumption has virtually all the environmental challenges for which crude oil is being persecuted – air pollution, soil erosion, water degradation, and the release of greenhouse gas. Moreover, shale oil production is much more expensive and even more environmentally damaging. While the West and other economies like China and Brazil that has shale oil reserves in abundance may continue to exploit it for their convenience from time to time, especially during periods of high crude oil price or supply disruptions, it is never likely that shale oil would become a sustainable alternative to crude oil, now or in the future. In fact, for reasons of its negative environmental impact and high costs of production, shale oil is as endangered as crude oil. Shale oil is not the major threat to crude oil – the search for renewable energy is still on.

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<sup>6</sup> Shale oil is an organic, fine grained sedimentary rock that contains chemical compounds called kerogen. When heated at high temperature, shale oil undergoes a process that releases vapour. And when cooled, this vapour generates shale oil (different from conventional fuel) as one of its byproducts. Shale oil could be used to perform much of the functions that crude oil byproducts also perform. It is therefore an alternative to crude oil.

#### 5. Improved Extraction Technology

In North America, the natural gas future closed the year 2012 at US\$3,351 per million BTUs (British Thermal Units) which means it sold for the oil equivalent of US\$19.41 per barrel or about 25% of the price of oil for the same amount of energy delivered. The quest for US energy independence has been bolstered by new drilling techniques and technology (horizontal drilling and hydraulic fracturing, simply known as fracking). While fracking is not totally proven yet – there are some extreme doubts about its environmental credentials, but if those approved fracking sites continue to produce at current rates in the United States, natural gas will continue to displace oil in factories, home heating, and displace coal (not a green fuel) in electric power generation. Natural gas is also being seen more and more in transportation as cars and large vehicles are now being converted to run off liquefied gas. In other words, natural gas will decrease US oil consumption, and in the process take some pressure off global oil demand. Combine this with the enhanced US extraction technology for crude and the net result is that the world's spare capacity or 'safety cushion' for oil is expected to roughly double to 5.7 million barrels per day in 2017 – a safety cushion size the world has not seen since before 2003 [37].

While western economies are intensifying efforts to find alternatives to fossil fuel, several countries, especially the oil producing ones, still consider much of the talks on 'alternatives' as a propaganda aimed by the west to discredit crude oil as a commodity – or as they put it, an effort to 'give the dog a bad name in order to hang it'. Some even prefer to assume that there can never be an alternative to crude oil. But the situation has gone past the issue of assumptions. It is about time to face the emerging reality. For the oil producing nations, the bubble seems about to burst and it is time to start taking much more seriously, that issue that had been treated with lip service for way too long – the need to diversity their economies away from the current over-reliance on crude oil earnings. Sooner than we know, demand for crude oil may drop as more countries find ways of producing renewable energy. And with the billions of dollars that are being invested in research and the development of renewable energy, it might not be long before a cost effective, sustainable alternative to crude oil is found.

#### ALTERNATIVE ENERGY SOURCES – TACTICAL OPTIONS FOR NIGERIA

While the crude oil consuming nations are wailing about the negative impact of fossil consumption on the eco-system, for the oil producing nations like Nigeria, it is actually a double jeopardy. Not only do they also suffer the same damages to their natural environment owing to their consumption of the commodity, they also face another critical challenge – the negative impact of the exploration of crude oil on the human and ecological environment. The experiences in Nigeria's Niger Delta and several other oil producing communities attest to this problem. The negative impact of gas flaring, oil spills, degraded soil, debased aquatic life, loss of flora and fauna biodiversity, are some of the numerous environmental repercussions suffered by oil producing nations as a result of oil exploration activities. And because of this double impact, ideally the oil producing economies should be even more concerned about finding alternatives to oil in the long term than the oil consumers.

The world's major oil consumers are putting measures in place to finally do away with their centuries-long overdependence on crude oil. But what do the major oil exporters need to do to be able to finally do away with their over-dependence on crude oil proceeds? For Nigeria and other oil exporting nations, the following are tactical options they can explore to prepare their economies well in advance for a future world without oil.

### **1. Diversification of the Economy**

The first thing oil producers like Nigeria must do are the same old sermon – diversify their economies away from crude oil dependency, for the reasons that the West is right now diversifying away from crude oil consumption, much more. For a start, climate change is not a Western problem, it is a global danger. Carbon and greenhouse gas emissions is also not a Western challenge, it is a global one. If the sea levels around the world rise to uncontainable levels, the resulting devastation will not be restricted to the Western world; it would be a global crisis if the earth comes crumbling down owing to the constant violations on it arising from massive cases of deforestation, greenhouse gas emissions, climate change and global warming, it will not be caving in on Western economies alone but on all humans. Diversifying away from crude oil has gone beyond being a political or economic issue – it is now an ecological one and a moral responsibility of all nations, including nations that today earn tens of billions of dollars from the export of the commodity.

Also, there should be stricter regulations and implementations of environmental laws. The current environmentally degrading practices which leave oil spills unattended and destroy the eco-system with impunity need to be addressed. The least oil explorers could do in the short term is to improve on their environmental impact assessment and management practices to reduce the ecological impact of their exploration activities.

### **2. Development of Alternative Energy Sources**

Another measure crude oil exporters should take is to begin to find alternative sources of energy for themselves. The whole world has now seen the 'unsustainability' of the over reliance on crude oil. Oil producing economies are not immune to the crisis that could follow should we all wake up one day to discover that oil wells have dried up. The rest of the world is preparing to hedge such a development; and so should the major oil exporters. Luckily, sources of renewable energy actually abound in several of these countries – sunshine for thermal energy, wind for wind energy, water for hydro energy, among others. African major oil producers such as Nigeria, Angola and Libya are also currently fighting the problem of inadequate electricity supply. Leveraging these natural, renewable sources of energy would enable them use one stone to kill two birds.

### **3. Paradigm Shift in Energy Consumption**

Energy efficiency should become a way of life. People should learn to walk again as was the tradition in the days of old, instead of bringing our own cars to embark on journeys that are just few kilometers away. People should learn to ride bicycles on the streets again, while local authorities should ensure the safety of such commuters by building walkways and bicycle pathways. There is also the need to develop the habit of switching off electrical gadgets that are not in use and to learn to deliberately abstain from using energy when there is no pressing need for it. Energy wastefulness is one of the scourges to fight in the new dispensation.

### **4. Establishment of Energy Research Centres**

It is time that major oil producing developing nations begin to establish full fledged agencies dedicated strictly to Renewable Energy research and development. It is also time to train and retrain the workforce on major global emerging trends – sustainable development, renewable energy, energy efficiency, waste management and recycling,



environmental preservation, bio-degradability management, and several others. Delay is indeed dangerous as most of these oil exporters are already far behind in the global campaign to walk away from fossil energy and go 'green'.

#### **5. Exploitation of other Natural Resources**

Luckily, several of the major oil producers in Africa and Asia have other commercially viable natural resources at their disposal. It is time to invest in their sustainable exploration and development. Also, businesses must begin to see the transition towards renewable energy production and usage as their corporate social responsibility. In fact, this should become a major performance measurement indicator going forward. In addition to the gradual reduction in fossil energy usage, at the communal, national, individual and corporate levels, energy efficient bulbs and home appliances should be introduced in existing and new buildings; waste and recycling bins should be deployed in strategic locations and made accessible to all.

#### **6. Enthronement of Stable Macroeconomic Environment**

Government of oil dependent economies like Nigeria must begin to create a very conducive environment for businesses of all sizes to thrive, to attract local and foreign investors. The small and medium sized enterprises must be encouraged with the provision of necessary infrastructures, access to funding and a favourable tax regime. The blossoming local industries must also be protected from harsh and unfavorable competition posed by imported goods and services. The development of the productive sector is one way to diversify the economy, provide jobs, enhance the quality and standard of living and fight the scourge of high poverty rate prevalent in several developing and low income economies.

#### **7. Improved Investment in Agriculture**

Massive investment in agriculture should be implemented, along with policies that encourage environmentally friendly agricultural practices that do not destroy the forests or downgrade the natural environment. A flourishing agricultural sector would ensure food security and self sufficiency in one of life's most indispensable need – food. It is also a way to protect the local economy from imported inflation, high food costs and possible supply disruptions and shocks. A viable agricultural industry would also provide meaningful employment for the populace and alleviate

the scourge of poverty and hunger while also diversifying the sources of local and foreign exchange earnings.

#### **8. Inculcation of Culture of National Savings**

Also, it is time for oil producing economies that have not already inculcated the practice to begin to save their crude oil earnings for future generations and invest in projects that are sustainable and with the potentials to turn around their economic fortunes. Nigeria has taken a step in this direction with the establishment of Excess Crude Account in 2011. The Government of Nigeria must continue to invest heavily in this Account. It is also time to ensure fiscal and monetary prudence and avoid wasteful spending that do not in any way impact on the socio-economic bottom-line. It is time to fight corrupt practices in public administration and ensure a transparent and efficient management of crude oil and other natural resources.

#### **9. Massive Investment in Education and Skill Acquisition Programs**

Also, preparatory to that era when there will be no more billions of dollars in foreign exchange to be earned from crude oil exports, major oil exporting countries should begin to build a viable, educated, skilled and globally competitive workforce. This would go a long way in encouraging innovation, entrepreneurship and a sustainable economic diversification.

### **CONCLUSION**

It is important to state the fact that fossil energy producing economies are not in any way immune to the current concerns about the negative impact of fossil consumption on the environment. It is a global problem and of global concern. The oil producing economies should not see ongoing campaigns against fossil fuel consumption as a façade or another western-styled imperialist tool. This time, the threats are real and no economy should be caught unawares.

Also, it is important for developing economies to understand that the efficient management of crude oil resources is the only way they would be able to use oil wealth to build a lasting legacy. In fact, one could call this the era of consolidation of oil wealth, preparatory to the worst possible outcomes. Oil reserves may not last forever, but they can utilize what they earn from the commodity today to build solid economic structures and generate sustainable wealth that the future generations

could leverage. With the threat of Peak Oil, this might be the only way to convince posterity that ‘once upon a time’ there were huge oil reserves and great oil wealth in these major exporting countries.

From all indications, the world seems all out to get rid of fossil fuel consumption. And it is time for crude oil resource dependent economies to begin to chart a new economic path for themselves. If they fail to do this, and quickly too, the end result could be economically catastrophic.

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