

A REVIEW OF THE ENVIRONMENTAL EFFECT OF NON RENEWABLE RESOURCES IN NIGERIA

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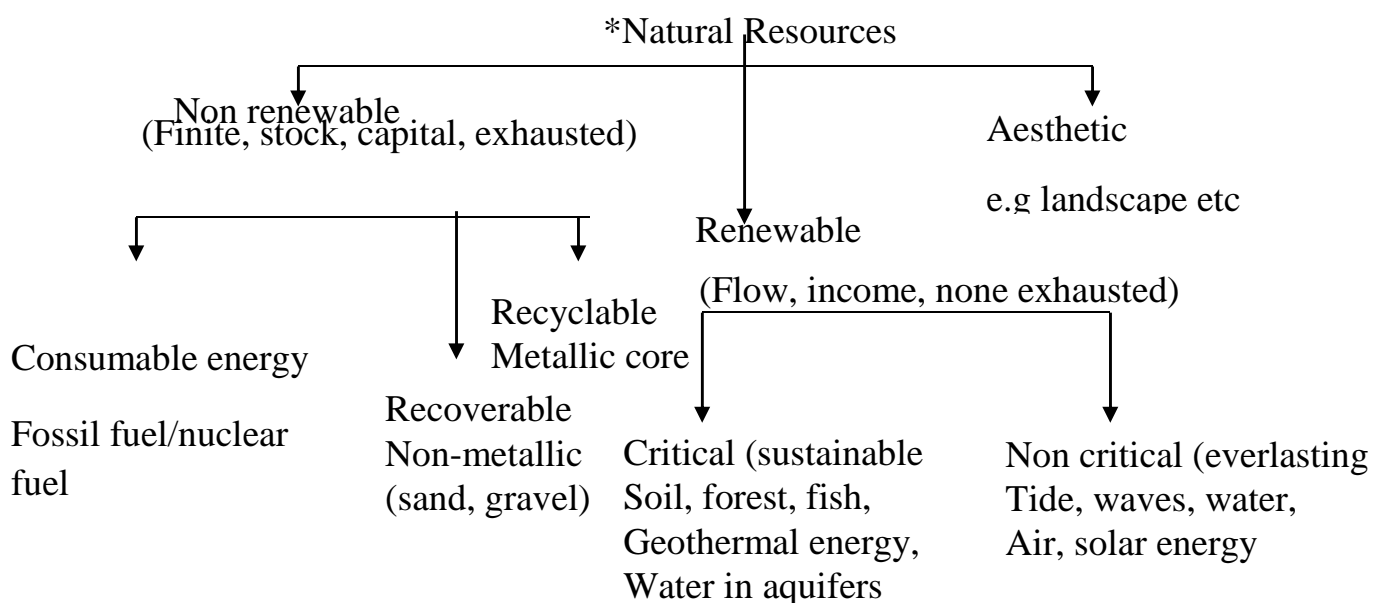
Abstract

Non renewable energy source are natural resource which are divided into two, nuclear fuel and fossil fuel. In Nigeria, unclear fuel is not well developed but fossil fuel is the major source of energy use in the country. Fossil fuel includes coal, petroleum and natural gas, play an important role in Nigerian economy. This study reviews past work on environmental effect of non renewable energy source and apply it to Nigeria situation. The non renewable energy sources have helps Nigeria to improve their standard of living; unfortunately, it has tremendously damage the environment by affecting the existence of humans. The environmental effect of fossil fuel has two dimensional effect; the localized effect and the globalize effect. The localized effect is the effect of fossil fuel within the area of extraction, transpiration, refining and consumption; this manifest in the following ways pollution (Air, noise and water), forest degradation soil and land degradation, wildlife disruption land subsidence and drilling mud release. Globalize effect of fossil fuel is the effect of fossil globally and it take the following form, air pollution, acid rain, global warming, sea level rise, Ozone layer depletion, effects on human health and other organism, the environment problems which of fossil fuel has cause can be minimized by adopting the following measured by improving the efficiency of petrol engines and outright banned on second hand cars, conservation of energy and alternate source of energy are developed to reduced carbon dioxide in the atmosphere.

Key words: Natural resource, non-renewable energy, fossil fuel, pollution.

Introduction

Nigeria is a country that is abound with natural resources. Among these resources, we have the non-renewable energy resources otherwise known as consumable energy sources which is the main economy stay of the country. Figure one (Fig. 1) shows the classification of natural resources after the model of Guinness and Nagle (2002) with slight moderation by the author of this paper.



Source: Guinness and Nagle (2002) with slight alteration

Fig.1. A Classification of Nature Resources

Byrne (2001) observed that energy play an important role in many aspect of modern society and the technological exploitation of energy source has enable developed economics to attain a high standard of living for much of the population while the developing countries like Nigeria are keen to follow suit. Nigeria energy demand has increase tremendously over the years and this projection is expected to increase in the future as most under developed areas are now being developed and the rate of urbanization is increasing day by day couple with the ever increasing population of the country with a higher energy demand.

This paper reviews past work on the environmental effect of nonrenewable energy sources and apply it to Nigeria situation. The author provide no new evidence about the environmental effect of nonrenewable energy resources but rather use current available data to derive policy recommendations regarding the environmental effect of nonrenewable energy resources as applicable to Nigeria situation.

Non Renewable Energy Resources

Non renewable energy resources are substances which can be used up because they are finite resources which can be exhausted or depleted, if the rate of utilization exceeds that of formation. Hesser and Leach (1989) noted that non renewable energy resources are accumulations or concentration of useful materials from the earth's crust that cannot be recycled to replaced within a useful period of time. But, Blunden and Reddish (2003) observed that the energy cycle is one way process turning natural resources into useful energy and unwanted by products. The cycle of fuel can take hundreds of millions of years, that is, turning plants materials formed by photosynthesis form carbon dioxide back into useful materials of energy substances.

Non renewable energy sources are classified into two types, mainly nuclear fuels and fossil fuel. Unclear fuel or energy is formed through radioactive processes of fission of materials over billions of years. This type of energy is not well develop in Nigeria, though, the mental, uranium is available in the country. Just of recent, the federal government has started embarking on nuclear power station in Kaduna State, which is yet to produces energy. This paper therefore lay more emphases on the environmental effect of fossil fuels use in Nigeria.

The Fossil Energy (Fuels)

Fossil energy are originated from remains of organic matter that are preserved in the earth's crust (Byrne (2001, STS). But the energy released from burning fossil fuel is obtained from solar radiation that has been converted into biomass through photosynthesis and then store in fossil form (Byrne 2001) and Blunden and reddish (2003). During the burning of fossil fuel, light and heat is being given off as a result of the released of hydrogen gas and carbon substances which is contained in the fuel (STS)

Fossil fuel includes the following fuels, coal, crude oil, natural gas and synthetic fuel (gas from coal). Coal is made up of sedimentary rock and it comes in different form. Peat is a soft substance made up of decayed plant fibers; lignite is a brown coal, soft and feverish in texture; Bituminous is a dark black coal and the most abundant; and anthracite is a very hard and brittle coal which is like pure carbon (Byrne (2001) and STS).

Coal comes with impurities such as carbon, substances, clay minerals, sulphur substance, carbonate, and salt, iron pyrites (Blunden and Reddish. (2003). During the combustion of coal, many of these substance (impurities) are released to the atmosphere. No wonder during the reign of King Edward 1 of the England, he banned the use of high sulphur –type coal (sea coal) in 1307 because its use caused an intolerable smell to permeate the neighborhood annoyance and the injury of bodily health (STS).

Crude oil is produce by a geological processes acting on buried plant remains (Blunden and Reddish (2002). It contains numerous hydrocarbons. The crude oil occur together with natural gas and in the process of extraction of crude oil, natural gas is being released to the atmosphere as in the form of gas flaring. The oil extracted from the ground is called crude oil because it contains impurities such as nitrogen, oxygen, sulphur and some trace element (Byrne (2001). But when it refined, it called petroleum and all liquid fossil are group as petroleum (STS) see Table 1 showing the different groups of petroleum products and their numbers of carbon present in each group.

Table 1: Petroleum Products

Petroleum	Carbon			Content
Gas methane	1	-	-	3
Gasoline (petrol)	4	-	-	10
Kerosene (paraffin)	11	-	-	13
Diesel fuel	14	-	-	18
Heavy gas oil	19	-	-	25
Lubricating oil	26	-	-	40
Waxes	40<			

Sources; Blunden and Reddish (2002)

Natural gas is produced in two different ways. First, is through coalification (i.e. the process of forming coal) which is called synfuel (dry natural gas) and the second, is through the process of maturation (i.e. the process of forming crude oil) which is called wet natural gas (Byrne 2001).

Coal, petroleum and natural gas are the main sources of energy for industry, transportation and homes (STS). They are important asset to Nigerians, providing energy that allows Nigerians to progress in various ways. See Table 2 explains the types of uses of fossil fuel in Nigeria.

Table2: Uses of Fossil Fuel in Nigeria

Fossil fuel	Uses
Coal	Electricity generation, heating etc
Petroleum	Transportation, petrochemicals, electricity generation, cooking, heating
Natural gas	Heating, cooking, electricity generation

Sources: compiled by the author

As the population increases couple with rising income so, is the demand for energy increases too, leading to the increase production and importation of these fuels. See Tables 3 and 4; also the numbers of power stations has been increasing day by day with the establishment of independent power plant (IPP) which allow cooperate body organization to embark on power project in the country. Almost every state government has embarked upon a power project to generate electricity to improve the development of infrastructure, (roads, railways and distribution centers) and industrialization.

Table 3: Nigeria: Crude Oil Production -1958-2002 (thousand Barrels)

Year	Daily Average	Total Production
1958	5.1	1,876
1959	11.2	4,096
1960	17.2	6,367
1961	46.0	16,082
1962	67.5	24,624
1963	76.5	27,913
1964	120.2	43,997
1965	274.2	100,065
1966	417.6	152,428
1967	319.1	116,462
1968	141.3	51,732
1969	540.3	197,204
1970	1,083.1	395,331
1971	1,531.2	558,888
1972	1,815.7	664,546
1973	2,054.3	749,820
1974	2,255.0	823,064
1975	1,783.2	650,885
1976	2,066.8	756,449
1977	2,085.1	761,062
1978	1,897.0	692,405
1979	2,302.0	840,30
1980	2,302.0	840,230
1981	1,439.6	525,457
1982	1,287.0	469,755
1983	1,235.5	540,975
1984	1,388.0	507,088
1986	1324.0	535,929
1987	1324.0	483,269
1988	1451	529,602
1989	1714.8	625,908
1990	1809.8	660,559
1991	1890	689,850
1992	1948.9	711,340
1993	1894.2	691,400

1994	1907.4	696,190
1995	1906	715,400
1996	2027.9	740,190
1997	2081.4	759,710
1998	2126.5	776,190
1999	2134	778,900
2000	2185.8	797,800
2001	2238.8	817,150
2002	1878.8	685,773

Source: Adeyomo (2008)

Table 4: Nigerian Natural Gas Production and Disposal 1970-2005 (Million Cubic Meters)

Year	Total production	Quantity Utilized	% Total	Quantity flared (Tcl)	%Flared
1970	8.04	0.72	8.96	79.62	91.04
1971	13.0	1.85	14.23	127.9	85.77
1972	17.1	2.74	16.02	168.5	83.98
1973	21.9	3.95	18.04	214.9	81.96
1974	27.2	3.94	14.49	267.8	85.51
1975	18.7	3.23	17.27	183.3	82.73
1976	21.3	6.59	30.94	206.2	69.06
1977	22.0	9.72	44.18	209.5	55.82
1978	21.3	18.66	87.61	194.4	12.39
1979	27.6	15.46	56.01	260.7	43.99
1980	24.55	3.64	9.53	22.21	90.47
1981	17.11	3.64	21.27	13.47	78.73
1982	15.38	3.24	22.37	11.90	77.37
1983	15.19	3.44	21.33	11.95	78.67
1984	16.25	4.65	21.17	12.81	70.83
1985	18.57	4.82	25.04	13.92	74.96
1986	18.74	4.98	25.72	13.92	74.28
1987	17.17	5.51	29.00	12.19	71.00
1988	20.25	6.30	27.21	14.74	72.79
1989	25.13	6.02	25.07	18.78	74.73
1990	28.43	6.80	21.17	22.41	78.83
1991	31.46	7.06	21.62	24.66	78.39
1992	32.47	6.97	21.7	25.41	78.3
1993	33.07	6.67	21.1	26.10	78.9
1994	32.70	6.75	20.6	25.96	79.5
1995	32.98	6.91	20.9	26.07	79.0
1996	36.61	9.97	27.23	26.64	72.8
1997	32.34	9.64	29.81	22.70	70.1
1998	37.61	13.96	37.73	24.23	62.27
1999	40.32	15.00	39.88	22.61	60.1
2000	52.45	18.76	46.53	21.56	53.47
2001	46.79	25.67	49.00	28.35	51.00
2002	51.52	25.71	54.95	21.08	45.05
2003	60.39	27.04	52.48	24.48	41.10
2004	60.39	36.23	60.00	24.26	40.00
2005	59.25	36.26	61.20	22.99	38.80

Sources: Adeyomo (2008)

These entire power project coming up in the country has one common raw material, “fossil fuel” which is the major source of pollution in the world (Folorunso and Folorunso (1997) Bunden and Reddish (2003) and STS).

The Environmental Effect of Fossil Fuel

Fossil fuel play a vital role in Nigeria but its effect is unquantifiable in many ways. Just as, Barry commoner (1972) in Doob (1991) suggested that within the environment all the parts are interrelated and that a change in one part of the system causes changes in other parts. Also nothing just disappear. Pollution will simply move from on place to another or perhaps it will be transformed and nature is enormously complicated. He further stated that environment is like a watch. If you close your eyes and poke a pencil into the works, the watch might run better, but the chances are it will be seriously damaged. The odds that 'poking around' in the environment has been and will continues to be harmful are overwhelming. Base on this suggestion, the environmental effect of fossil fuel has two dimensional effects, the localized effect and globalize effect. See Table 5.

Table 5; *Effect of Fossil Fuel on Environment

Pollutant	Sulphuur Dioxide	Airborne particulates	Carbon monoxide	Ozone	Nitrogen Dioxide
Sources	Combustion of fossil fuels	Coal burning cause black smoke vehicle are the major contributors of black smoke	Incomplete combustion of fuel from vehicles, and petrol engines	Secondary pollutant from photochemical reaction	Motor vehicles and power station are the major sources
Health	Causes breathing problems and cardio respiratory diseases	Heavy metals and complex organic compounds are carried into lungs which cause cancer	Deprive body of oxygen by reacting with hemoglobin, it also causes drowsiness and death if inhaled by pregnant women.	It is harmful at ground level height concentration causes lungs infections and coughing and asthma	Increase susceptible to viral infection, bronchitis and pneumonia
Environmental effect	The main constituent of acid rain which damage aquatic life and increases concentration of heavy metal in acidified water, injury to plant, corrosion of building	Soiling f buildings, with cost reduced visibility and odour	React with other chemicals to produce green house gas, methane and oxidizes to carbon dioxide which contributes to global warming	Is a major component of photochemical smog and a green house gas. Damage agricultural crops, forest, plastic rubber and paints	It contribute to acidic rain, at small quantity help plant growth but at high concentrate susceptible to insect attack or damage.

***Sources:** Bob Sigby (1995) with slight modification

The Localized Effect of Fossil Fuel

Localized effect is the effect of fossil fuel within the area of extraction, transportation, refining and consumption. This can take different form. Such as pollution (air, noise and water), forest degradation soil and land degradation, wildlife disruption, land subsidence and drilling mud release.

The effect of pollution can be views as the most damaging and immediate effect of fossil fuels could have been witnessed a couple of hundred years ago in London, England, Smog that dirty combination of fog and smoke from burning coal, caused a great number of Londonites to experience shorter lives span due to respiratory sickness. Today China comes in mind of similar effect. In Nigeria, where power supply is inadequate, most Nigerians are forced to use generators in every nook and cranny of the city, thereby increasing the level of Air pollution. So many lives have been loss due to generator fumes. Apart from that, when these products are scarce, adulteration becomes the order of the day. Of recent, the Joint Military Task Force (J.T.F) discovered about one hundred and fifty seven (157) illegal refineries use in refining petroleum products. These refineries are crude in nature because of the lack of specification of design. These adulterated product causes explosion in the homes of users of these products. For instance, the kerosene explosion in

Lagos, Port Harcourt and Benin City occurred as a result of adulteration. It has affected so many household in the country.

Furthermore, the number of automobile have increased tremendously that most people find it difficult to move freely with their motorbike or car and most of these automobiles are second hand cars popularly called “Tokurambo”, their emission of pollutants like carbon mono oxide is very high compare to new automobiles. See Table 6 indicate the level of emission from petrol engines.

Table 6: Emission Caused by Road Transport

Names of pollutant	Percentage of total emission by road
Hydrocarbons	36
Nitrogen oxide	51
Carbon monoxide	89
Lead	70
Black smoke	42
Carbon dioxide	19

Sources: Byrne (2001)

Water pollution is easily notice in the stream, rivers and ocean as a result of exploration, exploitation, refining and marketing of petroleum products. The activities of Niger Delta militant has increased the level of water pollution in the region by blowing up oil pipelines. This has brought about a decline in biodiversity in the region.

Forest degradation is noticed when exploration of fossil fuel is taken place. The cutting of forest trees has led to deforestation of tropical forest couple with the increase in population and improve standard of living (Folorunso and Folorunso (1979). The impact of forest degradation has affected wildlife and those animals are no more in existence any longer in the tropical region of the country.

Fossil fuel exploration has caused land degradation which in turned accelerate soil erosion and coastal erosion and the spillage of oil on the land had rendered it unproductive for agriculture.

They also observed that the pollution of land and water bodies by oil spills and other exploration activities have led to serious decline in the soil productivity and the formation of acidic rain which are detrimental to food production. Furthermore, the activities of petroleum industry resulted in pollutants discharge into Rivers and creeks of Niger Delta. This pollution affect marine organism and other forms of water bodies' degradation which include indiscriminate disposal of refining effluent into rivers and creeks of Niger Delta. For instance the Port Harcourt Refinery disposes it effluent into the Okrika Creeks.

Globalize Effect of Fossil Fuel

Globalize effect of fossil fuel is the effect of fossil globally that is the effect of fossil fuel can be noticed all over the world. The following explain it effect globally.

Air Pollution

Fossil fuel generates most of Nigerians electricity and transportation. They produce most of the air pollutants. During the combustion of fossil fuel like petroleum and natural gas, large number of carbon dioxide (CO₂) and other green house gases (GHG) are emitted into the atmosphere. Although, carbon dioxide is the least potent GHG, it is the most important contribution to global, warming because of the volume of emission (Byrne (2001).

Acid Rain

Fossil energy source like coal and oil are most important source of sulphurdioxide (SO₂) and nitrogen dioxide (NO₂). These pollutants can dissolve in atmospheric moisture to form sulhric and nitric acids. These are the major component of acid rain (Byrne (2001)

Acid rain is a global phenomenon because these pollutant (SO₂ and NO₂) can be blown thousands of kilometers ways from it origin and fall as acid rain in another area. Such phenomenon is called “Transboundary pollutant”.

Global Warming

Global warming is caused by the release of carbon dioxide and other GHG into the air, which traps heat from the sun in the earth's atmosphere as it was explained earlier that fossil fuel and transportation is the major source of CO₂. Scientists believed that there could be severe droughts, flooding, tornados and temperature

change, if something is not done about it. But the effects have been noticed by the melting of ice and glacier in the polar region.

Sea-Level Rise

Sea levels will rise due to ice and glacier melting and thermal expansion of water. This may cause flooding of low-lying areas, coastal and salinization of soil making them less fertile. (Byrne (2001) this is as result of global warming caused by fossil fuel combustion.

Ozone Layer Depletion

During the combustion of fossil fuel, nitrogen compounds are released into the atmosphere. These nitrogen compounds react with oxygen compound which forms the ozone layer; thereby reducing the ozone layer and permitting the ultraviolet rays from the sun down to the earth.

Effect on Health

Health hazards associated with combustion of fossil fuel are numerous. This can cause diseases like cancer and respiratory diseases like tuberculosis, cancer etc which are direct effect from pollution. See table 5.

The Way Forward

The way forward to prevent such a calamities is; to improve the efficiency of combustion devices in petrol engines and outright banned on second hand cars 'Tojunbo car's in the country. Secondly, conservation of energy, should be adopted by reducing domestic and industrial energy consumption. This can be done either through a cost saving approached by making appliances to be more efficient such as the use of fluorescent light-rather than the normal bulb which consumed a lot of energy. Another approach is, Alternative energy source that do not contribute CO₂ to the atmosphere, such energy source are solar, geothermal, biofuel, waste to energy, tidal power and wind.

These alternative energy sources, if developed, it help in reducing the dependent on fossil fuel.

Conclusion

Non renewable energy source play a very important role in Nigerian economy. Virtually all aspect of the economy depends on fossil fuel, this energy has help Nigerians to improve their standard of living. But it has tremendously damage the environment, by affecting the existence of humans. This takes different dimension both local and globally, it has caused pollution. Acid rain, global warming, sea level rise, ozone layer depletion and affect human health like cancer, tuberoses and others diseases.

We are in danger, unless adequate measured is taken to improve the efficiency of petrol engines and outright banned on second hand cars, conservation of energy and alternate source of energy are developed to reduces CO₂ in the atmosphere.

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