

In honour of Prof. Ekhaquere at 70
Irreversible investment-scape in Nigeria

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Abstract. This paper examines irreversible investment in the Nigerian Economy. We demonstrate that there are numerous opportunities for irreversible investment in Nigeria. We provide a cursory review of the literature on irreversible investment with emphasis on the determination of the optimal time for an irreversible investment. We examine the investment-scape in Nigeria. The investment-scape in the country contributes to very high uncertainty and hence supports the decision to postpone irreversible investment. This explains some of the apparent anomalies in the Nigeria economy such as importation of petrol when the Country exports crude petroleum products. Possible strategies for enhancing the irreversible investment scape are proposed.

Keywords: irreversible investment, uncertainty, investment opportunities.

1. Introduction

With the largest Africa population and a high deposit of crude oil, Nigeria spends a huge chunk of her foreign earnings in importing petrol. This is one of the apparent anomalies in the Nigerian economy. Certainly, to correct the problem of importing petrol when the Nation exports crude oil requires massive investment in the petroleum sector. A high proportion of the investment in the petroleum sector is irreversible investment.

According to Dixit and Pindyck (1994), an investment in a project is termed "irreversible investment" when the sunk cost in the project cannot be completely recovered should the investor change his or her intention to invest in the project. The change in the decision to invest may result from the availability of new pieces of information on the profitability of the investment. Most industry specific investment are irreversible investments. For example, an investment in the construction of a refinery is irreversible because if an investor in the construction of a refinery should decide to quit because of adverse conditions in the refinery sector, no investor will be willing to pay the sunk cost invested in the construction. In deed, all those in the refinery business will also be aware of the prevailing conditions in the business that may be influencing the investor to sell off. Hence they too will be willing to pay the amount that has been invested.

This paper examines the irreversible investment-scape in Nigeria. In Section 2, we highlight some irreversible investment opportunities in the Nigeria economy. We review the literature on irreversible investment in section 3. Irreversible investment is not a now or never phenomenon. With uncertainty associated with an irreversible investment, most investors will postpone their investment. In section 4, we examine the irreversible investment scape in Nigeria and highlight reasons for postponing some well-advertised investment in Nigeria. Strategies for reducing the waiting time to invest are proposed in Section 5. Finally, we have the conclusions in Section 6.

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2. Irreversible investment opportunities in Nigeria

The Observatory of Economic Complexity (OEC) states that in 2014, Nigeria was the 38th largest export economy in the world and the 125th most complex economy using the Economic Complexity Index (ECI).



Figure 1. What Nigeria exported in 2014. (Source: http://atlas.media.mit.edu/en/visualize/tree_map/hs92/export/nga/all/show/2014. Downloaded 21 February 2017)

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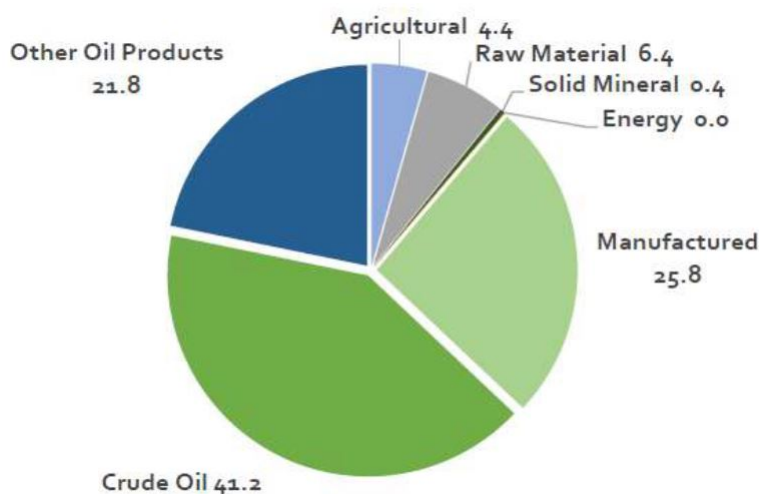


Figure 2. Third quarter Total Trade in 2016 (Source: Nigeria Bureau of Statistics)

Figure 2 shows Nigeria Sectorial breakdown of Total Trade (Export) in the third quarter of 2016. The source is the National Bureau of Statistics December 2016 report on external trade. Observe that oil products (crude oil and other oil products) accounts for 63% of the total export in the third quarter of 2016. A closer look at Figures 1 and 2 show that the main component of Nigeria’s export is crude oil and oil related products.

Figure 3 shows what the USA exported in 2014. A comparison of Figures 1, 2, and 3 shows clearly that Nigeria has room for improvement in her production system. Certainly, the USA exported more products than Nigeria. There are many products that require technological know-how that are produced in the USA but are not produced in Nigeria. Under the worst case scenario, Nigeria can aspire to manufacture goods for her domestic consumption. Figure 4 shows Nigeria imports for 2014.

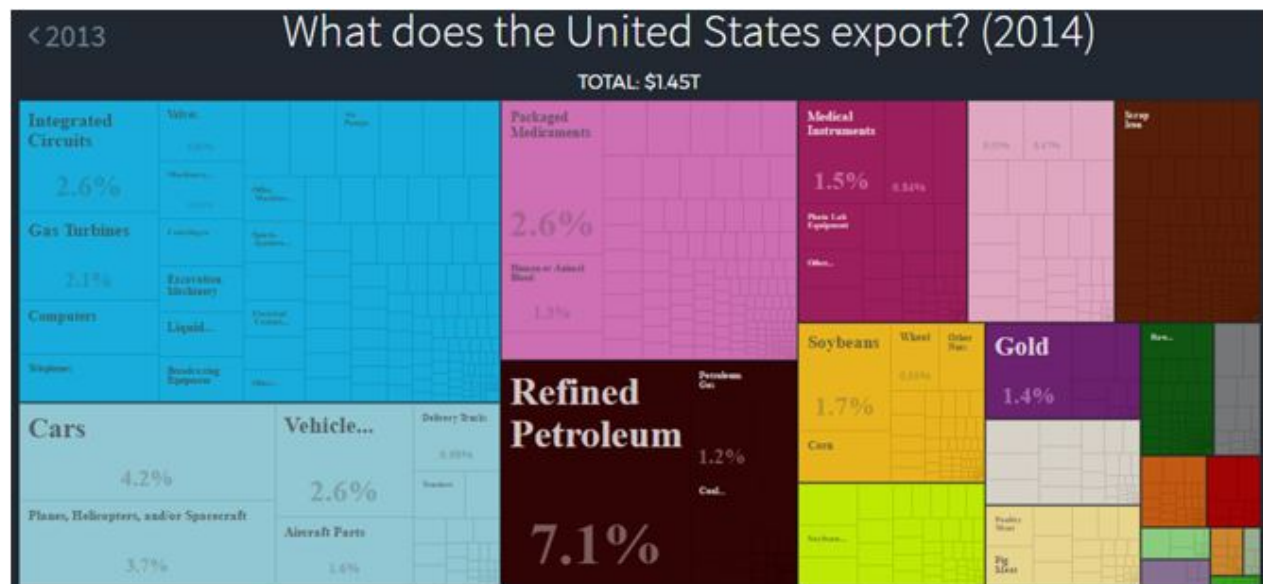


Figure 3. What USA exported in 2014 (Source: <http://atlas.media.mit.edu/en/visualize/treemap/hs92/export/nga/all/show/2014>. Downloaded 21 February 2017)

To bridge the gap (i.e. reduce imports and diversify exports) calls for massive irreversible investment.



Figure 4. What Nigeria imported in 2014. (Source: OEC. Downloaded 21 February 2017)

Ogbuanu (2016) identified ten items with ready market that can be imported into Nigeria. These items include:

1. Mobile phone accessories:
2. Women hair wig and extensions:
3. Fairly used cloths, bags and shoes
4. New clothes, bags and shoes
5. Fairly used telephones:
6. Jewellery
7. Computer parts
8. Fabrics
9. New telephones
10. New beddings.

These items can be manufactured in Nigeria if there is investment in the plants to produce them. Other areas Nigeria has irreversible investment opportunities include refined petroleum, cars and vehicles production, production of electronics products including computers, agricultural products, textiles, Gas turbines, etc. Government has on its own abandoned investment in many areas of the economy to give room for private investment. For example, electricity distribution is now under the private sector, and many licences have been issued for the construction of refineries. Despite governments call on the private sector, the complexity of the Nigerian economy is still very low.

Many investors have acquired licences but they refused to utilize them. The Airline Industry is shrinking rather than expanding. According to OEC, "the Economic Complexity ranking of Nigeria has decreased by 31 places over the past 50 years from 94th in 1964 to 125th in 2014". This shows that there is lower irreversible investment in Nigeria compared with those countries that have displaced Nigeria in the economic complexity league.

The Energy Sector is calling for massive investment. As a result of low investment, only about 40% of the installed capacity of 12,341 megawatts expected from the 140 turbines is available. Indeed, only about 78 turbines are functional (see <http://www.nairaland.com/3094236/fashola-reveals-road-map-incremental>).

3. Review of literature on irreversible investment

The main features of irreversible investment in Nigeria are:

- a. They are associated with uncertainty in many aspects.
- b. Most projects are associated with time for construction.

Dixit and Pindyck (1994) examined irreversible investment decisions under uncertainty. They examined several irreversible investment projects using real option theory. The main conclusions from their study are:

- It is reasonable for a firm to delay an irreversible investment in order to obtain additional information on the profitability of the project when there is uncertainty. This is termed 'the option value of waiting to invest' and firms consider this 'option' when making irreversible investment decisions under uncertainty. In Nigeria about 96 firms have obtained the license to build a refinery but less than ten firms have actually started.
- The simple net present value rule viz: "invest in a project when the present value of its expected cash flows is at least as large as its cost" is incorrect whenever there is uncertainty and irreversibility.

Macdonald and Siegel (1986) examined the question of optimal timing of an irreversible investment. Real option theory was used to study the optimum timing problem. They assume that the sunk cost F and the present value of the project V can be described by geometric Brownian motion. Thus

$$dV = \alpha V dt + \sigma V dz \quad (3.1)$$

$$dF = \alpha_F F dt + \sigma_F F dz \quad (3.2)$$

where z is a standard Wiener process, α , and α_F are drift parameters while σ and σ_F are variance parameters.

The analysis of Macdonald and Siegel (1986) using real option theory for the determination of optimal timing of irreversible investment concluded that it is optimal to invest when V/F exceeds a threshold value, and to wait otherwise. They suggest the use of prices as a better alternative in the determination of the present value of the project, V .

van den Goorbergh et al. (2003) considered a model for irreversible investment where it is assumed that the output price P_t can be described by a geometric Brownian motion. They derived conditions for an investor to undertake an investment or postpone the investment. Folta et al. (2006) investigated the relationship between uncertainty, irreversibility and entry. They provided empirical evidence to demonstrate that "uncertainty has a more pronounced negative effect on entry into more unrelated industries where assets are less re-deployable across business units". Thus when there is uncertainty, irreversible investment is likely to be postponed.

Kellogg (2014) provides empirical evidence to support real options theory. The data used is on oil drilling project in Texas. Kellogg (2014) stated that "firms should delay irreversible investments until a significant gap develops between the investments' expected benefits and costs. Moreover, as

uncertainty increases, real options theory tells us that the incentive to delay should grow stronger and the gap between the expected benefit and cost necessary to trigger investment should widen." Further, Kellogg (2014) observed: "I find that the response of drilling investment to changes in uncertainty is broadly consistent with optimal decision-making. That is, when the expected volatility of the future price of oil increases, drilling activity decreases by a magnitude that aligns with that predicted by the real options model. The close adherence of firms' drilling decisions to the theory is underscored by a related finding that firms have a substantial economic incentive to time their investments optimally: ignoring within-sample variation in oil price volatility can reduce the value of a drilling prospect by more than 25 percent". Thijssen (2015) presented a model for analysis of irreversible investment in projects characterized by uncertainty over both the construction costs and revenues. Levy jump-diffusion process was used to model both processes. Uncertainty was associated with the construction time. This is similar to most projects in Nigeria where projects are not completed on time. Thijssen (2015) noticed that ignoring construction uncertainties leads to a substantial probability of making an erroneous decision. The model developed was applied to a proposed irreversible investment in a high speed rail in the UK. In the analysis of the proposed irreversible investment, passenger number was considered a geometric Brownian motion. Ticket price and operating cost were taken into consideration. Conclusion similar to that of Macdonald and Sigiel (1986) was reached, namely wait if there are uncertainty associated with the project.

In an irreversible investment, waiting is a good decision which may be optimal. Waiting is the optimal decision when there is uncertainty. Thus it is imperative to minimise uncertainty associated with an irreversible investment, otherwise an investor will hold the option to invest. When considering investment climate in Nigeria in 2015, U. S. Department of States observed that "much of Nigeria's market potential remains unrealized because of significant impediments such as pervasive corruption, inadequate power and transportation infrastructure, high energy costs, an inconsistent regulatory and legal environment, insecurity, a slow and ineffective judicial system, inadequate intellectual property rights protections and enforcement, and an inefficient property registration system." Further, the report noted: "The public increasingly resorts to the court system and has become more willing to litigate and seek redress. Use of the courts, however, does not automatically imply fair or impartial judgments". The World Bank's publication, Doing Business 2015, which surveyed 189 countries, ranked Nigeria 170 out of 189 on enforcement of contracts, compared with its 2014 ranking of 147. The Doing Business report noted that there can be significant variation in performance indicators between cities in Nigeria (as in other developing countries). "For example, resolving a commercial dispute takes 720 days in Kano but 447 days in Lagos".

4. Irreversible investment-scape in Nigeria

In this section, we examine some prevailing conditions that affect irreversible investment decisions in Nigeria. These conditions we shall call investment-scape. In any society, the index of these conditions can very easily lead to high uncertainty to be associated with an irreversible investment especially when the pay-off (income) from the project will flow for a long time into the foreseeable future and the initial income will arrive after some delayed as a result of project construction time. The irreversible investment-scape in Nigeria include the following features:

- a. Security
- b. Corruption
- c. unethical practices
- d. Energy
- e. Water
- f. Transport
- g. Land
- h. Inconsistent Government Policies
- i. Tariff Regime
- j. Technological knowhow (skill deficiencies)

4.1 Security

The 2016 Global Peace Index for Nigeria is 149 out of 163 countries in the World. This is a reflection of the security challenges in the country. We are aware of the problem and the efforts being made to tackle it. Suffice to say that the reported progress by government has not translated to peace on the ground. There is fall in crude oil production even in March 2017. The authors of the Peace Index stated that Nigeria's position of 149 out of 163 is not good for an economy struggling to attract foreign direct investment needed to diversify its economy.

4.2 Corruption

According to Transparency International, "Nigeria scored 28 points out of 100 on the 2016 Corruption Perceptions and she is ranked 136 out of 176". The implication of this level of corruption is that there is no straight forward pattern of doing business in Nigeria. As reported elsewhere in this paper, contracts are not easy to enforce. Corruption jeopardises business plan because some business partners are not predictable. That business partners are unpredictable is itself a form of uncertainty and can easily lead to reduction in the value of an irreversible investment. This is one reason why the present administration has decided to tackle the problem. Government on its part should ensure that workers salaries are paid as and when due and that workers are paid living wages. Paying a driver a wage that will not cover his transport fare to work and also pay his rent means the driver has been forced to be corrupt. We know that some men are greedy, government should also not be greedy.

4.3 Unethical practices

Some food items including beans, sesame seeds, melon seeds, dried fish and meat, peanut chips and palm oil were banned by EU till 2016. The ban was induced by some Nigerian exporters who exported sub-standard products. The attitude of cutting corners which is inherent in some people and can make others suffer financial lose. Such actions we call unethical practices. Unethical practices are deliberate actions that falls outside of what is considered standard or morally right or proper for a person or organizations, an industry or profession. Unethical practice can be very costly to those at the receiving end. For example delivery adulterated inputs to a production company can be very costly for the production company. Unethical practices can drastically reduce the price of our products and this increases uncertainty for an irreversible investment.

4.4 Energy

According to the world Bank, only 55.6% of the total population of Nigeria has access to electricity in 2016. This sector provides huge potential for irreversible investment when we take into consideration the gap between supply and demand for energy and the potential sources of energy in the country. The energy crisis in the country is another source of uncertainty for most irreversible investment project. The electricity tariff system is a problem. Both the consumer and the supplier of electricity are complaining about the tariff. Perhaps we need mathematical models to determine appropriate tariff system for electricity. The energy crisis is compounded because of our attitude to the issue. When Dams were constructed in the country, coal was abandoned. Our lips service to non flaring of gas shows how determined we are to solve the energy problem. We have caol, we have gas, rather than concentrate on these two proven sources of power for now, and ensure they are working, we are foraying into biogas. Where in the world has biogas become the only source of their electricity supply? Even in Germany where biogas technology is well establish, the profitability of the biogas plants is being questioned.

4.5 Water

Water is one of the features in the irreversible investment-scape in Nigeria. The issue of inadequate running water in the country is well documented. According to Bloomberg(2015), "Nigerian Water Shortage is a Bigger Killer Than Boko Haram" (<https://www.bloomberg.com/> sited 22/2/2017). Unicef is one of the International Organizations trying to help solve the problem. Recently, it was reported that Kaduna Refinery lost N2.2bn to water pipeline vandals, vide Vanguard of 7th February 2017. Many industrial projects require water. The Kaduna refinery experience shows that a lot of money can be involved in the provision of water and unidentified persons can interfere with an organisation's planned water supply. In the case of Kaduna refinery, the water was sourced from a river using pipes. Government should be aware of this problem and set machinery in motion to make water available.

4.6 Transport

In Nigeria, road is the major means of transportation. According to Wikipedia, "Nigeria's railways are in a parlous condition". In-land waterways are not developed and the air transport system is suffering especially as Arik Air is declared to be owing huge sums of money and it is currently being managed by an external body. These developments place a lot of burden on Nigeria roads. Heavy loads such as fuel, cement and iron rods are carried on the roads and this lead to frequent damage and increases cost of transportation and attendant risk associated with travelling long distance on very bad roads. An interesting aspect of transportation in Nigeria is the unpredictable nature of our means of transport. Flights can be delayed or cancelled without explanation other than "operational reason". There can be unexpected diversion on the road because of maintenance or road failure without adequate warning. On January 1st 2012, Nigerians woke up and they were told that fuel subsidy has been removed. This act of government led to operation 'Occupy Nigeria 2012', (see https://en.wikipedia.org/wiki/Occupy_Nigeria) and other references. In recent times, the issue of diverting air passengers from Abuja airport to Kaduna Airport was on the front burner, (see for example dailypost.ng/2017/01/10). Question about safety of passengers and associated cost were asked, (see [Dailypost\(2017\)](http://dailypost(2017))) From the foregoing, it is clear that transportation in Nigeria is an issue that can affect irreversible investment. Certainly, the transport system in Nigeria can easily increase production cost without notice. This state of affairs is not good for irreversible investment. Efforts should be made to improve the transport infrastructure in the country. The use of pipelines to transport petroleum product can reduce the pressure on the road.

4.7 Land

According to Mabogunje (2009) the land used Act of 1978 is "a clog in the wheel of development". Further Mabogunje (2010) stated that "The World Bank publication on "Doing Business in Nigeria 2010" rated Nigeria 178th out of 183 economies in respect of difficulties of registering properties in the country." Indeed Udoekanem et al (2014) states that the Land Used Act of 1978 creates too much bureaucracy in the documentation of land transactions, land registration and land titling. Thus the acquisition of land is a big problem in Nigeria. What is also very worrisome is the demolition of structures by various government under the name of "development". A recent case in point is the demolition of a market in Lagos. Despite, protest from traders, the Lagos State Government went ahead to demolish the market. The land aspect of the investment scape in Nigeria is a source of uncertainty in irreversible investment since land acquisition can delay the take-off of a project. Even when a project has taken off, the land can still be in dispute. This is common with many agricultural project with large farmland (see <http://nairametrics.com/appeal-court-rules-against-okomu-oil-in-farmland-dispute-case/>). Urgent action should be taken by government to reform the Land Use Act of 1978.

4.8 Inconsistent government

Inconsistent Government Policy has been the bane of the Nigerian Economy. This has serious effect on irreversible investment. An action that is legal today may be illegal or not allowed tomorrow. Numerous examples can be cited but we shall cite just two cases.

- (a) FG bans vehicle imports through land borders - The Guardian Nigeria <https://guardian.ng/news/fg-bans-vehicle-imports-through-land-borders> The order was given in December 5th 2016 and it was to take effect from January 1 2017. Many importers complained about the grace period.
- (b) CBN Bans Cash Deposits Into Domiciliary Accounts Prior to this ban, it was proper and legal to deposit cash (in foreign currency, such as US dollar) into what is called domiciliary account in a Nigerian bank. With the ban, people who received foreign currencies as a result of legal business transactions were not allowed to deposit such money into their accounts. Prior to the ban, many people were compelled to open the domiciliary account to enable them make payment overseas through the bank. For example, parents who had children studying overseas were compelled to open domiciliary accounts in order to send money to their children through the domiciliary accounts. The sudden ban left many people stranded both in Nigeria and abroad. The ban was lifted six months later after a lot of damage has been done. According to Business News (January 16, 2016) customers were unwilling to make "cash deposits into their domiciliary accounts three days after the Central Bank of Nigeria lifted the ban on foreign currency deposits." This ban contributed to the shortage of foreign currencies in Nigeria. It also produced doubts in the minds of those who had course to use domiciliary accounts. Vangaurd (2015) quoted the Lagos Chamber of Commerce and Industry as follows: "significant disruptions, distortions and dislocations have been created in the business environment by the CBN as a consequence of the following policy measures: restrictions on the use of export proceeds, denial of access to foreign exchange market for 41 broad categories of products, including critical inputs needed in manufacturing and service sectors, prohibition of cash lodgements into domiciliary accounts and tight exchange controls and administrative allocation of foreign exchange are typically characterised by lack of transparency, corruption and considerable abuse." Inconsistent Government Policies are sources of concern and uncertainty to irreversible investment investors because they impinge on business operations to produce negative results. In deed, the executive orders are design to stop some business transactions. Government should limit her executive orders to taxation, government budgets, the money supply, interest rates and other known policies as it is in developed countries. Government should stop releasing executive orders that are not common in developed economies. When orders are released, people should be given time to adjust. For example one month is not enough for people to adjust to the ban on vehicle imports through land borders.

4.9 Tariff Regime

Merriam-Webster dictionary defines tariff as: "a schedule of duties imposed by a government on imported or in some countries exported good" or "a duty or rate of duty imposed in such a schedule" or "a schedule of rates or charges of a business or a public utility" and "price" or "charge". There is no systematic method of determining tariff. Essentially, tariff is based on political will in many areas such as price of petrol. The price of petrol per litre and electricity tariff are two important tariffs with respect to irreversible investment that government should find a way of handing over to market forces. It is not possible to run a capitalist system with socialist policies. Even the exchange rate has been subjected to abuse. We should not expect one to invest in a refinery and government will determine the price of the output. Government may as well set up the refinery. The unhealthy situation where government set the price of petrol may be contributing to the non-utilization of the license given to organisations to build refinery. The electricity companies have been having running battles with consumers over tariff. Certainly, the battle will affect their willingness to invest in the industry.

4.10 Technological knowhow

In many areas with irreversible investment opportunities there are skill deficiencies in this country. This is more so with opportunities associated with digital devices. The training programmes in our institutions requires strengthening if they are to cope with the challenges associated with the modern age. The Academic Staff Union of Universities has been at the forefront of the vanguard for the upgrading of our universities. That our universities require upgrading and strengthening is supported by the various global rating of universities. No Nigerian university is in the first 100 in the world. We are equally not doing well in the ranking of African Universities. Government has put in place some good initiatives but the initiatives are poorly implemented. The Industrial training programme is very sick. You need a microscope to distinguish between the following universities: "a university of agriculture", "a university of technology", "a petroleum university", and "a university such as the "University of Benin".

The issue of low technological knowhow is compounded by our attitude to scholarship. For some reasons, vital components of many educational programmes are allowed to suffer or die. For example some young medical doctors find it very difficult and frustrating to do housemanship, micro-teaching is used to replace teaching practice; industrial training positions are not available for many students; alternative to practical are permissible; etc. These developments produce ill-equipped personnel.

5. Strategies for reducing waiting time to invest

Our Court system should be reformed. A situation where justice cannot be obtain speedily deter investors. This situation compared 31 procedures spanning an average of 529 days and averaging 21 percent of the cost of the contract in OECD countries. A U.S. supplier of fuel for the Nigeria Airways state airline, which went into liquidation in 1997, received full payment for its share of the liquidated assets only in 2010. Observe that contract enforcement requires an average of "92 percent of the value of the contract". The difficulties and legal delays associated with enforcing contracts explain why some miscreants engage in frivolous contracts such as selling lands with improper titles with impunity. Such miscreants are aware of the loopholes in our legal system. Government should be aware that the report on our investment climate by the U. S. Department of States is utilized by Foreign Investors and the legal issues is not included in that report for fun.

Poverty and deprivation must be addressed urgently. "The 2009 amnesty of Delta militants significantly reduced attacks on pipelines and other petroleum facilities, increasing oil production from 700,000 barrels per day (bpd) at the peak of militancy to about 2 million bpd today". (US Department of States 2015). It is well known that a hungry man is an angry man. Concerted efforts must be made by Federal, State and Local governments to improve on the living condition of the people. Public squalor and private affluence cannot live in harmony.

Government should urgently address public infrastructure that are in the state of decay. At the moment many SME provide their electricity, water and maintain their access roads. This should not be. Government think-tank should be up and doing and there should be evidence that they are working.

Data on Nigeria Economy is not up to date. This necessitate the use of indirect method and outside sources. Units in the country charged with the production of statistics should embrace world class standards in the production of timely and accurate information.

6. Conclusion

Government should be conscious of irreversible investment-scape in Nigeria. Many organisations comment on the irreversible investment scape in the country. Conscious effort should be made to identify these observations. Correcting the errors in our irreversible investment-scape is better than image laundry. We cannot do better than the facts on ground. For example, the CIA observed as follows: "Despite its strong fundamentals, oil-rich Nigeria has been hobbled by inadequate power supply, lack of infrastructure, delays in the passage of legislative reforms, an in-

efficient property registration system, restrictive trade policies, an inconsistent regulatory environment, a slow and ineffective judicial system, unreliable dispute resolution mechanisms, insecurity, and pervasive corruption. Regulatory constraints and security risks have limited new investment in oil and natural gas, and Nigeria's oil production has contracted every year since 2012". (<https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html>). Image laundry may emphasise our "strong fundamentals", but it is the investment-scape that will determine investors decision to commit funds to irreversible investment. Therefore, we should be aware that international organizations have more information on Nigeria than we know. We must endeavour to do things right. Foreign Direct Investment (FDI) is needed to develop the country. They cannot come in large numbers when the irreversible investment-scape is laced with uncertainty in every direction.

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