BAM2018

This paper is from the BAM2018 Conference Proceedings

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Exploring the Challenge for Sustainable Development in the Energy Sector: Sociomaterial View of two British and Nigerian cases

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ABSTRACT

The global pressure on green environment has been a major issue to attaining future Sustainable Development (SD). In this study, the researchers explore the recent challenges of SD in the power sectors in the UK (as a European North country) and in Nigeria (as an African South country). These two contexts have witnessed unstable epileptic power supply despite the trillions of dollars invested in the sector. To avoid solving sustainability problem and causing other economic, social, or environmental problems, a thread of scholarly work attempted to develop a systemic approach of SD. Aiming to offer an appreciative systemic lens of SD (Thatchenkery et.al, 2010), we adopted the sociomaterily concept to shed the light on the intimacy between the social/organisational context and the resource-based/material context of SD. Sociomaterilaity emphasizes on the ongoing interaction between technology and the economic, social, and environmental pillars of sustainability. This systemic view of SD avoid the defects of other dominant views such as complexity theory (Sabau, 2010), neoclassical economics/ free market approaches (Heikkurinen & Bonnedahl, 2013), and ecological economics (Lele, 1991).

SUSTAINABLE DEVELOPMENT: THE CHALLENGE

The British energy companies are committed to the sustainability agenda aiming to make a positive contribution to the society, economy and environment. The annual league table in UK lists a range of initiatives are underway to reducing the sector's environmental impact in the country. The researchers are of the opinion that technological advancement can also initiate more avenues and innovations that could help to sustain the environment instead of the degradation that has been encountered over the years with more commitments of the developed countries and companies that impact more on the environment. In this study, various related literatures, archives, white papers and publications will be explored and analysed.

According to Warburton (2013) in UK's Sustainable Development Commission, Sustainable Development (SD) is a continuous process denoted as a journey and not a destination enjoining everyone to keep moving in the right direction and that as an approach it tends to maximise positive outcomes by recognising the relationship between these three approaches to sustainable development (economy, society and environment), by ensuring a long term success across diverse sectors in delivering beneficial solutions in different ways.

Further to the submissions of the Sustainable Development Commission publication on United Kingdom (SDC UK) government becoming a greener energy economy in 2010, they analysed the progress made so far despite the slow pace for change, improvements in energy sector, water consumption, waste, recycling and road transport was favourable with a continuous drive and projection into the future with a record of about saving £13.7 Million from reduced road travels in 2008 to 2009 alone and a savings of 18 million cubic metres of water the equivalent of 7,200 Olympic swimming pools, adding up to £13M worth of water bills in 2008-09. In addition, landfill cost savings from reducing waste by 126,000 tonnes in 2009-08 with the equivalent of the total waste produced by over 250,000 individuals in the UK. Also, the report estimated then that, if the new government succeeds in meeting its commitment to cut carbon emissions from government offices by ten percent over 12 months, which could result into major benefits to society (estimated to £13 million, in addition to any reduction in energy bills (SDC UK, 2010). The energy sector is believed to be vital to the development and growth of the economy of any country, therefore there has to be an effective, stable and sustainable energy production and supply.

Okolobah and Ismail (2013) described Nigeria as a tropical country within the gulf of Guinea, the most populous black country in Africa endowed with numerous natural resources in energy such as petroleum and her oil reserve considered to be ninth largest in the world, unexplored natural gas and reserves considered to be the fifth largest in the world, tin, iron ore, lead, zinc, bitumen, coal, limestone, niobium and a lot of others.

They also pointed out that Nigeria with a population of over 150 million people has an installed capacity of 8,000MW of electricity producing 4,242.7MW and enable to provide adequate energy supply for its citizen, plagued with epileptic and erratic power supply over the past two decades resulting in slow economic growth and sustainability. The huge energy instability and setback has been traced to the protracted period of instability in governance for decades and lack of commitments by both the military leaders and the politicians at one time or the other, undermining the rich energy resources the country has been endowed with (Amadi, 2015).

Nigeria still far beyond the UK, but not so much endowed with such vast natural resources. It still manages and conserves what it has to maintaining sustainable development. Over the last decade, Nigeria was committed to pursuing energy sustainability, economy and environmental agendas. Furthermore, they stressed that Nigeria produces an average of about 30 watts/per, while South Africa (a neighbourhood country with less population) of about 42.7 million was able to produce 1045.67 watts/per person and they also discovered that most of the energy facilities in Nigeria have not been maintained in the last twenty or more years and Power Holding Company of Nigeria (PHCN) plants are aging despite the trillions of dollars that have been purportedly ploughed into the sector reform (Okolobah and Ismail, 2013).

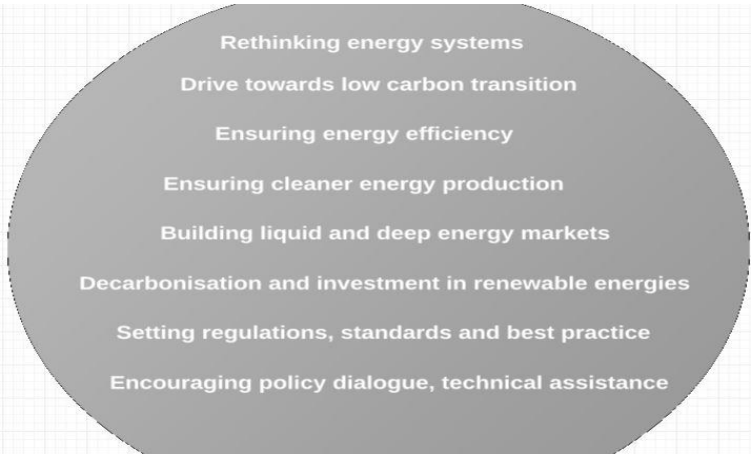
In addition, Oyedepo (2012) also supported that the energy crisis in Nigeria has been over the past two decades and that failure has contributed to the high level economic and social imbalance, high poverty rate, paralyzing various industrial and commercial activities where companies and average households are subjected to the use of generating plants. This invariably led to higher level of air pollution, because of the frequent use of those generating plants in millions of homes and industries daily because of the energy poor supply. He further discovered that the council of renewable energies of Nigeria estimated that the frequent power outages has

recorded a huge loss of over US$984.38 million every year with the health hazards due to the high level of carbon emissions uncontrolled. Also, Oyedepo (2012) emphasised that Nigeria is considered as the African giant and the most prolific oil producing nation in the continent of Africa. Ironically, the Nigerian Guardian recently reported the negative impact caused by the drastic fall in oil prices after removing the Iranian sanctions. Such change in the international market harms Nigeria's national budget for the year 2016 with consequent to the entire economy. The country's over reliance on oil production make it so vulnerable to those global changes (TheGuardian, 19th January, 2016).

Udoh (2015) thinks that being oil-dependent economy has led to an overuse of wood fuel in more than 70% of Nigerians living in rural areas. Consequently, high rates of deforestation, erosions, and floods are expected (Oyedepo, 2012). In response, The UNOSD has developed eight SD goals for Nigeria in 2016 (See Figure 1).

The issue of the North-South divide is a socioeconomic gap between the developing and developed contexts. Lievan (2003) uncovered the biotechnology boundaries between the north and south to raise the third pillar of environmental sustainability. Fulfilling the four pillars of SD through innovative strategies and technology is a step toward the so called global capitalism (Castells et al., 2000). In Therien's (1999) view, today's inequalities, deprivation, exploration, exploitation of the developing nations and their natural endowments without considering the environmental impact could as well today compromise and undermine their ability to truly attain a credible SD especially in its energy sector which is being discussed in this study.

Figure 1: UN Millennium Sustainable Development Goals for Nigeria



Summarized from UNOSD, 2005

He further observed that there is a shift in the perceived divide and gap giving way to a more reasonable matured partnership with a paradigm shift of UN to the discourse and recent practices of its agencies such as UN Economic & Social Council (ECOSOC), United Nations Development Program (UNDP), International Labour Organisation, UNESCO, European Union

looking into the concerns of these developing nations to curtail the perceived north and south divide on SD.

The UN climate change conference taken place in Paris, called the richest 20 countries to raise $100bn a year by 2020 to help the poor nations transform their economies. This can be a step towards SD, with pledges to curb emissions and the transformation of our global economy from one fuelled by dirty energy to one fuelled by sustainable economic and environmental development (TheGurdian, December 14, 2015). Such movement might help moving from an accumulated ecological impact to an overlap between the four pillars of SD (Hopwood et al., 2005). In doing so, the next section discusses different theoretical attemps that have been developed by scholars to offer such a sustainable overlap.

THEORITICAL FOUNDATIONS OF SD:

Solving some problems might create other problems (Checkland, 1981). Advocates of systems thinking in the SD research community affirm the difficulty of addressing SD challenges following a single side approach, rather that integrated and inclusive remedies to be developed at the local, national, regional and global levels. The world community need to rise to the overwhelming challenge as the perceived disparities between the north and the south do not really portray the nature of the complexity of the world as everyone needs to come together in achieving sustainability and true international partnerships. Therefore, a systemic framework for SD is needed as a guide for all the regions, locals, countries alike to structure same and tailor it to their social, economical, environmental, and biotechnological requirements.

In year 2006, the Scottish Government Publication cateogrised SD into strong versus weak sustainability; the strong extreme represents the non ecospheric nature capital resources which could be depleted, but that they expire must be absolutely protected as they say there is no substitute to the planet. Then the weak sustainable development is an approach that suggests that human made capital could substitute for the natural capital and a willingness to approach (The Scottish Government Publication [TSGP] 2006). In year 2012, the UN set four principles of SD, including, poverty alleviation, social inclusion, cutting carbon emission and pursues renewable energies, and good governance (UNSDSN, 2012). These approaches have been followed by different regulatory approaches that develop international codes of conduct and other free market approaches that exchange CO2 emission quotas for tax exemptions.

Apart of these varying attempts, SD was theorized using complexity theory (Sabau, 2010), neoclassical economics/ free market approaches (Heikkurinen & Bonnedahl, 2013), and ecological economics (Lele, 1991). Contributing to this body of knowledge Thatchenkery et.al (2010) stated a special call for studies that conceptualise SD using the so called Appreciative Inquiry Theory (AIT).

Appreciative Design

AIT is a systemic approach enhances the humans reorientation from resource-based view of SD to value-driven SD. AIT emphasises on sustainable designings and reinforces the ecosystems systems that create sustainable value across the board. The value-driven SD offers reconciliation between the shareholders (economic) value and wider stakeholders (social & environmental) values (Mohamad et.al, 2015). The rise of socially responsible investments reached at $2.71 trillion out of $25.1 trillion in the American investment by 2007 (Dow Jones Sustainability Indexes, 2015).

SD is no longer a project, rather than a sustainable enterprise that maintains the triple bottom line (Elkington, 1997). It is a systemic process through which top management create an inclusive value for employees, community, and customers. This requires a life cycle approach to innovate new resources, processes, and to improve the organisational overall effectiveness (Laszlo, 2008). It requires a new design to deliver the social needs behind a technical system in different fields (e.g. Power/energy, finance, entertainments etc) (Foster & Forster, 2004; Thatchenkery et.al, 2010). This participatory approach of SD creates social intelligence and reduces the resistance for new techniques or policies (Cooperrider et.al, 1995). Also, it motivates the entrepreneurial thinking of stakeholders involved in sustainability programmes (Warzynski & Krupenikava, 2010).

Despite the aforementioned stone edges of SD as an inquiry system, the use of technological artifacts as a quadratic bottom line where completely ignored. The interaction between these artifacts (e.g. biotechnology) and the other three pillars requires a new conceptualisation. In the next section we contribute to SD as an appreciative inquiry system.

Sociomaterilaity Theory

During the last five years, the term "Sociomateriality" has emerged as a complementary and sometimes as a synonym to the Socio-technical conceptualization. This concept was vague until Orlikowski (2007) investigated this phenomenon to understand the entanglement of the social and the material artifacts (e.g. technology, managerial technologies, devices, cognitive schemes, and symbols) in everyday life. Orlikowski & Scott (2008) examined the presence of technology in organizational life through a desk analysis of 100 articles published in the top management journals between 1997 & 2006.

Following Kling's web/discrete entity model the authors classified the presence of technology into "*discrete entities*" and "*mutually dependent ensembles*" as key streams of technology in the working life (see Table 1). The former treats technology as a catalyst of the organizational processes, but myopias how all organizational practices and relations inherits technological/material intervention. In this sense, technology is considered as a distinct organizational phenomenon rather than an integral part of all organizational processes, activities, and events. It also sees "humans/actors" and "technology/objects" as primarily self-contained entities that interact (Orlikowski & Scott, 2008). The latter stream focuses more on the agencies of both humans and technology how they fuse with each other to achieve daily routines, processes and objectives. *"Humans and technologies have no inherent properties, but acquire forms, attributes, and capabilities through their interpretation"* (Orlikowski & Scott, 2008: 456). This study concluded that technology, work, and organizational life should be conceptualized mutually independent and a multiple view of technology development in work environment is essential.

Table 1: Two Streams of Research on Technology and Organizations

	Research Stream I	Research Stream II
Ontological Priority	Discrete Entities	Mutually Dependent Ensembles
Primary Mechanisms	Impact; Moderation	Interaction; Affordance
Logical Structure	Variance	Process
Key Concepts	Technological Imperative Contingency	Social Constructivism Structuration
View of Social and Technical Worlds	Humans/organizations and technology are assumed to be discrete, independent entities with inherent characteristics	Humans/organizations and technology are assumed to be interdependent systems that shape each other through ongoing interaction
Examples	Blau et al. (1976) Huber (1990) Aiman-Smith & Green (2002)	Barley (1986) Prasad (1993) Boudreau & Robey (2005)

Adopted from Orlikowski & Scott (2008: 438)

Our study will use these two classes; "discrete entities" versus "mutually dependent" to explore and investigate the status of SD in the British versus Nigerian power sectors.

RESEARCH METHODOLOGY

Our study explored the challenges of SD in the power sector and revealed the North-South contextual divide. We also investigated the key influencing factors that affect the success/failure of SD strategies in both of UK and Nigeria.

Using an interpretative approach and qualitative data collection methods (namely, Semi-structured interviews and Survey) we gathered evidence of the social/ governance, economic, environmental, and technical factors that shape SD in UK & Nigeria. Future strategies to effectively manage these factors have been also discussed (Myers, 2013). As shown in Table 2, we conducted two phases of fieldwork.

Table 2: Research Methods and Justification

	Phase I	**Phase II**
Country	**Qualitative Interviewing**	**Qualitative Survey**
Nigeria	**Participants:** Supply Chain Managers who manage SD project. **Sample:** 6 supply chain managers as listed in their organisational list of the six Nigerian power suppliers. Afam Power Plc; Sapele Power Plc; Ughelli Power Plc; Geregu Power Plc; Shiroro Hydro Power Plc; Kainji Hydro Power & distribution.	**Participants:** Employees and lower-level managers involved in SD initiatives. **Sample:** Two companies; Shiroro Hydro Power Plc; Kainji Hydro Power & distribution have existing SD projects. Survey was allocated to two quotas of 30 participants work in each company.
United Kingdom	**Participants:** Supply Chain Managers who manage SD project. **Sample:** 18 power company as listed in as follows: Ecotricity; Good Energy; Ebico; OVO Energy; Utility Warehouse; Flow Energy; The Cooperative Energy; Marks & Spenser Energy; Sainsbury's Energy; First Energy; Extra Utility; EON; SSE; Spark Energy; British Gas; EDF Energy; Scottish Power and N Power.	**Participants:** Survey was allocated to two quotas of 30 participants work in each company. **Sample:** Five companies; OVO Energy; British Gas; EDF Energy; Scottish Power and N Power.

Phase I aimed to identify if the power companies (in both of UK and Nigeria) follow institutional strategies for SD. Doing so, semi-structured interviews helped evaluate the current status, explore the key factors that affect SD projects, and to focus on the most successful companies in the field. This phase included 24 interviews with supply chain managers, 6 out of which work in the UK.

Phase II aimed to explore the key challenges and potential solutions set by companies in both of UK and Nigeria. This phase offers a deep insight of current SD projects in 2 Nigerian companies and 5 British power suppliers. The survey has been allocated to 30 participants in each company with 85 % response rate.

FINDINGS & ANALYSIS:

In this section we shed the light on the British versus the Nigerian power markets. Then, we demonstrate our findings in relation to the sociomateriality nature of SD in the energy sector in both of UK and Nigeria. Key challenges uncovered were; organizational/strategic; personal /political; economic, environmental, and technological.

92% of British providers emphasized that SD is a major tool for socio-economic development, while 89 % of Nigerian providers confirm that the national concern of SD is slow over the last decade. Currently, Nigeria experiencing a protracted periods of power inefficiencies, failures and unable to generate and supply power to the entire nation.

90 % of the British experts see SD as a process that balances between the present and future generations. The government developed variant strategies for carbon emissions-cut and called for more dependency on fossil fuel and renewable to keep such balance. The investment on affordable renewable energies requires a partnership between the government, international communities and local non-governmental organisations. The ongoing efforts for SD are part of the European Union requirements, the UN climate change campaign, and strict regulations. Such efforts motivate good practice and standards even in the energy sectors in the UK. 10 % of the British experts reported that SD strategies are boiled down because of high resistance to greening and environmental activists. They reflect on the conflict SD projects raises again the routine operations and logistical procedures. In UK, the use of molecular biology and chemical engineering helped produce affordable carbon-neutral fuels identical to diesel and jet fuel (npower supply chain manager, Dec 2015).

In Nigeria, 75 % reported a variety of challenges such as poor government policies, lack of standards and poor procedures leading to poor service delivery in the sector and in the country in general. But that with the new government in place now, the country awaits more hope for recoveries and with the reforms that has engrossed the sector over the years. More also, that the sector and the country in general has been endowed with a lot of resources including renewable resources, but the question will be affordability and sustainability for now and the future. And the other 25 % remained neutral.

In the UK 98 % of the respondents pointed to challenges such as low energy security, low quality supplies, affordability of biotechnology. However, they confirmed that the government is developing public-private partnership to overcome such challenges. Private partners improve the corporate affordability and in turn increase the employee's satisfaction (including effective rewarding system, involvements and engagements, drive for research and developments and other robust incentives.

In contrary, the Nigeria counterparts declined to talk about the issues surrounding their perceived level of satisfaction and this reveals why the sector has been like that in that region for ages they said. 85 % of them seen the power availability in Nigeria as unstable at no time and epileptic in nature. The energy infrastructures are quite old, lacked appropriate maintenance and absolute neglect by the various governments that have come and gone in the past years and the purported significant investment that have been acclaimed spent by those governments to maintain and reform the sector. Also, they highlighted the issue of absolute dependency on oil by the entire

nation even when there are other numerous resources and energy renewables as well. The respondents suggested various things that could be done to ensure the sustainability of the sector. Amongst which was the issue of fully privatising the sector as their UK counterparts and for the government to become more responsive and committed to the nation and sustainable development as other rich and developed nations. The issue of safety was also raised within the region and they looked up to the government to make the country more secured for investments.

While 96% of the British providers confirmed receiving continuous development programmes to manage SD projects, only 3% in Nigeria companies received the relevant training. 85% of the Nigerian participants gave no response to the issue of staff development, which reflects the internal politics in these institutions that hinder future training strategies. But this leads to a low level of employee's satisfaction as discussed above. Appendix 1 reflects our results in more details and connects them to the interview guide and survey questions.

DISCUSSION: NORTH-SOUTH DIVIDE OF SD

Case of the British Power Sector

According to recent publications by Ernest and Young 2014, the UK's energy sector has been a major contributor to the UK economy and in 2013, its total economic impact was £96 billion which makes up about 6 percent of the GDP of UK; also creating a lot of job opportunities across the country which explains how the sector is to the prosperity and stability of the UK economy as a whole, as well as how it delivers an absolutely fundamental service for everyone. From an international perspective the UK has one of the most open and vibrant energy markets in the world probably due to its drive towards sustainability, standards and regulations. Recently, electricity prices have been broadly in line with prices in Europe and, in the case of gas, below most. On the domestic front, latest statistics on household switching show that, over the past year, around 3.5 million households shopped for a new supplier leading to reductions in bills. An increasingly prominent feature of electricity distribution is the move to a 'Smart Grid'. The Smart Grid Vision and Route map. This invariably refers to a modernised electricity grid that utilises information and communications technology in monitoring and actively controlling generation and demand in near real time, thereby providing a more reliable and cost-effective system for transporting electricity from generators to homes, businesses and industry (Ernest & Young, 2014).

Furthermore, the UK's transmission and distribution investment in both gas and electricity networks continued in 2013, with the introduction of price control and about £5.3 billion was invested in 2013 for replacing or upgrading existing electricity network infrastructure and in accommodating new generation, particularly the increased penetration of renewables; with a clear focus on the following three significant projects:

- The £200 million in the 2.2GW Western Link electricity connection between Scotland and Wales.

- The Western High Voltage Direct Current (HVDC) 420km subsea link is a £1 billion joint venture between National Grid and Scottish Power Transmission. London Power Tunnels: £1 billion National Grid project that started in 2001 to rewire the capital's transmission network via 32km of deep underground tunnels.
- And the £600 million of upgrades to the 220km Beauly-Denny power line in Scotland to accommodate 2.5GW of renewable generation. The first section of the circuit was electrified in 2013, with the upgrade expected to be completed in 2014 (Ernest & Young, 2014).

Currently in UK, the renewable technologies use natural energy to make electricity, including other fuel sources as; wind, wave, marine, hydro, biomass and solar. Renewables produce 7% of the UK's electricity, and EU targets mean that this is likely to increase to 30% by 2020. From 2020, renewable energy will continue to be an important part of the strategy to reduce carbon emissions. To achieve this, a range of technologies will need to be used, such as onshore and offshore wind farms, biomass power stations or hydropower systems (EnergyUK, 2015).

Case of Nigerian Power Sector

Nigeria as a major African country endowed with abundant resources and sources of energy, including oil and gas, hydro, coal, biomass, wind and solar energy; it's believed to be Africa's largest oil-producing country and accounts for nearly a third of the continent's crude oil reserves. Nigeria is ranked the second in natural gas after Algeria while petroleum export is the main hub of the country's economy with the current crude oil reserve about 35.5 billion barrels. Nigeria also has other sources of energy as tar sand, coal and lignite, bitumen and uranium deposits. In spite of all these daring records of its endowments, the country has been experiencing energy deficits in a number of areas, including oil, biomass and especially electricity, mostly due to inefficient technology, poor management, poor standards and procedures and its high demand and over-exploitation of natural resources. According to the Manufacturers Association of Nigeria, they identified that the growth of Nigeria's industry sector has been severely hampered by lack of energy, particularly electricity and that between 2000 and 2009, about 857 major firms either closed shop or suspended operations due to poor energy supply (Interview with the head of Manufacturers Association of Nigeria, 2015).

It is very sad to infer that nearly all major companies in Nigeria provide their own electricity through diesel generators, which is not a step toward a sustainable environment in recent times. This could be energy poverty which takes the form of inadequate quantity, poor quality and low access, despite the abundant endowment of energy resources. According to recent publication, the Nigerian Association of Energy Economists has said that about 75 per cent of Nigeria's 170 million people still live without access to regular electricity supply; they opined that despite statistics indicating that 45 per cent of the country's population is currently connected to the national grid, regular supply is still restricted to just about 25 per cent of the population; with a high level of dependency on traditional biomass sources for cooking, which are quickly becoming a scarce resource and lack of access to electricity and modern energy sources profoundly limits economic development, constrains people's life chances and traps millions in extreme poverty (This Day Live, 2015).

Table 3: Sociomaterilaity of Sustainable Development in Power Sectors in UK & Nigeria

	Nigerian Energy Sector (Stream II)	British Energy Sector (Stream II)
Ontological Priority	The technical pillar is missing, while the three other pillars are not in intimacy (i.e. Discrete entities)	There is a high use of biotechnology and advanced technological infrastructure that matches the socioeconomic plan for the country and the need for green society.
Primary Mechanisms	Using traditional SD policies that improve the efficiency of carbon-fuel than to green the environment. The proposed technology will be imported from western countries, which will result in design-actuality gap (i.e. Technology as a moderator).	An interactive public-private participatory approach to develop SD policies. Affordance is maintained by the private sector, while regulations are forced by the public side.
Logical Structure	SD includes different economic, environmental, and social enablers that are not consistent.	SD is considered as an iterative process where reconciliation between the four pillars of sustainability takes place.
Key Concepts	Less advanced infrastructure and potential of imperative technology to be imported in case of contingency.	SD's technology is social constructed by participatory stakeholders involved.
View of Social & Technical Sustainability	The four pillars of SD; technology, economy, society, and environment are independent of each other's.	The four pillars of SD are interdependent and their ongoing interaction shapes the future performance.

Sociomaterilaity of SD

Looking through the Nigerian energy sector, the series of reform strategies and privatization programmers as pursued by the national governments were more political rather than real business for national development and sustainability. The challenges of setting major infrastructures, maintaining existing ones, bidding for the licenses by companies are more politically and regionally motivated. This set aside specialties, competencies based on technological expertise thereby recycling same people around while maintaining the status quo and rigid to change, development and sustainability. This could lead to a major challenge in the global drive towards renewable energies for a sustainable development in the region. With the culture of influencing who gets what against the culture of capability and expertise.

In the case of the UK energy sector, the scenario is different with major energy companies focusing along with the government on driving towards sustainability. The energy sector in UK is fully private sector based and their contribution to the national economy and development has been quite immense with glaring records on ground. Most of these companies like the British Gas owned by Centrica, E-ON, Npower, Scottish power, EDF energy and SSE as the six big producers of energies promoting renewables. While OVO energy and some others also promoting affordable renewable energies as marketers to households and businesses. There are

existing statutory regulations and standards put in place by government and its agencies to regulate the energy sector. The situation is far from this in Nigeria and that is why situation of SD is a major challenge. As shown above, Table 3 presents the sociomaterial difference between SD in the UK versus Nigeria. It clarifies that, UK takes stream II, while Nigeria is still at the early stages of stream I.

CONCLUSION & FUTURE RESEARCH

Our research offered a literature review of SD in both of Europe and Africa. The evidence provided shows that energy efficiency and renewable energy technologies are very prominent in the overall agenda for sustainable development whether local, national, regional or global. Also, it shows that SD is a quadratic bottom line process that should be iterative and social constructed by public-private stakeholders. Key challenges found are; poor governance, employees satisfaction, technological infrastructure, organisational resistance, and affordability. However, they exist with varying degrees in Nigeria and the UK.

Our research offered a new conceptual lens of SD based on Sociomaterilaity (Orlikowski, 2007). A part of other approaches such as complexity theory (Sabau, 2010), neoclassical economics/ free market approaches (Heikkurinen & Bonnedahl, 2013), and ecological economics (Lele, 1991), our research offers a systemic approach that contributes to the body of literature on AIT (Thatchenkery et.al, 2010).

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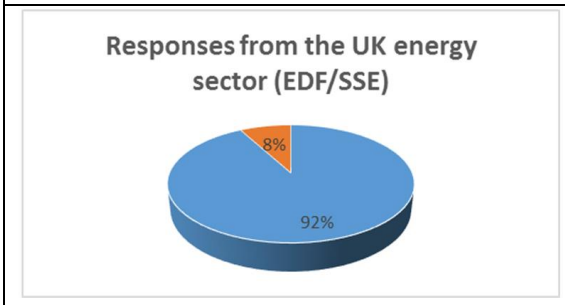
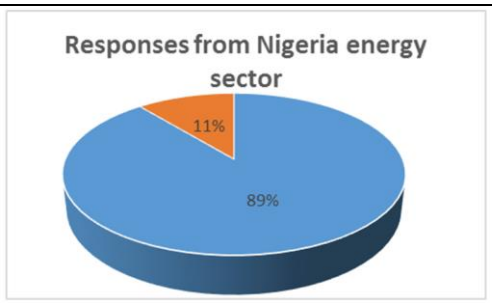
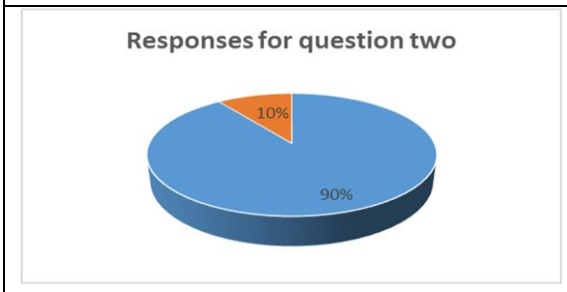
APPENDIX 1: SURVEY QUESTIONS

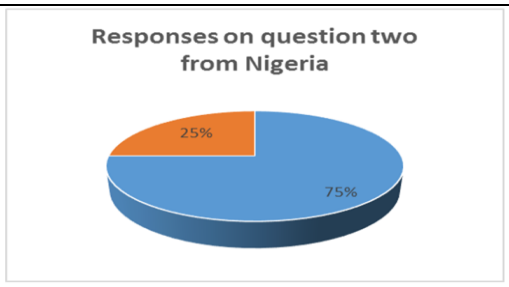
Question one: To what extend sustainable development is important in your region?



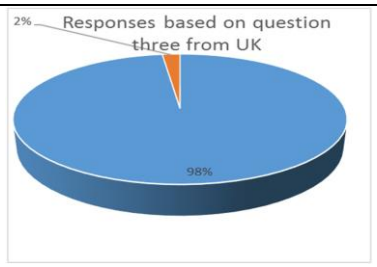


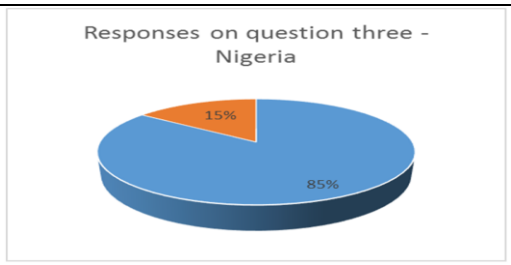
Question two: Does sustainable development only focuses on the future alone?





Question three: Can you suggest strategies to improve the SD in your company?





Question Five: Have you been on any recent intensive professional trainings and development programmes on the job for employees in your sector?

Responses	Percentage (UK)	Percentage (Nigeria)
Yes	96 %	3 %

No	1 %	12 %
Undecided	3 %	85 %
Question Six: How satisfied are you working within your sector in your region?		
Responses	Percentage (UK)	Percentage (Nigeria)
Very satisfied	94 %	7 %
Unsatisfied	3 %	13 %
Undecided	3 %	80 %