DOCTOR OF PHILOSOPHY

Towards the development of a framework for the enhancement of sustainable supply chain management (SSCM) in the Nigerian downstream oil industry

Akinremi, Temitope Adetokunbo

Award date:
2018

Awarding institution:
Coventry University

Towards the Development of a Framework for the Enhancement of Sustainable Supply Chain Management (SSCM) in the Nigerian Downstream Oil Industry

Temitope A Akinremi

A thesis submitted in partial fulfilment of the University's requirements for the Degree of Doctor of Philosophy

May 2017

Certificate of Ethical Approval

Applicant:

Temitope Akinremi

Project Title:

Sustainable Supply Chain Mangement in the Oil Industry

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

28 April 2017

Project Reference Number:

P23457

Abstract

The oil industry is an enormous industry and contributes significantly to global economic and social development. The global importance of the oil industry cannot be overemphasized as it is an essential part of global transportation as well as a major source of raw materials to the petrochemical and agricultural industry. In recent times, there have been increasing calls for the oil industry to evaluate and address the impact of its own supply chain processes just as many businesses that are engaging with the oil industry are reengineering their supply chains towards sustainability enhancing practices and thereby reducing the negative impact of their value adding activities.

This research work investigated variations in Sustainable Supply Chain Management (SSCM) in a developing (Nigeria) and a developed (UK) oil producing country. It also evaluated drivers and challenges to SSCM, and identified SSCM measures that are being adopted in these two countries.

A comparative research approach was adopted and both qualitative and quantitative data was employed. Analysed data showed that a country's level of development influences SSCM, and a final outcome of the study was the development of a framework with the potential for enhancing SSCM practice in the Nigerian downstream oil sector.

This research study represents a new area of work. It makes significant contributions to the sustainability field and the downstream oil industry.

Acknowledgements

I am indebted to God Almighty for the strength and fortitude he granted me and without whose love and compassion, it would have been impossible for me to complete this research programme.

I would like to use this opportunity to express my profound appreciation to everyone that has supported and assisted me in the course of my research programme.

I wish to express my sincere appreciation to my Director of Studies, Dr Richard Anderson for his unwavering support, encouragement, and assistance throughout my PhD programme. I appreciate your drive for excellence and constructive criticism. This helped me all through my research programme. A big thank you to my supervisor, Dr Anthony Olomolaiye. I deeply appreciate your support, criticism, words of encouragement and confidence in me. I would also like to express my profound gratitude to Dr Steve Martin and Dr Babatunde Anifowoshe for your guidance and encouragement.

A big thank you to all the NNPC managers that participated in this study; for making out time to be a part of this study and for their unwavering cooperation all through the study.

It is hard to find words to express my heart-felt appreciation to my loving family, my loving and wonderful husband (Sunkanmi) whose support and words of encouragement has seen me through trying times, my pearls of inestimable measure (Jotham, Joachim and Jonelle), my sister (Kemi), my brothers (Ade & Tolu), my uncles (Kunle & Dayo) and Oreoluwa my niece-in-law. Many thanks for your unwavering prayers, encouragement and confidence in me all through my programme. You always gave me the assurance that things can only get better.

To all my friends and family members that could not be mentioned here, I say thank you for all your prayers and support.

Abbreviations

The following abbreviations are used in this thesis;

AGO – Automotive Gas Oil
API – American Petroleum Institute
BP – British Petroleum
BPSD – Barrel Per Stream Day
CDM – Clean Development Mechanism
CHP – Combined Heat and Power
CNPC – China national Petroleum Corporation
CSR – Corporate Social Responsibility
DPK – Dual Purpose kerosene
DPR – Department of Petroleum Resources
DECC– Department of Energy and Climate Change
DWT – Dead Weight
EHS – Environment Health and Safety
GDP – Gross Domestic Product
GHG – Greenhouse Gas
GNI – Gross National Income
GRI – Global Reporting Initiative
HHK – Household Kerosene
HIV – Human Immunodeficiency Virus
HPFO – High Pour Fuel Oil
HSE – Health Safety and Environment
ISO – International Standard Organisation
JIT – Just in Time
LGA – Local Government Area
LPG – Liquefied Petroleum Gas
LPFO – Low Pour Fuel Oil
LCA – Life Cycle Assessment
MVS – Maximum Variation Strategy
NNPC – Nigerian National Petroleum Corporation
PMS – Premium Motor Spirit
PPMC – Pipelines and Product Marketing Company
SC – Supply Chain
SCM – Supply Chain Management
SPDC – Shell Petroleum Development Company
SPSC – Sustainability Performance Supply Chain
SPSS – Statistical Package for the Social Sciences
SSCM – Sustainable Supply Chain Management

TBL – Triple Bottom Line
TQM – Total Quality Management
ULSD – Ultra Low Sulphur Diesel
ULSP – Ultra Low Sulphur Petrol
UK – United Kingdom
UKPIA – United Kingdom Petroleum Industry Association
QMS – Quality Management System
V1 – Version One
V2 – Version Two

Table of Content

List of Figures

List of Tables

1 Introduction

1.1 Introduction

Trade in ancient times can be traced back to prehistoric times when exchange for goods or services was not done via monetary means but rather by the Barter system (Sharma 2015). The transfer of ownership of goods or services in exchange for another good or service characterised the *"trade by barter era"*. This was the beginning of trade also regarded as commerce in ancient times. Barter trade is characterised by no exchange of money but rather, good or service for good or service (Walker 1878). This era made a way for the later use of a medium of exchange in form of shells, precious metals and further on money, and in recent times, credit cards and other non-physical means of payments (Pomeranz and Topik 2015)

This evolution of the trade system which is characterised by exchange of goods and services through a monetary medium via a network that allows these transactions, referred to as a market place has over the years transcended through an era of movement of goods and services to locations where they are needed from specialized areas of production (Pomeranz and Topik 2015). This involved the use of trade routes to allow the movement of goods to distant markets. Trade routes are pathways used for the transportation of goods and this may be by road, over water and any other logistical network that allows movement of commercial activities (Cambridge Dictionary 2017). This logistical network gradually over time has become a structured and regularized means of transporting goods and services in modern times. Also, the need for movement of goods and services has undergone a gradual and systematic transformation allowing the availability of goods and services in centralized locations closer to the market and the consumers of the product where possible.

Bringing commercial activities closer to the required market and the production of goods and services from far and near to meet the needs of customers in a structured and timely manner characterises modern day business activities. Thus, this increased the need for a system that allows coordination across all activities involved in the process and this was foundational to the concept of the supply chain (Robinson 2015).

Supply chains have evolved over the years from the simple buying and selling of goods to a more organized and structured exchange of goods and services via a system that incorporates the sourcing of the raw materials up to the delivery of the goods to the final consumer and sometimes the disposal of unused or waste parts of the products. This involves procuring the

raw materials for the production of goods and services, transportation of the raw materials to the required production location, the production process, quality checks, storage of the goods in centralized locations and getting the goods to customers in a timely manner (Lee and Billington 1995). This process describes a typical supply chain. A supply chain encompasses everyone involved from raw material sourcing to the eventual delivery of the product to the customers and even now, to the disposal of unused parts or after-life of the products.

Overseeing supply chain activities and functions to facilitate its efficiency and effectiveness in a way that ensures that suppliers, manufacturers, logistic team, marketers and everyone involved in supply chain processes characterises supply chain management. Supply chain management is the management of a network of multiple relationships across the supply chain (Lambert and Cooper 2000). It allows the integration of inter-company and intra-company processes to evolve an efficiently managed and coordinated supply chain.

In this age, much of society generally expects that efficiently managed supply chains are expected to go beyond the premise of timely delivery, cost reductions, quality and customer satisfaction, but extend further to take into consideration the environmental, social and economic impact of their activities on the larger society (O'Rouke 2014). This brings into focus the increasing need for the integration of sustainability into supply chain management. Sustainability also discussed under the umbrella of sustainable development has become an important topic of discussion following the 1987 Brundtland report (Vachon and Mao 2008) and it evaluates the preservation of resources; environment, economic and society for future generation whilst it is being harnessed by the current generation (Kuhlman and Farrington 2010). Sustainable Supply Chain Management (SSCM) is the incorporation of sustainability concerns which focuses on the environment and socioeconomic dimensions into an organization's supply chain in order to steer business activities towards positively impacting contributions on sustainability dimensions.

SSCM is not native to a particular industry as organizations across the globe are expected more and more to take into cognizance how their supply chains and by extension their profit making activities meet the needs of the current generation and its effect on the global society now and in the future (Carter and Rogers 2008). It encompasses how resources are put into credible use now and its continuous availability for future generations, business processes and its impact on the environment, and an organization's responsibility to its stakeholders and society. Economic posterity is required for future generations to thrive and in this regard, the survival

of supply chains characterised by positively impacting business processes on sustainability dimensions is crucial to making this possible (Carter and Rogers 2008).

The oil industry plays a key role in the development of many countries as it contributes to global economic and social economic development (Briggs, Tolliver and Szmerekovsky 2012 and Hughes and Rudolph 2011). The reason for this is that the industry plays a prominent role in the global energy supply, transportation and provision of raw materials for petrochemical and manufacturing industries to mention a few. Apart from the major contributions made by the oil industry towards the world economy, the industry's supply chain is also an area of contention with regards to sustainability (Pies *et al*. 2010). To start with, a large proportion of the raw material used in the industry, which is petroleum, is a naturally occurring hydrocarbon which is continuously depleted with every barrel of oil sold to the global market. This aside, the environmental and social impact of the continued exploration and refining of petroleum for economic gains by the oil industry and world leaders has been the centre of discussions in many sustainability discussions even as the industry claims to be striving towards a more sustainable supply chain. It is no news that the oil industry's supply chain activities have adversely contributed to global sustainability issues as a result of some of its detrimental effects on sustainability dimensions (Ihlen 2009).

It would however be unfair to totally castigate the oil industry's supply chain as being unsustainable even as the industry is constantly under scrutiny and has been criticised for some of its poorly implemented supply chain activities. Many oil industry players are ardent supporters and proclaimers of sustainable supply chain activities with investments in business strategies in this regard (Pies et al. 2010). However, this effort is marred by unprecedented catastrophic results of some of the industry's unsustainable practices both in the upstream and downstream sectors of the industry (Ihelen and Roper 2009 and Ketola 2007).

These SSCM issues that characterise the oil industry's supply chain however seem to be more pronounced in developing oil producing countries which tend to bear a larger percentage of the oil industry's unsustainable practices compared to their developed counterparts. Whilst the oil industry's unsustainable practices especially in the upstream sector in developing countries has been a centre of discussion by many scholars, academicians, world representative bodies, NGOs and even affected stakeholders, not much work has been done on the down-side end of the supply chain. This thesis examines the variation in SSCM in the oil industry downstream supply chain of a developed and a developing oil producing country in order to proffer

implementable improvements via a SSCM framework that will improve the industry sector's efficiency and performance across the dimensions of sustainability and in turn improve the country's profitability and stakeholder relationships.

1.2 Background of the Study

This research work is borne out of the need to evaluate the supply chain practices of the downstream oil sector in developing countries and its effect on the dimensions of sustainability. The downstream oil industry which is often overlooked for reasons which may stem from the very numerous sustainability issues facing the upstream oil industry sector is not free from negatively impacting supply chain activities. The downstream oil industry supply chain which is characterised by refining, storage and distribution of refined products is an integral part of the oil industry and contributes to economic and social development.

The downstream oil industry supply chain is characterised by decision making at various stages; planning, scheduling and operations and at different management levels. This necessitates an alignment of complex processes to allow for the harmonization of decisions and accompanying supply chain activities towards the accomplishment of set business goals. Deriving competitive advantage in modern day supply chains requires the integration of processes in a manner that allows the implementation of strategies fashioned towards end-to-end performance improvement objectives (Lasschuit and Thijssen 2004).

Recent years have seen a move from traditional manufacturing and sale of products to end-users to a more coordinated supply chain which is anchored on timely product delivery, a clear market understanding and customer satisfaction. Thus, rather than businesses competing, supply chains compete and the success of which is determined in the marketplace by the end-user (Christopher and Towill 2001 and Lambert and Cooper 2000).

This new era of successful brands riding on the success of their supply chains competing favourably with other supply chain instead of the old system of brand versus brand competition relies on the management of multiple, intricate network of relationships that stem across the supply chain (Lambert and Cooper 2000). Whilst gaining a competitive edge and in turn improved profitability crucial to the strategic positioning and longevity of an organisation, the impact of business activities captured in supply chain processes are also factors to be considered as the convergence between supply chains and sustainability is now an important topic of discussion (Linton, Klassen and Jayaraman 2007).

The consideration of sustainability in supply chain management makes way for an organisation to evaluate the impact of their supply chain activities on sustainability dimensions even as they thrive to stay competitive in the market place. The liaison between sustainability and supply chain management has reiterated studies linked with green purchasing, reverse logistics, EMS (Environmental Management System), and green supply chain (Seuring and Muller 2008 and Vachon and Mao 2008). Many organisations are taking into cognizance the environmental and social effects of their supply chain activities and this is evidenced by the high number of organizations with certified ISO standards and the adoption of CSR (Corporate Social Responsibility) strategies to encourage a more positively impacting supply chain (Darnall, Jolley and Handfield 2008 and Vachon and Mao 2008).

With regards to SSCM, many developed countries as well as its developing counterparts have in place checks and procedures for monitoring and ascertaining that organisations adhere to set regulations and standards to ensure that sustainability considerations remain an important part of an organisation's business ideals (Dashwood 2014). These regulations cut across industry sectors including the oil industry which is often scrutinized for many of its supposed unsustainable practices and business activities. With the continuing rise in stakeholder issues especially in the oil industry in a developing oil country such as Nigeria (Ambitunni, Amezaga, and Emeseh, 2014), it is no wonder that the adoption of SSCM in such countries become questionable.

Studies on a country's industrial profile and its adoption of sustainability efforts with accompanying results are still lacking (Vachon and Mao 2008) even as industry specific sustainability practice in developing countries remain vague (Pugh 2013 and Grindle 2002).

1.3 Aim of the Research

The aim of this research is to critically evaluate the variations in SSCM in the downstream activities of the oil industry and to develop and validate a framework that will have the potential to enhance the levels of sustainability in the downstream oil industry.

This research work differs from previous research work and is therefore novel, as it focuses on the downstream sector of the oil industry's SSCM practice and examines the influence of a country's developmental level on sustainability adoption and its effect on the dimensions of sustainability.

1.4 Objectives of the Research

In order to achieve the above mentioned aim, the following research objectives have been identified and will be focused upon in this research work;

- The investigation of variations and similarities in SSCM in the downstream sector of the oil industry in developed and developing regions/countries with specific emphasis on a product stream along the refining and distribution links of the supply chain.
- Identifying the drivers and barriers of SSCM practice in the downstream oil industry in developing and developed oil producing regions/countries.
- The development and validation of a framework to evaluate and analyse the oil industry's downstream SSCM efforts in developing and developed regions.

1.5 Research Questions

Based on the research aim and objectives, research questions that will be answered in the course of this work are:

1. What sustainability measures are deployed by the downstream oil industry – Nigeria and UK?
2. What is the influence of Nigeria's level of development on achieving effective downstream SSCM
3. What are the drivers and barriers to SSCM in the Nigerian and UK oil industry and how do these impact on SSCM in these countries?

1.6 Research Methodology

The mixed-method research method was adopted. This involved the collection of both quantitative and qualitative data. Quantitative data was collected via the use of questionnaires from local communities around the Nigerian downstream oil industry infrastructures and qualitative data was collected via interviews from the Nigerian downstream oil industry. A pilot study was conducted prior to data collection and this informed and guided the data collection process. Interviews were conducted over the telephone and selection of respondents was based on purposive sampling technique. This was to ensure that respondents being interviewed were vastly experienced and knowledgeable to contribute to the study. The reason for the choice of telephone interview was based on the difficulty of reaching respondents located across the country's four refineries and the distribution centres across the country and the advantage of being able to plan interviews around the busy work schedules of respondents.

Respondents interviewed were senior supply chain managers, sustainability managers, suppliers, transport and logistics managers and HSE managers in the downstream sector of the Nigerian oil industry. For the quantitative aspect, questionnaires were administered face-to-face to residents living close to downstream infrastructures. Analysis of collected interview and survey data was conducted using the Nvivo 10 software and the Statistical Package for Social Science (SPSS) software respectively.

1.7 Structure of the Thesis

This research study consists of nine chapters and these chapters are: Chapter 1 which is the introduction to the thesis. This examines the background, aim, objectives and questions for this research study. Chapter 2 reviews the literature and examines supply chains and sustainability in business organizations and the oil industry specifically. Chapter 3 critically examines major elements of supply chain activities in the Nigerian and UK downstream oil industry. Chapter 4 examines the various types of research and approach and gives a justification for the mixed method research and case study approach respectively. The chapter also presents the data collection process for the quantitative and qualitative aspects of this study. Chapter 5 gives an account of the data analysis and presents qualitative data analysis results and statistical results from the data collection process. It also present results from analysed secondary data for the UK downstream oil industry. Chapter 6 is the data evaluation chapter and it examines the results from the data analysis chapter for the purpose of providing answers to the research questions raised in the introduction chapter. Chapter 7 presents the SSCM framework for the Nigerian downstream oil industry. It shows the framework development process and the stages undergone to evolve a final framework version. It also shows the framework validation process which involved a validation workshop with the Nigerian downstream oil industry executives. Chapter 8 is the concluding chapter of this research study. The chapter summarises main findings from this study and reports on the contribution to knowledge and industry of this research study. It also discusses limitations and recommendations of this research study and ends with a brief summary of the thesis.

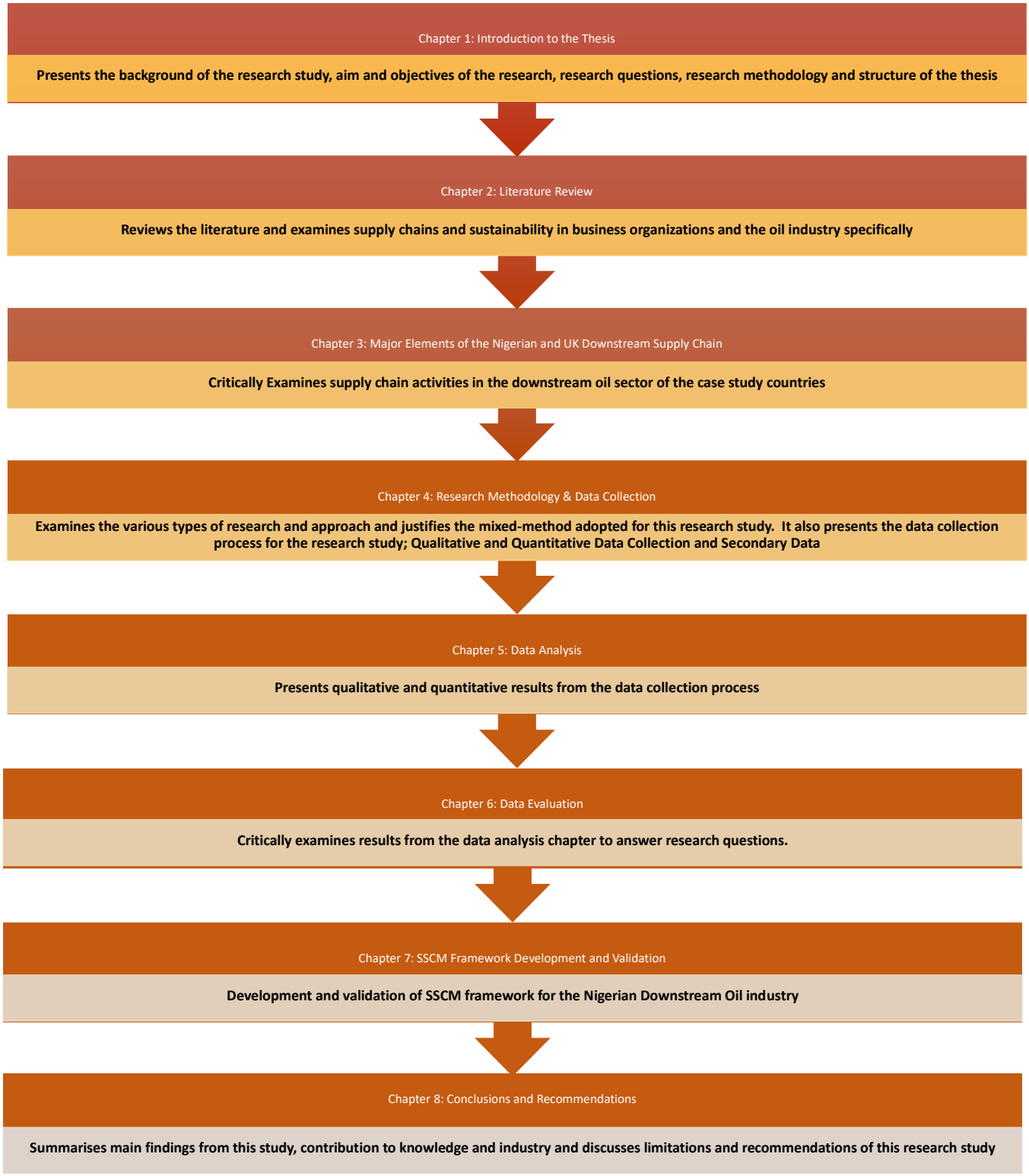


Figure 1.1 Thesis Structure

1.8 Summary

This chapter examined trade in ancient times and the evolution to a more structured commercial system as is existent in modern times. Also, the chapter examined the research background and the justification for this study. The aim, scope, objectives and research questions were also outlined and the methodology for conducting the research was also summarized and justified. The next chapter is the literature review and it presents a detailed evaluation of literatures on supply chain management, sustainability and SSCM in organizations and further on with focus on the oil industry.

2 Literature Review

2.1 Introduction

In this chapter, some sustainability constructs and theories are examined and sustainable supply chain management as well as sustainability frameworks and indicators. An overview of the oil industry supply chain is presented, followed by sustainable supply chain management in the oil industry. Drivers and barriers to sustainable supply chain management in the oil industry is also reviewed. This is followed by an evaluation of sustainability issues in the upstream and downstream oil industry supply chain. A review of current sustainable supply chain management practices is also conducted.

2.2 Sustainability

In the last 25years, sustainability has become an important topic of discussion and an integral part of key processes in industries across the globe as more organisations are being confronted with the task of scaling down their environmental footprint (Carter and Easton 2011, Holden, Linnerud and Banister 2014, Infante *et al*. 2013, Singh et al. 2009, Krajnc and Glavic 2005).

In the last quarter of 2015, 195 countries entered into a first-ever universally binding global climate deal at the Paris Climate Conference (COP21). A key goal of this partnership is the reduction and eventual mitigation of emissions in order to keep global average temperature below 2^{o}C as a long term goal. This is aimed at reducing the harmful effects of emissions and the negative impacts of climate change (European Commission 2018). This trend of taking into cognizance how the effects of industrial and societal value adding activities can be minimized and their impacts mitigated began a long time ago. The concept of sustainability started becoming prominent in 1946, when sustainable farming was introduced by Lady Eve Balfour (Yusuf *et al*. 2012). This began a trend of awareness of the numerous issues such as pollution, use of non-renewable energy sources and so on associated with industrialization and economic development in both developing and developed countries. This trend continued over the years and by the 1970s, issues surrounding population growth, rising resource depletion and increasing environmental degradation further pushed the sustainability concept into limelight (Du Pasani 2006). Following this period, various important milestones have been recorded with respect to the sustainability concept. Some of these milestones as identified in the work of Wu (2013) are; the definition of sustainable development as defined in the 1987

report of the United Nations World Commission on Environment and Development, the 1992 United Nations Rio summit on Environment and Development on plan of action for achieving sustainable development across the globe, the emergence of the term "sustainability science" in the 1992 report of the United States national Research Council, the publication of the paper on sustainability science and the United Nations 2002 World Summit on Sustainable Development.

According to the 1987 Brundtland report, sustainability can be defined in the context of sustainable development, which is the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). This definition by the United Nations in 1987 which is regarded as "Our Common Future" is the most frequently cited definition in many literatures (Santiteerakul 2015, Toman 1994 and Wu 2013). This definition emphasizes a process of change where a balance is sourced "… between human development and environmental protection as well as intra- and intergenerational equity" (Wu 2013: 1001).

The ability of future generations to thrive successfully according to Pearce, Markandya and Barbier (1989) is dependent on the current generation ensuring that future generations possess resources for their development. Thus, whilst meeting human needs with available resources, it is required that progressive systems are put in place to ensure a dynamic balance to ensure that societal and institutional growth as well as environmental protection are all in harmony to facilitate the transfer of equal benefits and opportunities to future generations (WCED 1987). Sustainable development as defined in the work of Diesendorf (2000: 3) "… comprises types of economic and social development which protect and enhance the natural environment and social equity". Mihelcic *et al*. (2003), Glavic and Lukman (2007) and Diesendorf (2000) all share similar views on sustainable development with Glavic and Lukman (2007) defining sustainable development as "… the evolution of human society from the responsible economic point of view, in accordance with environmental and natural processes". This definition views environmental, societal and economic resources as contributing to present and future generations. Dresner (2008: 2) stated that the sustainability concept is portrayed by various schools of thought in numerous ways "some emphasizing development through economic growth, and others emphasizing sustainability through environmental protection". A common point of agreement however, is that the sustainability challenge has evolved over time, but the issues that remain pertinent are how economic growth, good quality of life, and a well sustained

and stable environment can be maintained now, without compromising its availability in the future.

2.2.1 Sustainability and Sustainable Development

Sustainability in the Brundtland report is defined in the context of sustainable development. This definition has however been criticised as contestable (Ihlen and Roper 2011). The Brundtland sustainability definition, whilst emphasizing an important viewpoint of the concept which is long-term based, is however limited in two ways; Firstly, the definition equates human needs with wants whilst failing to explicitly include the natural environment and secondly, it also assumes that economic growth is systematically a part of development and fails to categorically distinguish between the different types of economic structure (Hopwood and O'Brien 2002 and Ihlen and Roper 2011). Thus, failing to explicitly distinguish between the economic growth that involves the use of naturally occurring materials and energy but with a diminishing and negative effect on the natural environment.

Also, at the 2012 United Nations Rio summit held in Brazil, the creation of SDGs (Sustainability Development Goals) as add-ons to the already existing millennium goals were emphasized in order to protect the earth whilst also considering reduction in societal poverty. Briggs et al. (2013) however argued in favour of a more stable earth system alongside directed efforts towards the protection and security of life's support system and poverty alleviation (Griggs *et al*. 2013).

This definitional in-clarity in the description of what sustainability and sustainable development is can be perceived as an important political opportunity that allows for meaning to emerge as the concept is being implemented, thus benefiting from what can be regarded as "*constructive ambiguity*" Robinson (2004). Regardless of the supposed limitations ascribed to this Brundtland definition, a common viewpoint is that many works are rather focused on the feasibility of the concept and the existing interacting relationships between the environment, society and economic systems (Beske and Seuring 2014, Kulhman, Tom and Farrington 2010, Robinson 2004 and Wolf 2014).

A more acceptable definition is to describe sustainability as the goal point or the desired end-point of the sustainable development process. Hence, sustainable development can be described as the pathway to sustainability. It is an integrative process that encompasses the actualisation of the sustainable development process over a long-term period that is focused

towards a balance of all interacting relationships (economic, social and environmental) such that all relationships result in a positively impacting outcome for all sustainability dimensions (Diesendorf 2000, Harris 2003, Kurnia *et al*. 2014, Pratima and Desjardine 2014 and Washington, 2015).

As stated in previous sections, in sustainability discussions, three essential aspects are often identified. These are regarded as the dimensions of sustainability and these capture the essence of the sustainability definition. The three dimensions of sustainability; the social, environmental and the economic dimensions (Amini and Biestock 2014, Baske and Seuring 2014, Elkington 1999, Krajnc and Glavic 2005, Seuring 2013, Winter and Knemeyer 2013 and Oyedepo 2012). These three dimensions of sustainability make up the themes under which the sustainability concerns are discussed. Hence, sustainable development is often presented "… as aiming to bring the three together in a balanced way, reconciling conflicts" (Giddings, Hopwood and O'Brien 2002). These three sustainability dimensions are elaborated upon in subsequent sections.

2.2.1.1 Environmental Sustainability

Human life and livelihood is heavily reliant on the natural environment and this emphasises the need for its protection (Melville 2010) to achieve a progressive and socially sustainable society (Goodland 1999). Morelli (2011: 22) described the environment as a subset of ecological sustainability describing human interaction with the ecological system. This thought the author further emphasized on, in his definition of environmental sustainability as "a condition of balance, resilience and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity". Harris (2000: 6) stated that "an environmentally sustainable system must maintain a stable resource base, avoiding over-exploitation of renewable resource systems or environmental sink functions, and depleting non-renewable resources only to the extent that investment is made in adequate substitutes". This includes biodiversity, atmospheric stability, and other ecosystem functions not ordinarily classed as economic resources".

The sustainability concept in the context of environmental pollution, climate change, global warming and the needed change to save the environment especially in the oil industry has become a challenging but prominent subject of discussion (Ihlen 2009 and Pearce, Markandya

and Barbier 1989: 11). This is evident in the call for the oil industry to source for renewable energy sources so as to minimize the past and current intrusion on the ecological stability of the environment in order to stop further damage (Dincer 2000, Mirchi *et al*. 2012, Stambouli et al. 2012).

Renewable energy is energy obtained from resources that replenish themselves over a period of time. Sunlight, water, wind, waves and plants fall within this category of energy. Non-renewable energy resources on the other hand, cannot be replenished and can therefore be extinct over time, an example is fossil fuel (Mirchi *et al*. 2012). Various forecasts have been made over the years regarding the futuristic consumption and depletion of global oil reserves (Bentley, Mannan and Wheeler 2007, Kontorovich, Epov and Eder 2014, Mirchi *et al*. 2012 and Stambouli *et al*. 2012). Hence, the challenge of ascertaining that global oil reserves are not exhausted, together with the mandatory need to sustain the environment has given rise to efforts channelled towards the development of alternatives to fossil fuel (Asif and Muneer 2007: 1390).

Novel innovations have been focused towards the creation of fossil fuel substitutes by the development and the use of fuel cells, bio-fuels, electricity (electric-powered cars) and the growth of nuclear energy. However, all these supposed alternatives are still work-in-progress as time and technological advancement is still required for these alternatives to meet global energy demand. Recent reports accent global dependence on fossil fuel, "Fossil fuels still dominate energy consumption, with a market share of 87%. Renewable energy continues to gain but accounts for only 2% of energy consumption globally" (BP: 2012). This shows that fossil fuel consumption continues to grow and replacement by renewable energy will take several years to actualise. According to Carter and Easton (2011: 46), the rising importance of sustainability can be attributed to the surging demand and growth potential of the energy industry, issues with climate change and better accountability with regards to environmental and social effects of organisations and their processes. The growth figure of renewable energy notwithstanding, its existence in today's oil environment is a welcome option to actualising environmental sustainability. That being said, even the use of renewable energy resources has to be controlled as its ability to refurnish itself can be hindered by pollution and over-utilisation.

2.2.1.2 Economic Sustainability

Similar to environmental sustainability where the consequences of environmentally unfriendly activities and decisions impact on both the social and economic dimensions, social sustainability can also be said to have its elements integrated in the environment and extending to the economic dimensions of sustainability (Lehtonen 2004 and Hadisty 2010). This is because, the need for economic growth requires making strategic decisions and embarking on commercially viable activities which often at times have adverse effects on the environment and ultimately on the society at large (Goodland 1995 and Qerimi and Hajdari 2017). McKenzie (2004) in his work described the two commonly used models for representing the inter-relationship between the three aspects of sustainability. According to the author, one of the models illustrate economic and social sustainability as thriving on the health of the environmental aspect while the second model describes all three aspects as overlapping circles, suggesting equal importance (see figure 2.1 and 2.2).

The author however argued that in reality this is not the case, as often times, all three arms of sustainability are not accorded similar relevance. In order to fully comprehend the prominence of social and economic sustainability, Dresner (2008) accentuated the two main concepts from the 1987 Brundtland definition of sustainable development. The author highlighted the notion of 'needs' and the concept of constraints imposed by technology and social strata on the ability of the environment to meet current and impending needs. Thus, in order to explicitly define sustainability, the objectives of economic and social development must be defined for all countries, irrespective of their level of development.

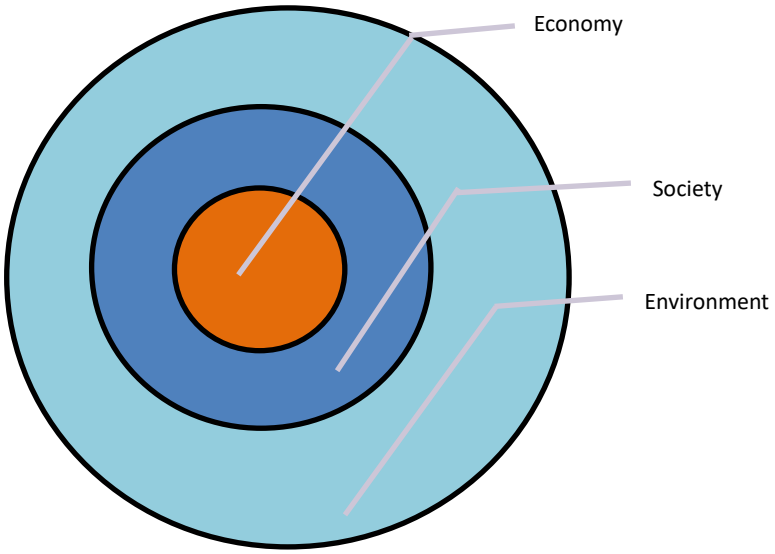


Figure 2.1 Environment Dependent Sustainability Model (McKenzie 2004)
The figure shows the dependent relationship existing between the economic, social and the environmental dimensions of sustainability.

Unruh (2008: 17) in his work defined economic sustainability as "the commerce that preserves the natural world's capacity to provide us with clean water, air and vital natural resources in perpetuity, while simultaneously achieving global equity through the elimination of poverty and the extreme disparities that currently exist in our planet". In this definition, one cannot miss the emphasis on environmental quality and its relationship with economic sustainability. Sustainable economic development impacts positively on the quality of the environment as better standards of living influences people's perception of the environment (Hadisty 2010). This is true if the dimensions of sustainability are equally enhanced to become truly sustainable as economic sustainability without environmental and social sustainability is detrimental to achieving complete effective sustainability.

Economic sustainability evaluates the "… internal and external implications of sustainability management" (Doane and MacGillivray 2001:19). Thus, it examines organizational management of; intangible assets, financial performance, effect on the external environment and social and environmental impacts. Economic sustainability has been described by some academicians as 'stock of capital' Elliot (2005: 269) and 'non-declining wealth' Pearce (1989: 34). The latter definition is based on the concept of 'intergenerational equity' as stated by Pearce (1989: 34, 36) and the ideology is that, future generations will fare better if present generation leave behind natural and man-made wealth no less than they inherited and this wealth must not be foreshadowed by boomerang impacts of environmental problems and social

disruptions. Natural wealth in this regard refers to environmental resources and assets in form of air, water, plants, oil and energy. Man-made wealth also sometimes referred to as capital wealth is made up of man-made goods, machines, factories and human intelligence.

Elliot (2005: 269) described economic sustainability in terms of capital and this is classified into three groups; natural capital (K_n), human capital (K_h) and created capital (K_c). Machines, factories and all man-made goods and products fall under the created capital category, while human knowledge and expertise applied in the operation and optimization of production processes are classified as human capital. Natural capital encompass naturally occurring production inputs, such as air, water, plants, and other nature endowed forms of capital such as crude oil. In this definition, all three forms of capital are viewed as substitutes and not complements. This is regarded as the neoclassical view on sustainability where it is permitted for any of the three forms of sustainability to be overly exploited so far the value of the total summation of capitals stay the same. Thus, K which is the capital stock is the sum of all three capital categories (K_n, K_h and K_c). This classification implies that the current generation can deplete a form of capital, say natural capital such as crude oil and make up it by harnessing and increasing another form of capital such as created capital so far the sum of capital stock remain the same and can be passed on to future generation so that they also enjoy the same quality of life as the current generation.

This contradicts Pearce (2005: 48) stance on economic sustainability in his work as he adopted the 'constant natural capital' attitude to the concept. Constant natural capital preaches that natural wealth should not decline and the emphasis is majorly on environmental conservation. This school of thought is referred to as ecological economy where the forms of capital are referred to as complements and the individual quantity is required to make an aggregate stock. If the quantity of man-made capital dwindles, it is believed that it can be replaced since it is a function of human intelligence. The same cannot however be said for natural capital as the loss in this category can sometimes be irreversible or may require another form of natural asset to act as a substitute, therefore, causing an imbalance in the total wealth being passed on to the next generation. Going by this analogy, the pressing global demand for natural capital such as fossil fuel will continue to impact negatively on economic sustainability especially with the new exploration discoveries such as shale sand in many continents around the globe. Elliot (2005: 270, 272) argued that in order to tackle the sustainability issue effectively, sustainability interests across prominent disciplines such as the natural, business, social sciences and all other

affected disciplines are taken into consideration so as to achieve a comprehensive reflection and coverage on the sustainability goal.

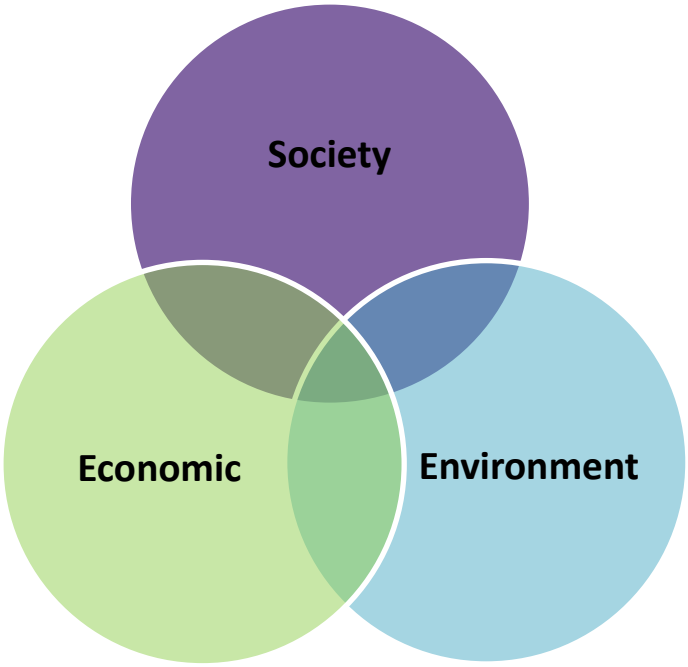


Figure 2.2 Overlapping Circle Model for the three Sustainability Dimensions (McKenzie 2004)
The figure demonstrates the overlapping inter-relationship existing between environmental, social and economic sustainability.

2.2.1.3 Social Sustainability

Of all the three sustainability dimensions, social sustainability is the least positioned in sustainable development discussions (Dempsey et al. 2011: 289, Ghahramanpouri, Lamit, and Sedaghatnia 2013: 186, Landorf 2011: 465, Magis and Shinn 2009: 1, Hutchins and Sutherland 2008: 1688, McKenzie 2004: 7, Lehtonen 2004: 199 and Seuring and Muller 2004: 1702). The reasons for this as stated by Landford (2011: 465) can be traced to the historic evolution of the sustainability concept transversing through periods of environmental emphasis, followed closely by the era of economic importance of the concept. He also mentioned that the other two sustainability dimensions have somewhat well-established channels of impact and performance measurement unlike social sustainability which is deficient in definitional clarity and exact dimensions. The reason for this ambiguity is attributed to the inconsistencies associated with what themes fall under the social dimension and how this is interpreted in the socio-political and the academic environment (Littig and Grießler 2005).

McKenzie (2004) attempted to distinctly examine social sustainability in its own right without the usual dress-up of the concept by the other sustainability dimensions. The author argued that recent developments have seen the birth of some sustainability indicators but these have however been insufficient to adequately represent social sustainability. This is attributed to the difficulty in estimating social sustainability and the task of developing industry-specific indicators as opposed to the multi-faceted ones developed for industries in general. Azapagic (2004) developed indicator sets to represent the key sustainability issues specifically in the mining and minerals industry. The author however did not fail to mention the herculean task of measuring how socially sustainable an organisation or a sector is as some of the social dimensions such as human rights protection and cultural value are difficult to express in physical terms. For example, the use of preservation of cultural values as indicator and defining stakeholder inclusion and assisting in community projects as themes under it cannot be said to distinctly capture the sustainability issues related to how the cultural heritage of local communities have been harnessed or tampered with.

Sustainability indicators are tools for measuring defined sustainability themes and estimating progress made in sustainable development (Reed, Fraser and Dougill 2006: 406). McKenzie (2004) further argued that in order to define social sustainability, a conscientious appraisal of the concept and its application for the purpose it is meant to serve is required so as to achieve a detailed and usable definition. Lehtonen (2004: 202) described social sustainability as a bipolar, reflexive and immaterial aspect of sustainability. According to him, the concept is bipolar as it describes both individual and collective themes; reflexive because social goals are influenced by individual and group perception and interpretation of such goals; immaterial as the concept is difficult to quantitatively evaluate.

The primary constituents of social sustainability are human wellbeing, equity, democratic government and democratic civil society (Magis and Shinn 2009). These four principles are essential prerequisites to social well-being and invariably, social sustainability. This view of social sustainability however identifies it as a people-oriented concept (Chiu 2003). The definition of social sustainability in light of achieving a sustainable quality of life by the present generation without jeopardizing the ability of future generations to do the same is a popular opinion and can be found in the works of many other authors (Azapagic 2003, Harris 2000 and Landford 2011). A common feature in the views of these authors is that a community can be said to be socially sustainable if there is equal distribution and consumption of resources, social

cohesion, equality, satisfactory quality of life, social justice and amiable social relations. The dimensions of social sustainability do not only cover people and their quality of life, it should also accommodate according to Chiu (2003) the social preconditions for sustainable development which stipulates that in order to be sustainable, the necessary social framework, standards and patterns need to be put in place to support environmental sustainability. This interpretation is said to be environment-oriented. A more far-reaching definition of social sustainability was proposed by Chiu (2003). The author stated that social sustainability should be both people- and- environment focused because the social pre-conditions to improve ecological sustainability is required for future generations to enjoy the same quality of life as the present generation and the equal distribution and consumption of resources and assets is a necessary prerequisite for social stability, peaceful coexistence and social integration.

2.2.2 Sustainability Theories and Constructs

Whilst many works have identified social, environment and society as the three dimensions of sustainability (Azpagic and Predan 2000: 243, Elkington 1999:75, Krajnc and Glavic 2005: 191, Lehtonen 2004: 200, Matos and Hall 2007: 1084, McKenzie 2004: 1, Mihelcic *et al*. 2003: 5315 and Oyedepo 2012: 1), some other literatures have identified other variations and components that make up the sustainability concept. An expansive view on TBL(Triple Bottom Line), weak and strong sustainability and resource based sustainability can be found in Appendix G.

2.2.3 Sustainability Frameworks and Indicators

An increasing number of businesses now appreciate the usefulness of sustainability but they however cannot comprehend how the concept act upon their business processes (Hallin, Sandberg and Mantel 2017). There is thus a need for a reassessment of some industrial practises and also the development of methods of monitoring and evaluating progress (Krajnc and Glavic 2005: 191). Frameworks have been developed by various organisations and authors in order to measure and assess the sustainability proficiency of business organisations (Singh et al. 2009: 191). Xing et al. (2009) in their work on developing a model to evaluate urban sustainability impacts reviewed various sustainability models and concluded that the Sustainability Assessment Model (SAM) was more auspicious as it covered all three goals of sustainability and it has been proven useful in real-life industrial application. Veleva *et al*. (2000) came up with a framework focused on evaluating the competence of sustainability indicators to effectively serve as a platform for evaluating performance and progress in

sustainable production. The focus was primarily on environmental sustainability and not on the other dimensions of sustainability. Ekins and Simon (2000) developed environmental sustainability indicators from objective standards in order to compare the current level of sustainability with set standards and ultimately identify the gap. They went further to state that sustainable development is in force when the 'sustainability gaps' between set standard and indicator-measured sustainability is zero or forecasted to approach zero within a stipulated period.

The creation of sustainability measuring tools is mandatory to ascertain conformance to sustainable practice and to check the impacts of business processes on the environment (Afgan, Carvalho and Hovanov 2000: 604). According to Azapagic and Perdan (2000), to evaluate and assess the level of growth with regards to sustainable development for any organisation or society, it is fundamental to develop suitable indicators for this purpose. Rametsteiner *et al*. (2011: 62) stated that "the role of sustainability indicators is to structure and communicate information about key issues and their trends considered relevant for sustainable development" They further affirmed that sustainable indicators are essential in developing a good understanding of the relationship between the dimensions of sustainability and how they are impacted by human activities, the inter-linkages between components of the system under study and the characteristics of the environment. Sustainability indicators are key functional tools for quantifying the growth pace of sustainability, specifying objectives, diagnosing areas of concern and for developing appropriate management actions (Reed, Fraser and Dougill 2006:410).

The interpretation of sustainability concerns into measurable indicator themes is an arduous task that requires contribution from all affected stakeholders (Azapagic 2004: 647), so as to ensure an unbiased representation of every stakeholder (United Nations 2007: 39). The translation of the issues associated with the mining and minerals industry into measurable indicators of corporate performance for example according to Azapagic (2004), would be an impractical task due to the vast number of people with vested interest involved and the global nature of the prevailing issues in the industry such as depletion of non-renewable resources, disturbance of the landscape, health and safety of workers and citizens.

Krajnc and Glavic (2005a: 192) stated that in order to actively tackle the sustainability challenge, it is essential to ensemble all indicators related to the sustainability theme as this is

crucial for informed decision making as well as ascertaining the participation of all stakeholders. Indicators can be selected by employing a number of statistical techniques such as "cluster analysis, detrended correspondence analysis, canonical correspondence analysis and principal components analysis" and qualitative research for the representation of stakeholder interest, problems and strategies. In an attempt to develop globally effective indicator sets, the United Nations Commission on Sustainable Development (CSD) designed a sustainability development framework and derived 58 core indicator sets from a list of 134 indicator sets, for sustainable development goals (Singh et al. 2009: 194).

According to Reed, Fraser and Dougill (2006: 411), the establishment of indicator sets to measure sustainability and achieve stipulated goals should be developed such that it can objectively measure advancement towards set sustainable development goals and must be adaptable for users to implement. To achieve this, it is essential to thoroughly examine and scrutinize the activities of the industry in question so as to fully comprehend the sustainability issues at hand and thus institute the development of indicators to measure progress (Azpagic 2004: 643). Often times, developed indicators are categorised under the three dimensions of sustainability; environmental, economic and social for various industries (Azapagic 2003: 309, Krajnc andGlavic 2005b: 553 and Azapagic 2004: 648).

Azapagic (2000: 248) developed a generic framework for sustainability indicators based on a Life Cycle Assessment (LCA) approach which takes into account the complete life cycle of a product including the flow of materials and the entire supply chain. The framework indicators were classified under the three sustainability dimensions and covered a wide range of themes which are applicable to industries in general. As a follow-up to this, the author developed a sustainability indicator framework for the mining and minerals industry (Azapagic 2004:647). This provided an integrated indicator sets which combined two or more sustainability indicators to facilitate a more comprehensive measurement approach so as to provide a well informed decision making platform for business executives and other stakeholders in the mining industry. Also, to create room for cross comparison across companies in the sector, Azapagic adopted the GRI format of sustainability reporting but with additional indicators on how well a company has fared with regards to a specific industrial activity.

The Global Reporting Initiative (GRI) is a multi-stakeholder organisation that provides sector-specific sustainability reporting framework for organisations worldwide to measure and report

their sustainability performance across all essential areas (economic, environmental, social and governance) of sustainability (GRI 2013). The GRI was initiated in 1997 by the United Nations Environment Programme (UNEP) in collaboration with the Coalition for Environmentally Responsible Economics (CERES) with the intent of improving the quality and adequacy of sustainability reporting (Singh *et al*. 2009: 194). The GRI reporting format is distinctly characterised by multi-stakeholder input, its independent governance structure and use by various government organisations in reporting sustainability (GRI 2013).

Similarly, the World Bank's role as a development bank and an international lender to corporations with the desire to invest in developing countries has placed it in an advantageous position in the drive towards sustainable development. This is evident in the creation of operational standards which may be viewed as practical instructions to be followed in specific circumstance such as managing projects with sustainability in mind (Uriz 2003: 77). This position is well visible in global projects in the oil and gas industry (Duruigbo 2005: 4). The operational policy manual of the World Bank captures themes such as environmental assessment where project benchmarks are set for key issues such as environmental degradation, displacement of people and communities and collision with rights of indigenous communities (Mackay 2005 and Uriz 2003).

The development of sustainability indicators to measure and establish the impact and performance of industries and most especially the oil and gas industry requires a non-generic set of indicators but rather industry specific indicators and frameworks. Most of the research work that has been done in this regard has often been centred on a broad array of indicators that according to some of the authors can be applied across various industries. These generalised indicators often do not capture some of the key sustainability performance measurement themes specific to industries. Azapagic (2004) emphasized this fact by developing tailored indicator sets to appraise sustainability performance in the mining and minerals industry. Also, the provision of a supplementary indicator sets and reporting guidance by the GRI Oil and Gas Sector Supplement (OGSS) GRI (2012) specifically relevant to the oil and gas industry further affirms the increasing need for industry-specific and most importantly, oil industry-specific sustainable development measurement indicators and frameworks. This is necessary to cut-down and if possible mitigate the seemingly sprouting impact of the oil and gas industry in order to ensure a sustainable future.

2.2.4 Sustainability in the Oil Industry

The issue of sustainability in major industries particularly in the oil industry cannot be over-emphasized, as it has over time become an important global topic of discussion (Infante *et al*. 2013: 289). Asif and Muneer (2007: 1399) stated that there is a deep-seated alliance between the environment and energy. In their words, "the production and use of all energy sources results in undesirable environmental effects, which vary based on the health of the existing ecosystem, the size and health of the human population, energy production and consumption technology, and chemical properties of the energy source and conversion device". The repercussion of many incidents in the oil industry (for example, the 2010 BP oil spill in the Gulf of Mexico) is usually catastrophic and the effect is normally felt globally on the ecosystem and on the financial side of world economy over a long period of time (Wan-Hussin and Alazzani 2013: 19). This aside, the oil industry is said to have a poor record in relation to human rights (Uriz 2003). As put by Spence (2011), public ambivalence towards the oil industry is comprehensible as the industry propels economic growth by meeting energy demand and achieving higher living standards but not without an accompanying cost on the society in form of negative impacts and effects of pollution, oil spills, deaths and environmental degradation. It is therefore no surprise that the oil industry is not excluded from the sustainability challenge since it is a prominent contributor in the foregoing (Oh, Pang and Chua 2010 and Infante *et al*. 2013).

The oil industry is a major player in world economy and this can be attributed to its size, volume in terms of market share and its fast and continuous growth (Natural Resources Canada 2010). The importance of the oil industry cannot be exaggerated as it is an essential part of global transportation as well as a major source of raw materials to the petrochemical and agricultural industry (Hughes and Rudolph 2011 and Natural Resources Canada 2010). The industry has become a dominant aspect of global energy and is an integral part of modern industrial economy (Hughes and Rudolph 2011:225). It serves as the main revenue generation for some of the wealthiest nations of the world. The industry is known to consist of two major sectors; the upstream sector which is involved in the exploration and production of crude oil and the downstream sector responsible for the refining of crude oil and distribution of products to end consumers (Morse 1999). Central to these sectors is a physical management interface responsible for taking strategic and management decisions for both sectors. The upstream sector of the petroleum industry is responsible for handling strategic issues and decisions for the upstream functions of the industry; hence it is accountable for the mobilisation of capital

and technology towards the exploration and production of crude oil (Morse, 1999). Thus, it is accountable for the allocation of resources and technical know-how towards the search for new oil fields, setting up platforms, extracting crude and other activities involved in extraction and production. The downstream sector on the other hand is responsible for functional and operational issues regarding the processing of the crude into various products (Fabiano and Curro 2012). Thus, it is involved in the refining of crude oil into a variety of different products, ready to be marketed and distributed to consumers.

According to Morse (1999), "two cycles define ; the interaction between the upstream and the downstream sectors; one is the process by which crude oil supplies are extracted…the second cycle which is dependent on refiners' demand for crude". By this, the first cycle refers primarily to the waiting period between capital invested into sourcing for oil and the eventual development of new oil fields. The second cycle takes into consideration the volatility of the oil market. This volatility is in effect highly influenced by supply and demand problems. According to Morse (1999: 3), when crude oil supply is in excess, producers source for safe markets to sell their crude without incurring losses due to the abundance of the product. Likewise, during periods of low demand, refiners look for ways to avoid any loss below operating profitability that may come about as a result of this. In effect, the oil market is characterised by the amalgamated activities of the industries' producers, refiners, companies and government, in order to create a balance between crude oil productions to refining competence and ultimately to customer demands.

The global presence and activities of the oil industry in their bid to meet energy demands as well as provide needed raw materials and resources for the chemical industry and the transport sector has for some time now raised sustainability concerns (Pies *et al*. 2010: 2). These concerns are however not over-rated as affirmed by the United States Environmental Protection Agency (2008) "the combined, incremental effects of oil and gas production in combination with other human activities can pose threats to human health and the environment". Ihlen (2009: 53) stated that "the issue of climate change and the subsequent development of international climate agreements have posed a challenge to the world's oil companies, as the production and use of their main product is a major source of carbon emissions". Bracho (2000) stated that the continued pollution being caused by activities in the oil industry can in the future be a threat to the survival of the industry. The continued exploration of crude oil has significant economic advantages, but this comes at a price; human rights violations, adverse

environmental pollution resulting from spilled oil, substantial contribution to green-house effect by the burning of associated gases, damage to landscapes and specie endangerment via oil sand extractions, seismic activities and building of exploration infrastructures (Pies *et al*. 2010: 2). Dabbs (1996) cited soil contamination, oil waste dumping, production pollution and water pollution as some of the many problems caused by the activities of the oil industry. The author stated further that, oil-rich communities and countries have also been known to suffer environmental damage as a result of local and international conflicts stemming from oil possession disputes. Of notable mention was the feud between the Niger Delta activists in Nigeria and Shell that led to the execution of renowned Nigerian activist Ken Saro Wiwa by the then Nigerian Military dictator Abacha over the oil exploitation rights in the Niger Delta region of the country (Bracho 2000).

Saha and Darnton (2005:12) stated that the avoidance of punitive measures that accompany the violation of environmental legislations, remediation and waste disposal costs, backbreaking tariffs, poor publicity, bid to remain competitive and pressures from various stakeholders are some of the primary reasons companies have embraced the sustainability challenge. According to Pies et al. (2010:2), the oil industries' allegiance to sustainability can be attributed to the not unusual investment scheme the industry is known for. This is because investments in the oil industry are often long term based and usually requires settling in specific locations for a long period of time depending on the project type and the life span of the oil reservoir. It is therefore in the best interest of the oil industry to adopt the sustainability stance in order to avoid environmental damage that may tarnish the image of the company; political crisis that can lead to suspension of business operations and damages; and social disapproval from communities they operate and the global community. Pies et al (2010) stated further that these special features of the industry ensure that oil companies have a genuine vested interest in sustainability, because they do not want to see their immobile investment being endangered by environmental scandals, loss of social acceptance or by political unrest. This argument by Pies *et al.* (2010) is not completely acceptable.

It is true that large operational investments by these corporations is a major sustainability driver as economic dividends is a strong motivator towards the ecological and social pillars of sustainability in the oil industry as stated in the work of Ketola (2007: 176). However, this does not signify that the entire industry is genuinely committed to sustainability as some have not adopted sustainability measures at all nor do they have the knowledge of the concept (Yusuf

et al. 2012) while some still engage in operations that are detrimental to the vulnerable ecosystems, emission of greenhouse gases and practise of unsustainable operations (for example the continued gas flaring in the oil-rich Delta region of Nigeria by Shell). Ihlen and Roper (2011) stated that "...the oil industry in particular, falter when confronted with demands that they should be ecologically sustainable, that the environment has to be privileged". This point is further buttressed by Ketola (2007), the author stated that the economic aspect of sustainability is given prime value as this pillar is seen as the road to economic growth and consumerism and is oftentimes at the detriment of the ecological pillar. Thus, though the industry is committed to sustainability and making progress towards sustainable development "this growth is still characterised by techno-centrism" (Ihlen 2009: 53), indicating that economic growth is given priority. Ketola (2007: 174) on his analysis of 'The Sisters' which represent four global oil giants; BP (Amoco), ChevronTexaco, ExxonMobil and Shell, deduced that the forms of sustainable development of these companies range from strong techno-centrism (environmental protection) to modified techno-centrism (resource management). In strong techno-centrism, trade-offs are made between ecology and economic growth and in modified techno-centrism, sustainability is seen as a mandatory constraint for ecological growth (Ketola 2007).

These foregoing shows that although the oil industry identifies sustainable practice as the way forward and to some extent can be credited for some of their sustainability initiatives, there is still the need for the industry to readdress their business strategy. Harris and Khare (2002) stated that an extensive sustainable strategy is required by the industry and this should include "growth with a diversified portfolio, improved cost competitiveness achieved through a low cost strategy, better environment protection and a proactive approach to all stakeholder issues. In order to actualise this strategy, it is imperative to take a closer look at the industries' supply chain in order to reengineer their business activities and operations towards efficient sustainable practise and standards.

2.3 Supply Chain Management in the Oil Industry

The oil and gas industry is characterised by various value-adding activities that involve global transportation of crude or/and refined products, ordering and inventory control, materials management, importation and exportation and efficient information systems and technologies (Chima 2011). Simple as the activities of the oil industry sound, they are not straightforward,

as the oil industry's supply chain is characterised as complex (Chima 2011) and requires a forward thinking approach that results in maximized supply chain efficiencies (Christopher and Holweg 2011). However in order to capture the essence of managing the oil industry value-adding activities, it is necessary to understand what the term *supply chain* and more so, what *supply chain management* means.

2.3.1 Supply Chain Management

Supply chain management (SCM) is an essential ingredient for companies to achieve a clear cut competitive edge in the business environment (Ahi and Searcy 2012). It is no surprise therefore to see that modern day businesses no longer compete "… as solely autonomous entities, but rather as supply chains" (Lambert, Cooper and Pagh 1998: 1). Over the years, business executives are becoming increasingly aware of the privileges associated with an efficiently managed supply chain as a decreasing number of companies remain vertically integrated (Lummus and Vokurka 1999: 2). Vertical integration in businesses has become less fashionable as firms of late are focusing on the gains that accompany "being specialised" by working to improve speed-to-market, agility, business growth and services while keeping cost at a minimum (Samaranayake 2005). In the same view, La Londe and Masters (1994: 39) stated that recent SCM approach "….represents the recognition that most of the benefits of vertical integration can be obtained simply by co-ordinating the logistics operations of independent firms in the chain". Thus, for firms to gain a competitive advantage and enjoy the benefits of supply chain activities, it is essential that a balanced and fully integrated supply chain guided by business demand is developed (Stevens 2007). Thus, to avoid opposing goals within an organisation, it is imperative that the activities of departments in organisations are effectively managed.

A good understanding of SCM is instrumental to business success via the efficient use and distribution of resources across the various arm of the business (Sukati *et al*. 2012: 226). The evolving and unique customer needs as well as envisaged revenue growth has led to companies developing an increasing interest in SCM (Gunnasekaran, Lai and Cheng 2006: 549). Arguments for the continuing trend towards SCM are summed up in the work of Lummus and Vokurka (1999) who stated that the increasing popularity of SCM in the business world can be attributed to global and domestic competition, desire by firms to improve overall performance

and the need for a comprehensive overview of a firm's supply chain and the inter-relationships that exist within and between them.

According to Gibson, Mentzer and Cook (2005: 23), various definitions have been used to describe SCM as "the discipline of supply chain management is going through a maturation process of reaching consensus agreement on what is included, and what is not included". The authors in their work on the perceptions of the role of SCM as a strategy or/and an activity, discovered that a higher percentage of respondent inferred that a combination of strategy and activity make up SCM while a fewer number of respondents perceived the role of SCM as wholly strategic or activity based. Similar to the aforementioned view, Ganeshan and Harrison (2002: 2) categorised SCM decisions into strategic and operational. By strategic decision, this entails the careful planning and design of a road-map that cover the supply chain life cycle. This is usually long-term based. Operational decisions are short-term focused and is aimed at the efficient management of the product flow as planned in the supply chain strategizing phase. Ahi and Searcy (2012: 226) examined various definitions of SCM in literatures and pinpointed that the core role of SCM is basically to manage activities that involve the flow of materials, services and information.

Sukati *et al*. (2012: 226) defined supply chain as "a set of value adding activities connecting the enterprise's suppliers and its customers". Companies are constantly seeking ways of conveying products to customers in a timely and efficient manner, hence, calling for a more cordial relationship between all parties who are directly or indirectly involved; manufacturer, suppliers, transporters, warehouses, retailers and customers also (Mentzer et al. 2001: 2 and Sukati *et al*. 2012: 226). Lummus and Vokurka (1999: 2) in their work defined supply chain as "all the activities involved in delivering a product from raw material through to the customer including sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, delivery to the customer and the information systems necessary to monitor all of these activities". The authors further stated that the management of all these erstwhile supply chain activities is a necessity for business growth.

Whether managed or not, the existence of supply chains in the business world is a certainty. Thus, Mentzer *et al*. (2001) in their work distinguished between the existence of supply chains as a business phenomenon and the management of supply chains as an activity that requires

conscious administrative effort by the firms participating in the supply chain. SCM was defined by Hervani, Helms and Sarkis (2005: 330) as the "coordination and management of complex network of activities involved in delivering a finished product to the end-user or customer". La Londe and Masters (1994: 38) defined SCM as "the strategy of applying integrated logistics management to all the elements of a supply chain". Cooper, Lambert and Pagh (1997: 2) mentioned that professionals and academicians often confuse logistics and SCM as being the same but iterated that SCM far exceeds what logistics management represent as it involves more processes and functions. Their adopted definition of SCM states "….the integration of business processes from end-user through original suppliers that provide products, services and information that add value for customers". A similar view is shared by Stadtler (2004) and Metzer (2001). A common feature of these foregoing definitions is the strategizing and effective coordination of supply chain activities and functions in order to achieve high levels of service, improve performance and customer satisfaction at the lowest possible cost.

A productive SCM system requires collaborations between and within firms, a cordial relationship between supply chain members and the dynamic flow of information, capital and materials across and within borders. Linton *et al*. (2007) stated that a critical evaluation of supply chains is necessary for businesses to fully comprehend the emerging values of sustainability and benefit therein as more businesses are now concentrating on optimal operations along the entire supply chain and not just on a specific aspect of the business. Increasing number of businesses obtain their raw materials from global suppliers (Mentzer *et al*. 2001) as production processes are scattered worldwide (Seuring and Muller 2008). This trans-boundary nature of supply chains and consumption makes it difficult and sometimes impossible for the proper monitoring and accounting of impacts caused by supply chains and its actors (Kong and Mont 2012). The existences of inter and intra-organizational supply chain transactions and activities have in recent times led to an "increasing consumer and stakeholder expectation for firms to be fully responsible for their business operations, and to clearly demonstrate their environmental and ethical behaviour" (Ashby, Leat and Hudson-Smith 2012: 497). According to Seuring and Muller (2008), companies that rule the supply chain, also referred to as focal companies or chain leaders (La Londe and Masters 1994) could be held accountable for the activities of their suppliers and their impact on sustainability. This is however possible in a favourable inter-organisational collaborations which is dependent on the existing relationship between focal companies and suppliers (Kogg and Mont 2012). It is therefore not surprising that sustainability has been described as a key element in supply chains

as more firms are focusing on greener products, waste reduction, pollution control and discontinuation of hazardous raw-materials and products (Sarkis, Zhu and Lai 2011 and Linton, Klassen and Jayaraman 2007).

2.3.2 Sustainable Supply Chain Management (SSCM)

The reason for the adoption of sustainability in the management of supply chains can be traced to the fact that increasing number of firms are concerned about the social, environmental and economic consequences of their actions which is captured "……in measures such as the triple bottom line (3BL), the three Ps of people, profit and the planet, and the goal of maintaining viable social franchises (the trust of employees, customers and the communities) as well as viable economic franchises" (Kleindorfer, Singhal and Wasenhove 2005: 483). Sustainability in supply chains not only considers the interacting relationship between the three sustainability dimensions, but also addresses improvement or sometimes the entire overhauling of existing production systems (Linton, Klassen and Jayaraman 2007). Svensson (2007) stated that the correlation between supply chains and sustainability practise can be traced to specific features such as; actors, activities, resources and interfaces; like interaction, co-ordination, cooperation and competition they both have in common. This same view is shared by Winter and Knemeyer (2011) who stated that there is a link between the concept of sustainability and SCM since sustainable practise equally span across business growth and profitability, relationships and the environment. This inter-relationship between sustainability and SCM however, has not always been the case, since past work on supply chain and sustainability ensued in isolation (Carter and Easton 2011: 47, Carter and Rogers 2008: 360).

Earlier works by Carter and Jennings (2002, 2004), saw the integration of these stand-alone concepts of SCM and sustainability into a more holistic term; Corporate Social Responsibility (CSR). The authors described the role of logistics and purchasing managers under the headings of Logistics Social Responsibility (LSR) and Purchasing Social Responsibility (PSR) as including their social responsibility to both internal; employees and external stakeholders which include; customers, communities they operate, suppliers and regulatory agencies. Carroll (1979) defined social responsibility as a firm's duty to society and it encompasses the economic, legal, ethical and discretionary categories of business operations. Diversity, philanthropic activities, human rights, safety and environmental issues all fall under the umbrella of social responsibility according to the author.

Similar to concepts such as justice and democracy, CSR is a contested concept with various labels, programmes and synonyms aimed at capturing business practices in relation to the society they operate in (Visser 2008). With regards to supply chain management, there has been an increasing number of organisations integrating CSR into their business activities (Lombardo and Vigano 2014) as increasing number of business activities rely in some way on the external environment which can also be referred to as stakeholders (Freeman 1984 and Pfeffer and Salancik 1978). In SSCM, it is required that supply chain actors take into cognizance their stakeholders by meeting stipulated requirements and fostering partnerships with them (Teutscher *et al*. 2006). Thus, stakeholder management in the supply chain is crucial to the achievement of business objectives and strategic corporate initiatives (Wolfe and Putler 2002) even as success driven businesses are mindful of the pressing needs of their stakeholders (Pedersen 2006).

CSR which is defined as the continuing commitment of businesses to "….go beyond compliance and engage in actions that appear to further some social good, beyond the interests of the firm and that which is required by law" (McWilliams, Siegel and Wright 2006: 3) takes into consideration three important characters; "community and society, employees and customers" Gopalakrishnan et al. (2012: 196).

The adoption of CSR by industry managers not until recently was viewed as non-economically rewarding (Carter and Jennings 2011). Some of the reasons for this mistaken belief according to the authors can be attributed to the lack of a clear-cut integration of economic performance with social responsibility and often at times, the manner in which the term "responsibility" is depicted and perceived in the business and the academic environment. A typical example is the perception of CSR by some oil industry practitioners as cited by Frynas (2005). According to the author, there are undoubtedly some avid believers and practitioners of CSR in the oil industry, but there are however some executives in the industry who see the whole concept as a waste of time and a perception to make people within and outside the industry feel good. Apart from this, there is also a perceived difference in CSR agenda challenges in developing countries compared to their developed counterparts (Visser 2008).

2.3.2.1 Carroll's CSR Pyramid

CSR constitute four categories of social responsibility and these are; legal, philanthropic, economic, and ethical (Carroll 1991). These four categories of CSR are represented in a pyramid as shown in figure 2.4b and represent the four layers of CSR.

Many studies (Aupperle et.al. 1985, Pinkston and Carroll 1994, Burton, Farh and Hegarty 2000) have tested and compared Carroll's CSR pyramid concept across various countries (England, France, Germany, Japan, Sweden, Switzerland and USA) and reports have shown that these four CSR categories are representative of the perception of organisational leaders on CSR importance and the weightings allocated to them (Visser 2008). Table 2.2 shows a comparison of these studies based on Carroll's CSR pyramid concept. It is noteworthy to mention that compared countries in the above studies are developed economies (Dow Jones 2016) and as such can be classified as developed countries (IMF 2016). CSR weightings across the compared countries relatively conform to Carroll's CSR pyramid (see figure 2.4b) but with some variations across the studies (Visser 2008). However, the table shows an interesting pattern across many of the compared countries and of particular interest in England (which is a country in the UK) where economic and legal obligations had more weighting in the four CSR categories. This is followed by ethical obligations, with the least weighting allocated to the philanthropic category.

These layers of CSR weightings by Carroll (1991) however differ from what is obtainable in the African context (Visser 2008) where majority of the countries are developing countries with underdeveloped economies (JICA Research Institute 2013). It shows that similar to Carroll's CSR pyramid, economic obligation by businesses tend to be the most important CSR layer in Africa (Visser 2008). This is no surprise as the continent is still faced by high unemployment rates, poverty and many other social problems. This economic obligation come with two sides; contribution and dependence. This is because the existence and activities of thriving businesses in many African counties is important to the government and communities alike for the provision of employment products and economic development. There is thus some form of dependence on the existence and continuing value adding activities of businesses in such countries and the movement or relocation of such businesses may cause negative economic consequences to the country and communities where it is situated.

In Africa, philanthropic responsibilities comes immediately after the economic layer instead of legal responsibilities as depicted in Carroll's CSR pyramid illustrated in figure 2.4 (Visser 2008). The reason for this can be attributed to the difference in priority placed on philanthropic contributions in Africa when compared especially with its European counterpart (Crane and Matten cited in Visser 2008: 40). In contrast to Europe, philanthropy takes a high priority (see figure 2.4a) as organisations in Africa are compelled by the socio-economic problems that characterise communities and African countries in general to contribute via philanthropic endeavours to the improvement of living standards in the region.

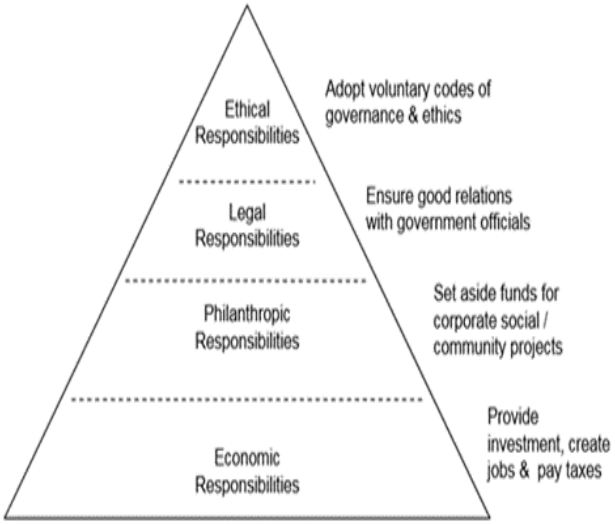
Table 2.1 A Comparison of Studies on CSR Based on Carroll's CSR Pyramid Concept (Source: Visser 2008: 36)

Studies	***Mean values***			
	Economic orientations	Legal orientations	Ethical orientations	Philanthropic orientations
Aupperle, Carroll & Hatfield (1985)	3.50	2.54	2.22	1.30
Pinkston & Carroll (1994)	3.28	3.07	2.45	1.15
England	*3.49*	*3.15*	*2.29*	*0.98*
France	*3.60*	*3.04*	*2.35*	*0.98*
Germany	*2.86*	*3.21*	*2.46*	*1.42*
Japan	*3.34*	*2.76*	*2.42*	*1.41*
Sweden	*3.27*	*3.30*	*2.43*	*1.00*
Switzerland	*3.11*	*3.04*	*2.70*	*1.10*
USA	*3.11*	*2.96*	*2.48*	*1.19*
Edmondson & Carroll (1999)	3.16	2.12	2.19	2.04
Burton, Farh & Hegarty (2000)	-	-	-	-
Hong Kong	*3.11*	*2.32*	*2.32*	*1.84*
USA	*2.81*	*2.42*	*2.51*	*1.99*

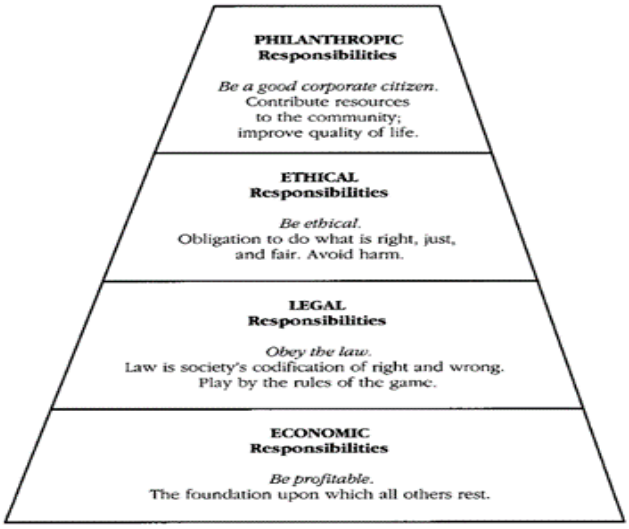
Also, in order to successfully do business in these kind of regions some level of stability is required and many companies "also realise that they cannot succeed in societies that fail and philanthropy is seen as the most direct way to improve the prospects of the communities in which business operates" (Visser 2008). In Europe however, acts of philanthropy is embedded in the legal framework which is the second CSR level and is ranked fourth in Carroll's CSR pyramid. The disparity in philanthropic CSR endeavour especially at the national level is "… generally a product of historical and cultural factors, and often continue to mature according to the prevailing economic and political priorities of the country" (Idemudia and Ite 2006: 196). It is no wonder therefore that the anticipated dividends of the oil industry's CSR projects in developing countries which is sometimes perceived as acts of philanthropy in the western world is a desperate necessity for social and community development (Frynas 2005) in these developing economies.

In contrast to Europe where organisations follow and abide by set laws and code of practice and doing what is right and fair as a matter of priority, legal and ethical CSR responsibilities rank third and fourth respectively in Africa where a more laid back approach which focuses on organisations maintaining good relations with government officials takes centre stage (Visser 2008). This low level of priority assigned to legal responsibilities can be attributed to poorly constructed laws, administrative inefficiencies and lack of resources (Mwaura 2004).

Figure 2.3 Pyramid of Corporate Social Responsibility (Source: Carroll 1991 and Visser 2008).



a) Africa's CSR Pyramid (Source: Visser 2005: 37)



b) CSR Pyramid (Source: Carroll 1991: 42)

2.3.2.2 Defining SSCM

Numerous definitions have been used to describe Sustainable Supply Chain Management, but a key feature in these definitions is sustainable development in the management of supply chains. Seuring and Muller (2008) defined SSCM as the "management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements". Apart from the widely adapted definition of sustainability, Carter and Rogers (2008) further identified transparency, culture, risk-management and strategy as four supporting aspects of sustainability. These four facets alongside the 'triple bottom line' as defined by Elkington (1999) were taken into consideration in their definition of SSCM. According to Elkington (2004), with the 'triple bottom line' (TBL) agenda, organizational sustainability addresses all three sustainability dimensions and focus "….not just on the economic value that they can add, but also on the environmental and social value that they add – or destroy". Carter and Rogers

(2008: 364) defined SSCM as the "strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination of key inter-organizational business processes for improving the long-term economic performance of the individual company and its supply chain".

The interaction of sustainability with supply chains go beyond integrating sustainability from initial processing of raw-materials to the final delivery to the end-user which is the core of supply chain activities (Linton, Klassen and Jayaraman 2007). According to the authors, the initiation of sustainability ought to begin from the product design phase and- design phase and extend through the entire product life-cycle in order to minimize the environmental impact during product use and afterwards, so as to prevent unnecessary resource depletion and harmful waste generation. This same view is echoed in the Extended Producer Responsibility (EPR) concept in which the scope of responsibility of a product is borne by the producer and it covers the entire product life-cycle from design, all through to the product post-life (Lenzen *et al*. 2007 and Annika *et al*. 2006). SSCM transcends through the entire management of activities and network of suppliers, and extends to the adoption of reverse logistics as well (Kogg and Mont 2012 and Ashby *et al*. 2012). Reverse logistics also referred to as Reverse Supply Chain (Bai and Sarkis, 2013) is the process where a producer accepts previously shipped manufactured parts or products for remanufacturing, recycling or proper disposition (Varma, Wadhwa and Deshmukh, 2006).

The close supervision of the activities of suppliers all down the supply chain by focal companies in order to source and produce environmentally and socially responsible products from 'cradle to grave' is not as straightforward as it sounds since there are numerous producer-supplier relationships at different levels to be overseen and this dictates the level of influence that can be exercised by the focal company (Kogg and Mont, 2012). In the study conducted by Sharfman, Shaft and Anex Jr. (2009), they observed that, organisations that view their supply chain as a partnership and not a rivalry relationship as well as provide their suppliers with technical, financial and training assistance had a better shot at supplier compliance with organizational set-standards. They stated further that such companies acknowledged that there are more profit and benefits associated with the whole chain adopting a sustainable stance. The possibility of profit maximization does not however simplify the challenges that accompany the practicability of SSCM in organisations and this becomes more arduous within an industry

with multifarious activities, products, markets and an expansive list of stakeholders which is typical in large corporations, like the Petroleum Industry.

2.3.3 Sustainable Supply Chain Management (SSCM) in the Oil Industry

The growing importance of ensuring that current generation has access to undiminished resources, good quality of life and economic development without compromising the availability of the same for future generations has and will continue for some time to pose a challenge to professionals, academicians, government and the general society. Sustainable practice in industrial activities and processes have always been scrutinized and debated; how sustainable are these industries? What level of importance is accorded to sustainability by the oil and gas industry? How does the industry's supply chain affect the dimensions of sustainability? Is the oil industry supply chain sustainable or can it be better? Is the standard and practise uniform across the globe (developed and developing countries) or does it vary? These are some of the questions demanding clarity and a critical evaluation of scenarios where the industry in question has or has not demonstrated their allegiance to sustainable practise.

The petroleum industry is known for its large-scale impact on world economy spanning through global, national and local economies (Briggs, Tolliver and Szmerekovsky 2012); its inflexible and complex supply chain network (Coia 1999 and Jenkins and Wright 1998) which poses challenges ranging from crude oil production capacity, lengthy transportation times and problems with mode of transportation (Hussain, Assavapokee and Khumawala 2006). According to Jenkins and Wright (1998), the oil industry supply chain is a typical illustration of a constrained and rigid chain since many of the essential elements of the chain are fixed and cannot be changed quickly. For example, the supply chain is governed by a take-or-pay contract with the quantity and location of petroleum products to be purchased agreed upon within a time frame of about nine months prior to sale to customer. The transportation of crude and its product is often via shipping and pipelines which are also tethered by a set capacity also often procured nine months beforehand. The only flexible component which can be re-set to accommodate changes in supply and demand according to the authors are the road tankers and its drivers. This is one of the reasons the supply chain in the petroleum industry is more complicated and challenging compared to other industries. Another reason for the complexity can be attributed to rising energy requirements and the dependency of many industries on petroleum based raw-materials. Also, the distant and dispersed oil resource locations and production sites add to the complexity of the industries' supply chain. Many oil producing

regions and sites have been affected by political uprising, wars and sometimes disagreements with oil producing communities leading to unpredictable oil supply fluctuating oil prices.

As mentioned in section 2.2.4, the supply chain in the petroleum industry is classified into the upstream and downstream supply chains (Hussain, Assavapokee and Khumawala 2006: 91 and Enyinda *et al*. 2011: 38). Despite the oil industry's similarity with most processing industries, its supply chain is quite unique as it is characterised by a high level of uncertainty, few suppliers, fluctuating market prices, high inventory costs and extremely flammable and risk prone products (Al-Othman et al. 2008 and Sinha *et al*. 2011). Olatoye (2013) on supply chain sustainability risks, identified and differentiated the value-adding activities of the oil industry's supply chain from the supply chain itself. A value chain can be defined as the process of adding value through production processes, assembling or other value enhancing operations to make products that meet customer requirements and demand (Olatoye 2013 and Feller, Shunk and Callarman 2006).

Some of the oil industry value-adding activities are; seismic, geophysical and geological activities, drilling, well logging, fabrication, construction and material procurement, pipeline transportation and water/shipping transport, in and off-country storage, separation of crude constituents by distillation, supply and demand planning, cost control and distribution (Chima 2007 and World Bank 2007). These activities are executed under the upstream, midstream and downstream sectors of the industry (Mitchell, Marcel and Mitchell 2012).

The upstream supply chain is responsible for crude oil forecasting, exploration, production and the transportation and delivery of crude oil from oil wells to the refinery (Hussain, Assavapokee and Khumawala 2006: 91). The infrastructure needed for the transportation of crude oil to refineries and storage facilities around the globe was classified by Briggs, Tolliver and Szmerekovsky (2012: 1) as the 'midstream' supply chain of the petroleum industry. According to them, the midstream sector is sometimes categorised alongside the upstream supply chain. As mentioned in section 2.2.4, the activities that characterise the downstream oil supply chain include; crude oil processing and refining, transportation, distribution and marketing of refined products to customers (Briggs, Tolliver and Szmerekovsky 2012).

The supply chain typically begins at the exploration phase which consists of seismic, geophysical and geological operations (Chima 2007) required for determining the location of

oil reservoirs deep within the earth crust or in sea-beds and how to reach it. This phase is followed by the production phase which is categorised by drilling and production of crude oil. The refining of produced crude oil into various products such as gasoline, liquefied petroleum gas (LPG), jet fuel, diesel, naphta, lubricant oils, asphalt, electricity and petrochemicals in the refinery follows the production phase (Briggs, Tolliver and Szmerekovsky 2012: 1 and Manzano 2005: 8). This phase is preceded by the challenging transportation of produced crude oil from most times remote oil reservoir stations to refinery locations which sometimes maybe located in an entirely different region or country. The sale of refined products and its derivatives to the end-user make up the marketing phase of the supply chain. The consumer is the last link on the chain and this range from the local to the global user of derived constituents of crude oil.

Figure 2.4 Oil Industry Supply Chain (Source: Chima 2007: 28)
Figure 2.5 show supply chain links in the oil and gas industry. This begins with the exploration phase up to the final delivery of useful crude oil derivatives to consumers.

According to Chima (2007: 28), the link as shown above show the interface between organisations and product flow through the supply chain. The individual link in the chain depends on the one before it to provide inputs for its operation. For example, production operations rely on the output from the exploration phase, refining is the vendee of production, marketing depend on the products from refining and the end-users of refined crude products such as petrol are the final link on the chain.

The adoption of sustainable practise in the oil industry's supply chain over the years has been advertised as being a core value of the industry (Ketola 2007). How genuine the SSCM efforts are globally, remain debatable. However, in order to catch a better glimpse of the industry's SSCM efforts, it would be noteworthy to identify some of the supply chain challenges in the industry as well as identify why the industry is keen on SSCM, in other words, what drives SSCM in the oil industry and what are the SSCM challenges in the oil industry?

2.3.3.1 Drivers of SSCM in the Oil Industry

Walker *et al*. (2008) identified some internal and external drivers of green supply chain management. According to the authors, cost reduction is a major internal motivation for industries to embark on an environmentally safe supply chain. The desire of business executives to reduce cost accrued from wastage, pollution and disposal of products at the end of their life-cycle has made some companies to examine alternative processes that are environmentally beneficial (Carter and Dresner 2001, Handfield 1997 and Yusuf *et al*. 2012).

Personal commitment and ethical values of business owners, executives and employee also play a significant role in the march towards sustainability (Walker, Di Sisto and McBain 2008). Daibat and Govindan (2011) pinpointed eleven main drivers of Green Supply Chain Management (GSCM) practices and this included; customer and cost pressures, government regulation, green design, reverse logistics and supplier integration. GSCM is an aspect of SSCM that focuses on the economic and environmental dimensions of sustainability (Wan Ahmad *et al*. 2016).

According to Anderson and Bieniaszewska (2005), with regards to CSR, the oil industry's position is rather peculiar as it is influenced by two categories of stakeholder; the indirect and direct stakeholders. The indirect stakeholders include the NGOs and pressure groups whose goal is mainly to facilitate environmentally and socially responsible policy and practise rather than economic gains. The direct stakeholders are the host nations and direct end-users of the industries' goods who they claim are more concerned about the operational performance and not on the social reputation of the oil industry. It is a widely-known fact that pressure groups and NGOs have abetted in stirring the policies of many players in the industry towards better sustainable practise by creating awareness and calling for more sustainable operations in the industry. The author's findings that unlike the indirect stakeholders, the direct stakeholders may not be particularly keen on the socially and environmentally sustainable practice by the oil industry but are rather focused on the operational performance which is sometimes equated to the employability of the industry is questionable.

Handfield *et al*. (1997) in their work stated that consumers play a key role in the industries' enactment of green practice by demanding more environmentally friendly products. This stance by consumers can be attributed to the growing public awareness of the global effects of unsustainable practise in today's world. Yusuf *et al*. (2012) also indicated customer perception

of enterprises as a key sustainable supply chain driver as firms are concerned about how they are viewed by their customers and often try to portray a positive image by emphasizing to their customers that its products and processes are established on strong sustainable practise. The same view is opined by Schrettle et al. (2013) and Walker *et al*. (2007). Hence, customers are interested in how organisations embrace the "*green*" concept and companies are known to capitalise on their endorsement of sustainable practise to win new customers and therefore driving demand in te company's favour. Hence, consumer's perception of a company's reputation would extend to the socially and environmentally sustainable policy the company embrace.

From this foregoing, it can be established that a strong motivator for the oil industry's adoption of SSCM is cost. The costs of pollution, downtime, cleaning up, dented company image, non-conformance to government regulations, customer and stakeholder perception. This emphasizes the un-diminishing need for a strategic and efficient SSCM in all of the activities of the industry.

2.3.3.2 Challenges in the Oil Industry Supply Chain

Logistics network in the chain is extremely inflexible as a result of the long lead times, high costs and multiple transportation modes involved in conveying crude oil from oil producing regions to supply chain partners and consumers in the chain (Hussain, Assavapokee and Khumawala 2006). For example, an oil production site may be situated in the Middle East and the refining unit situated across borders or continents. Hence, in such instance, various transportation modes will be required to cargo the crude oil to the required location giving rise to a labyrinth in the chain.

The petroleum supply chain is made up of a web of activities as depicted in figure 2.7.

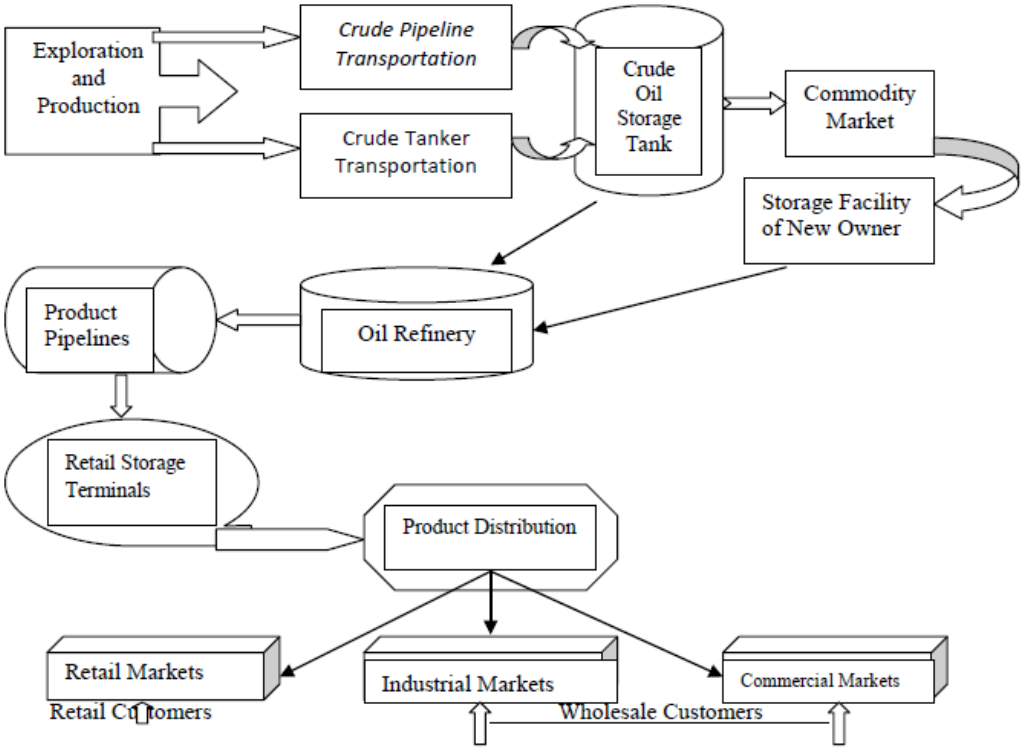


Figure 2.5 The Petroleum Supply Chain (Briggs, Tolliver and Szmerekovsky 2012: 3).
The Petroleum Supply Chain shows the interdependencies of the various links involved from the exploration of crude oil to the final consumers of refined petroleum derivatives.

The use of pipes and other tubular goods such as casings and tubings in the oil industry is crucial to the operational and logistics arms of the business and any unanticipated event such as a dawdle in the arrival of pipes or casing can lead to an interruption in operations which will ultimately result in high production costs (Chima 2007). Hence, the rigid nature of the industry's supply chain as mentioned in the previous section as well as the management of tubular goods act as a constraint on the chain and a headache to industry executives.

Hussain, Assavapokee and Khumawala (2006) also cited other areas such as the disintegration of processes in the supply chain, ineffective information flow, poor collaborations and information sharing amongst supply chain partners as some of the factors affecting the petroleum industry's supply chain. Chima (2007) stated that there is usually a tendency for individual organisations in the chain to operate in its own interest to maximise profits and sometimes at the expense of customer satisfaction and added value that could arise from collaborations across the supply chain.

Information flow in the petroleum industry is determinative to the integration of processes, technologies and people so as to ensure that each organisation along the supply chain can respond to the requirements of its customer in a timely manner and mitigate or protect itself from any form of risk it may be exposed to (Chima 2007: 28). Oil companies are often influenced by demand and supply uncertainties which may affect their operations adversely and ultimately touch on the profit margin (Arezki and Blanchard 2014. Also, information sharing and collaborations with supply chain partners are essential elements to achieving an adept supply chain in the oil industry. However, industry executives are oftentimes apprehensive over divulging demand/costs information with competitors thereby wasting cost saving opportunities (Hussain, Assavapokee and Khumawala 2006: 92).

Nnadili in her work (2006: 12) used Porter's five forces; PESTLE (Political, Economic, Social, Technological, Legal and Environmental) framework to analyse the external factors that bear upon the upstream supply chain. The numerous factors influencing the oil industry upstream supply were captured under the framework headings; Political, Environment, Economic, Social, Technology, Legal as shown in table 2.2.

Table 2.2 External Factors Acting on the Upstream Oil Industry Supply Chain Based on the PESTLE Framework (Source: Adapted from Nnadili 2006: 12)

	Political	Environment	Social	Technology	Legal	Economic
External Factors	Government Policy & Regulation	Natural Disasters	Skills Availability	Engineering Innovations	OPEC Regulations and International Law	Exchange Rates
	Local Content Requirements	Environmental Concerns	Social Values	New Production Methods	Local Regulations & By-Laws	Economic Growth Patterns
		Pollution		Internet Trading	Human Rights Concerns	Competitor Behaviour
					International Trade Agreements	Taxes & Wage Rates

Ambiguity is another key challenge in the oil industry as indicated by Matos and Hall (2007). The identification of the main stakeholders and social implications of activities the industry engages in has continued to be a source of concern to industry personnel. Being able to identify the level of interdependencies between various stakeholders both direct and indirect especially in relation to social issues is a complex task that requires proper distinction and synchronization

into the supply chain to facilitate cooperation amongst all parties involved in the supply chain and prevent disruptions in operations.

Another issue in the industry is its characteristic narrow product differentiation. The oil industry supply chain is quite unique as there are more products than raw materials and these products are the same across industry competitors. Products from the exploration and production section of the industry are similar for all players in the industry thereby making it impossible for companies to individualise themselves based on their product type or by simply bringing an appealing new product to the market (Chima 2007). Thus, in order for a company to stand out and be competitive, it must possess an economically efficient production system and a plausible supply chain structure that fully integrates sustainability.

O'Rouke and Connolly (2003) in their review on the effects of the oil industry's supply chain across the globe, stated that the consequences of the industry's activities travel with the oil and its impact is felt more by native and poor communities situated close to oil product transmitting pipelines as well as refineries and gas stations. Much work on sustainability in the oil industry's supply chain has focused on the upstream sector of the industry (Ambitunni, Amezaga and Emeseh 2014, Harris and Khare: 2002, Hirsch: 2006, Yusuf *et al*. 2014). This may be attributed to the magnitude of the impact of the oil industry's activities and the seemingly high number of stakeholders involved. However in order to address sustainability issues across the supply chain, it is imperative that the impact of both the upstream and downstream supply chain are taken into cognizance and none should be addressed in isolation (Vachon and Mao 2008 and Zhu and Sarkis 2004).

2.3.4 Sustainability Issues in the Upstream Oil Industry

The search for and the discovery of commercially viable oil reservoir, preparation of the reservoir site via the construction of infrastructures, crude oil production and the semi-treatment of the produced crude are the major activities that govern the upstream sector (Chima 2007 and Raut, Narkhede and Gardas 2017).

The high risk of oil spills, fire, deep water and onshore exploration accidents and the accompanying cost of clean-up, ecological impact and equipment loss all influence the dimensions of sustainability. Reports have shown that the Ixotoc oil spill of 1979 and the BP gulf oil spill of 2010 rank highest in the history of worst accidental oil disasters with a spill of

140 million gallons and 206 million gallons respectively (MNN 2014). BP management announced that the projected cost of the 2010 Gulf of Mexico oil spill exceeded $42.4 billion dollars. This estimate includes the cost of cleaning up the spill, remediating the environment, compensation claims by stakeholders and paying off the fine imposed by the American government (Gosden 2013).

Apart from spills and accidents, oil is also discharged into marine habitat via sludge from fuel-oil, washing of oil storage tank and ballast water from oil carrying vessel (Jernelov 2010). The author Jernelov (2010) further stated that recent operational discharges accounted for a higher proportion of oil expelled into aquatic environment compared to the accidental discharges in the 1970s.

The upstream sector is a known contributor to environmental damage which often times spread across regions and territories via its various value-adding activities (Parish *et al*. 2013). Typical environmental problems that accompany crude oil exploration and production as reported by Parish *et al*. (2013) includes; distortion of soil properties, polluted water containing toxic and radioactive materials brought to the surface during drilling, loss of biodiversity, destruction of natural mangrove and aquatic habitat as is the case in the Niger Delta region of Nigeria, emission of air polluting gases, fire-causing oil spills, distortion of the natural animal food-chain and further damage caused by resettled communities and construction of infrastructures.

Similarly, the upstream sector of the oil industry is responsible for some of the social problems in oil producing regions. Many oil producing countries are known to be affected by corruption, high rates of poverty, high child mortality, human rights abuse, oil motivated conflicts, high rates of unemployment, disruption and displacement of native settlements and loss of cultural heritage of indigenous oil rich communities (Anyanwu and Erhijakpor 2013, Brollo *et al*. 2010 and Ross 1999). Other effects linked to the upstream oil industry are; poor infrastructures and amenities in oil rich developing countries, high cost of living, high crime rates and other negative social vices such as increased cases of prostitution, drug use and its associated problems and health problems linked to environmental degradation as well as exploration activities (O' Rouke and Connolly 2003, Omodanisi, Eludoyin and Salami 2014 and Karl, 2004).

The social impact of oil exploration, drilling and production extends beyond occupational hazards that oil workers are exposed to, as it also impacts the social wellbeing of host communities as well as surrounding environs and ultimately the global community (Boohene and Peprah 2011 and Sebastain and Armstrong 2002). Upstream activities have the potential of causing adverse health problems as a result of exposure to some of the toxic chemicals utilized during extraction and exposure to radioactive materials brought to the surface during the drilling process (O'Rouke and Connolly 2003). Upstream activities have been reported to lead to acute skin and pulmonary reactions such as acne, facial lesions and asthma (O'Rouke and Connolly 2003).

Besides the economic effect of oil workers migrating to oil producing regions on the standard of living of the host community and surrounding environs, there is also the health risk of transmission of infectious diseases to the host community and vice-versa. Jobin (2003) in his review of the environmental and health assessment conducted on the Chad oil export project, identified malaria and sexually transmitted diseases as serious health problems especially amongst truck drivers required to convey a 1000km long pipeline from port of Douala to the Chad pipeline route. The author stated that reports showed that a total no of 1400 cases of malaria and between 200 to 600 cases of HIV infections were diagnosed after the first 12 months and the first quarter of construction respectively. Vibration and noise from exploration and drilling activities also pose as a health hazard to oil employees and surrounding human and animal habitat. Niven and McLeod (2009) in their work identified five groups of possible health hazards imposed by upstream offshore oil activities. These hazards were captured under physical (noise, vibration, exposure to extreme temperatures) chemical (exposure to toxic and carcinogenic substances), biological (hygiene related illnesses such as food-poisoning and air-borne diseases), ergonomic (work posture related illnesses, improper equipment arrangement or work-floor design causing health related problems for employees) and psychological hazards (stress encouraging activities such as long working hours and constant role change). Results from the investigation conducted by Rabanal *et al*. (2010) on the effect of seismic activities on wildlife in the Loango national Park in Gabon showed that seismic noise had a negative impact on large mammals (apes and elephants) in the park.

Aside these health concerns, this sector of the oil industry is also notorious for injuries, accidents, explosions, and high fatality rates that have impacted the way of life, means of livelihood and political stability in some oil producing regions (Nurain and Allen 2012). Oil

resource fuelled political conflicts and wars have been recorded in some oil producing areas and this has brought untold hardship to these regions. Oil resource has over the years stemmed up conflict in different countries and regions across the globe and (Eweje 2006 and Paki and Ebienfa 2011 and Karl 2004).

However, oil exploration activities despite its numerous negative impacts, also positively impacts the livelihood of the local people by making available employment opportunities especially at the initial stage of setting-up. This is because, apart from the highly skilled workers that will be required, there is a huge demand for a high number of low and medium skilled workers for road, pipeline and infrastructure construction. This high number of required manpower is however short-lived as fewer workers are required as infrastructure and construction works are completed. Thus creating an employment vacuum and a lengthy list of unemployed workers, many of which may be natives of the local community and some of which may have migrated to the oil producing area as a result of the employment boom. The clearing of land for exploration activities and setting-up infrastructures as well as the aftermath of some of the unsustainable activities of the oil industry such as oil spills in water used for fishing by natives makes it impossible for some of the local people to return to their primary occupation such as fishing or farming (Ebegbulen, Ekpe and Adejumo 2013, Idemudia and Ite 2006, Kadafa 2012, Omofonwan and Odia 2009 and Opukri and Ibaba 2008.

Although the oil industry is a self-professed sustainability conscious sector, the industry is however still lacking in their sustainability performance. According to Schneider et al. (2011), in their analysis of 10 global oil companies (BP, Chevron, ConocoPhilips, ExxonMobil, Royal Dutch Shell, Valero, CNPC, Petrobras, Saudi Aramco and Total) reported that the metrics adopted by these companies for measuring EHS (Environment, Health and Safety) were primarily focused on EHS management and not particularly on sustainability. Even at that, the major metrics (no of injury recorded, rate of GHG emissions and no of oil spills) adopted in the sustainability reporting of these reviewed companies pointed to the fact that the industry is still far off from fully addressing the sustainability challenge.

2.3.5 The Downstream Oil Industry

In order to fully maximise the usefulness of crude oil, it is essential for the resource to be processed from its raw form into simpler need- meeting products. There are different grades of crude with varying qualities (Al-Othman *et al*. 2008). This is because; crude oil is a mixture of various hydrocarbons that differ in composition, texture, colour, API (American Petroleum Institute) gravity, viscosity and volume of impurities (such as sulphur compounds) from one oil field to another.

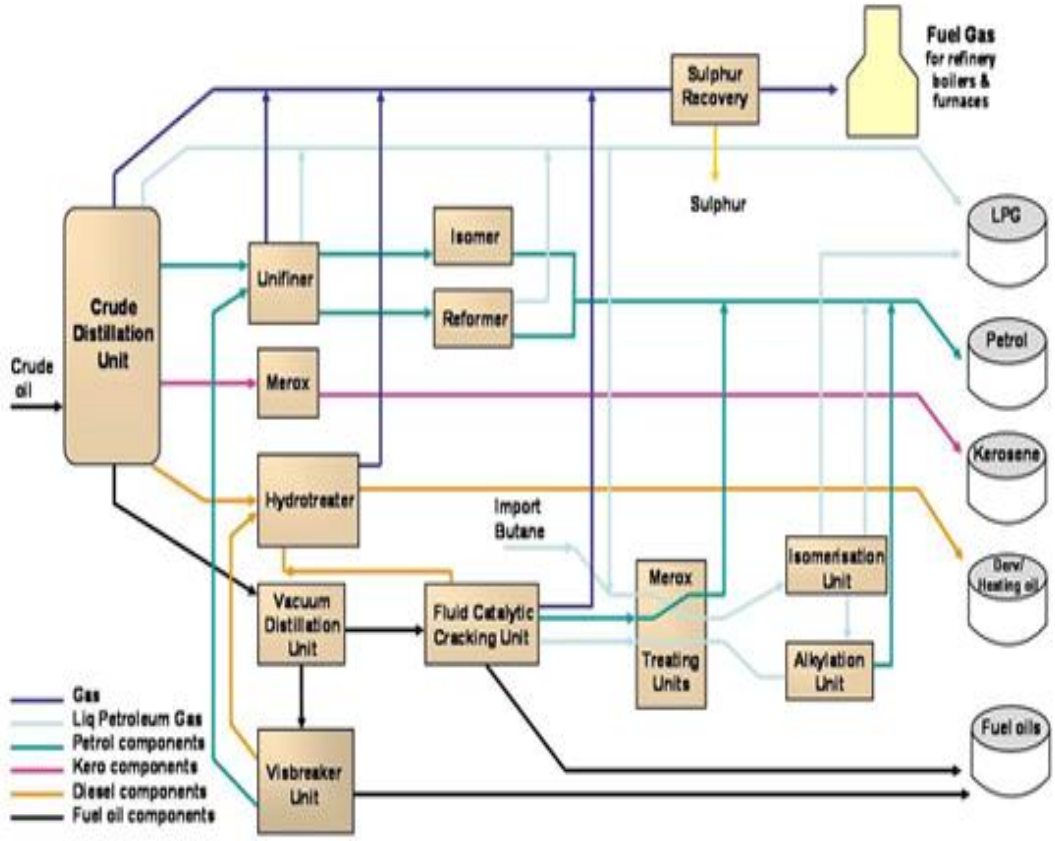


Figure 2.6 Typical Refinery Processing Units (Source: UKPIA 2015)
Figure shows the 5 key processes that take place in the refinery; distillation, conversion and reforming of the product stream to meet market demand and improve quality, sulphur reduction via desulphurization and the blending of the streams to ensure quality specifications are met and conform with industry regulations and standards

Low Carbon, high Hydrogen, high API and low percentage of sulphur compounds favour the increased production of gasoline and other non-heavy petroleum products (OSHA 1999). Prior to the crude oil being moved to the refinery for distillation as shown in figure 2.7, it undergoes phase separation, where the water and gas contained in the crude from the well-head is separated from the oil before the oil is subjected to further treatment. Thus, the crude oil from the upstream sector is transported from the drilling/production site to the downstream sector

for further processing. This is done via tankers and vessels to oil terminals. These terminals are often linked to refineries via a pipeline system (Neiro and Pinto 2004).

Table 2.3 Crude Oil Refinery Processes (Source: Adapted from Thomson 2013)

Refinery Process	Purpose	Output	Impact
Crude Oil Storage	Stores crude gathered from producing oil fields		Loss of farmable land, loss of biodiversity, deforestation and distortion of natural habitat to allow for new settlements, high risk of spills and blowouts Parish *et al*. 2013)
Desalter	Gets rid of impurities in the crude oil via water washing	Clean Crude oil	Contamination of ground and surface water, destruction of aquatic systems and subsequent loss of livelihood of local fishermen (Otokunefor and Obiukwu 2005).
Distillation Column	Distils the crude oil into fractions using boiling point ranges	Jet-fuel, Diesel, Naphta, residue	Atmospheric emission of particulate and gaseous pollutants.
Hydro treating Unit	Takes out sulphur, oxygen, nitrogen and metals from petroleum distillates	Cleaner products	Exposure to high levels of Sulphur dioxide can aggravate asthma condition, other health problems and even death. It is also a known cause of acid rain.
Catalytic reforming, Isomerization	Converts naphtha by altering its molecular structure to form gasoline	Gasoline	
Residual Fluid Catalytic Cracking (RFCC)	Processes residue from the distillation column to make useful products	Gasoline, Gas, Diesel, LPG	
Thermal conversion and delayed coking plant	Converts heavy oil residue to coke	Coke	
Storage and Blending	Further blending of products to meet market demand and environmental regulations. Storage of market ready petroleum products.	Products that meet market demand	Oil spills and environmental emissions

The refining of crude oil begins with the distillation of the raw crude into different desired products via fractional distillation. This is followed by product quality enhancing processes such as; cracking, reforming and further separation using extraction, hydro treating and oil sweetening techniques. Figure 2.7 shows typical processing units in the refinery.

Crude oil refining is the separation of crude into different fractions based on varying boiling points (OSHA 1999). These sometimes finished or semi-finished products can be further hydro treated or blended into high quality finished products. Schneider *et al*. (2011: 71) defined petroleum refining as "the physical, thermal and chemical separation of crude oil into its major distillation fractions, which are then further processed through a series of separation and conversion steps into finished petroleum products". This last stage results in a product mix that is commercially viable.

Valuable products that meet day-to-day needs of the growing global population originate from refining operations. This product-line include; gasoline, kerosene, LPG (Liquefied Petroleum Gas), distillate fuels, residual fuels, coke, asphalt, solvents, petrochemicals and lubricants. A summary of the basic crude oil refinery processes, functions and products is illustrated in table 2.3 as adopted from the work of Thomson (2013). These products are exported to international markets or transported using tankers and pipelines to distribution centres from where it is conveyed to fuel stations and other consumer markets (Al-Othman *et al.* 2008, Neiro and Pinto 2001).

2.3.6 Sustainability Issues in the Downstream Oil Industry

Due to the nature of crude oil, its derivatives and processing technology employed in the oil industry, the downstream sector is also disaster and accident prone and impacts on all sustainability dimensions. Thomson (2013: 3) stated that "any given refinery has about a one in ten chances of suffering a major accident during its operational lifetime". As mentioned earlier, activities of the downstream sector begins with the refinery. Thus, this link of the industry's supply chain is a major player in SSCM as it is a direct recipient of the upstream raw-materials and further contributes to the sustainability issues posed by the industry.

The activities of the downstream oil industry supply chain also largely contribute to global sustainability issues (O'Rourke and Connolly 2003). The sector impacts all sustainability dimensions right from the transportation of the crude to the final usage of refined petroleum products (Ambitunni, Amezaga and Emeseh 2014). A typical example is the transportation of crude oil and refined products through pipelines from oil producing regions or refineries. This has been identified as a source of economic, social and environmental problems to affected population (Oviasuyi and Uwadiae 2010, Jernelov 2010, Anifowose *et al*. 2012 and Omodanisi, Eludoyin and Salami 2014).

Apart from the largely publicised oil spills, there are several unpublicised small scale spills from pipelines, ships, discharges form tank waste streams and low quality products that add up to impact the environment and other sustainability dimensions (O'Rouke and Connolly 2003). Jernelov (2010) stated that despite recent developments that show a drastic reduction in the number of recorded incidences of large scale oil spills as a result of safety measures such as the use of GPS (Global Positioning System) to determine the location of oil-vessels, tankers with modified interiors to reduce leakage in case of accidents and the regulation of traffic on the waterways to prevent oil-vessel collisions, there however seem to be an increase in the number of pipeline spills and leakages. The increasing number of pipeline spills can be attributed to modern day longer-distance covering pipelines, deteriorating pipelines and infrastructures which suffer from poor routine maintenance (Arnold 2006, Restrepo, Simonoff and Zimmerman 2009 and Nwilo and Badejo 2006). There is also the deliberate destruction of pipelines by stakeholders to show their grievances and hostility to the use of their land or resources as can be seen in the Niger-Delta area of Nigeria which is prone to local militant initiated uprisings and pipeline destruction (Oviasuyi and Uwadiae 2010, Jernelov 2010, Anifowose *et al*. 2012 and Omodanisi, Eludoyin and Salami 2014).

Refinery operations contribute to environmental pollution through various sources. This include atmospheric pollution through the release of GHG, oil spills from pipelines into fresh water and terrestrial habitat resulting in the destruction of aquatic biodiversity and loss of soil nutrients, clearing of land for infrastructure construction and roads leading to resettlement and further deforestation, ground water pollution and build-up of radioactive waste materials (O'Rourke and Connolly 2003). This effect is more profound in developing countries where there are less than adequate regulatory bodies to monitor the activities of mostly state owned and private oil refining companies (Ambituuni, Amezaga and Emeseh 2014). It was reported that the 2012 explosion of the Venezuelan state operated refinery which resulted in the loss of lives and over $1.7bn damages was caused by a poorly maintained and deteriorating refinery (Lopez 2012). Other refinery incidences have been reported across the globe and this include; the Detroit refinery explosion of 2013, The Pembroke plant disaster in 2011 and the Buncefield disaster of 2006. A common attribute of these above mentioned accidents is that they were reported as avoidable if all the necessary safety measures and proper management and monitoring of infrastructures and safety devices were carried out rigorously (Fabiano 2014).

Characterised by very slim profit margin, the downstream oil industry amongst other issues is also plagued with over-capacity (Gainsborough 2004 and Mohite 2013). This has been a contributing factor to many refinery closedowns in recent years as can be seem in the UK oil industry (Bakhsh and Rowling 2014). This has a huge influence on the economy and society in general as sustainable development cannot be achieved in the absence of sustainable businesses (Schaltegger 2012). Some Other challenges plaguing the refining sector of the industry and influencing economic sustainability are; volatile oil prices, refinery complexity, ease of access to crude oil and market demand, market competition and compliance with GHG emission reduction legislations whilst conforming to stringent environmental laws (Mohite 2013, Mohite 2014 and Purvin & Gertz 2013).

Over the years, fluctuating prices of oil and petroleum products has impacted the dimensions of sustainability in different ways. Apart from its direct impact on the economy (Ayadi 2005 and Lee and Ni 2002), it also has the capability of causing social and environmental problems in many developing countries as exemplary in Nigeria (Ambitunni, Amezaga and Emeseh 2014). This has led to among many other issues, the unsafe handling of gasoline in black markets, puncturing of pipelines to leak out crude oil during times of shortages and the increased cost of other household items such as food and cost of services (Abu 2016, Adeoye 2013 and Majekodunmi 2013). These reactive mechanisms to increased oil price all impact the social, environmental and economic aspects of sustainability.

The price of global crude oil and refined products increased rapidly between 2003 and 2012 (IMF 2013b). Rising oil prices in the international market have affected many economies in the last decade (Kojima 2013) and importing countries seem to be worse hit with a sharp increase in energy bills and cost of gasoline (IMF 2013b). How these economies react to the price hike and its impact on the dimensions of sustainability and by extension the livelihoods of the citizenry differ. These price increments affect the entire oil supply chain and its effect is most noticeable in struggling developing countries. The government of such countries most often are inclined to subsidise the selling price of imported refined products and this has a huge impact on not just the economic growth of such countries but on other dimensions of sustainability as well. Adelabu (2012) stated that the budget allocated for refined products importation over the years has and is still having a drastic impact on Nigeria's capital expenditure and crude oil sale revenue.

Thus, although the upstream oil industry in Nigeria is a revenue generator much of this income is disbursed in the downstream sector via oil subsidies thus threatening economic sustainability. In Brasil, it has been reported that the national oil company Petrobras sells imported gasoline at a 15% discount at the pump station (Greeley 2014). A situation which has hampered the development of recent offshore oil discoveries in the upstream sector of the country. Likewise, Ukraine which has an estimated gas reserve of 1tcm (trillion cubic metres) and ranks 3rd in Europe for shale gas reserves (Perry 2014), is only able to meet its national gas demand by importing 64% of consumed gas from Russia (Energy Delta Institute 2011). This raises questions as to the peculiarity of this problem. Is this a case of a developing oil country and the expected symptoms of the "resource curse" as it appears that the downstream sector of developed oil producing countries seems to be less impacted. However, even non-oil producing developing countries alike are not exempted as many pay much lower energy prices and taxes compared to their developed counterparts despite the relative cost of producing and conveying petroleum and its products (Balouga 2012).

2.3.7 SSCM in the Oil Industry Now

There has been an increasing number of studies on SSCM in recent years (Akamp and Muller 2013, Galal and Moneim 2016, Kurnia *et.al* 2014, O'Rouke 2014, Sajjad, Eweje and Tappin 2015, Santiteerakul *et al*. 2015, Tate, Ellram and Kirchoff 2010 and Touboulic and Walker 2015), depicting an increasing awareness of the concept.

In general and also applicable to the oil and gas industry, some adopted measures as stated in literature for moving towards a sustainability integrated supply chain include but not limited to; carbon footprint reduction, reducing air emissions/pollution, waste management, decreased consumption of hazardous/harmful/toxic materials, development and use of renewable energy sources, decreased frequency of environmental accidents, suitable working condition for employees, increased development of host community /area, increased economic input to infrastructural development, reduction in energy use, reduction in the number of workplace accidents, employee education and skills development, reduction in the number of pipeline accidents and fires, reduction in the number of issues with stakeholders, adoption of green purchasing, use of eco-friendly products, resource management, supplier compliance auditing, increased focus on customer satisfaction, recycling and adoption of safety standards (Gopalakrishnan *et al*. 2012 and Yusuf *et al*. 2013).

Going back to the questions raised in section 2.3.3 on the oil industry's perception of sustainability, it is clear that a large percentage of oil industry executives are aware of the sustainability concept as can be seen in the work of Yusuf *et al.* (2012). The authors focused on the UK oil industry and their findings showed that more than 80% of the industry's operators are already on the sustainability route.

This figure is however based on 'measures of sustainability' and a limitation of this study however as stated by the authors themselves, is that, individual companies were examined and not entire supply chains. This thus raises further questions as to what the big picture would look like, since it is expected that sustainability initiatives should spread across the entire supply chain and to fully appreciate the SSCM efforts in an organisation, a complete integration of all activities that make up the chain is a necessity. The oil industry is a known ardent affirmer of sustainable practice but incidences such as the 2010 Gulf of Mexico oil spill, non-stop gas flaring in areas such as the Niger Delta and the incessant global oil spills cannot but raise doubts on how truly committed the industry is to sustainability. Ihlen (2011: 7) asked the question "are some industries simply based on a practise that at its core is unsustainable?" as this seems to be the description of the oil industry. In order to meet the global demand for oil and its derivatives which is necessary for economic growth (both for the industry itself and world economy), there has to be some casualties; the environment, social and sometimes the economic dimension depending on the stakeholder involved. For example, oil spillage in a community where fishing is the main means of livelihood, may lead to an imbalance in the ecosystem such that there is no more fish to catch (environmental), this may cause the inhabitants to lose their source of income (economic), which can result in parents pulling their wards out of school as they cannot afford the fees anymore (social). This is a simple illustration of the effects of unsustainable supply chain in the oil industry and its effect on the dimensions of sustainability. There are obvious gaps to be filled in the industry's acclaimed sustainability efforts judging by incidences that paint a true picture of what is truly militating in the industry.

Quoting Ketola (2007: 172) "… the 'sustainable development' of the oil companies has not saved us from the malignant effects of their unsustainable operations, such as the greenhouse effect, continuous degradation of the ecosystems and extinction of species" throws more insight to the anticipated answer to the question; is the oil industry supply chain sustainable or can it be better? The words of Ketola (2007), echoes concern for a sustainable environment now and in the future. Ketola(2007:172) further stated that the oil industry "…take advantage of the

economic and social pillars of their concept of 'sustainable development' to exploit the huge, tempting commercial prospects in the second and third world". According to him, the benefits of a better living standard equal to what is obtainable in first world countries is often too good to be ignored by these developing regions and these regions will ultimately pay dearly for this global economic invasion in the future. This is quite true; however, Ketola (2007) failed to mention if the same standard will or is being used in these evolving and often times stagnant economies. Is the sustainability effort the same in struggling developing countries where corruption is at the core of leadership and developed countries where there is significant societal awareness, structured and working judicial systems, industry monitoring organisations and watchdogs and a people-focused government? Frynas (2001) stated that oil companies in the Niger Delta area of oil-rich Nigeria often embark on short-term projects rather than long-term development projects that would better meet the needs of the community in a bid to buy a short spell of peace and carry on production operations. The author cited an example where Shell Petroleum Development Company (SPDC) built three community halls in a single Niger Delta community as three community leaders wanted to benefit personally from contracts for their construction. This example illustrates the dilemma the oil companies sometimes find themselves in. Oil companies have been known to operate according to the '*societal values'* of the society they find themselves. This sometimes is due to no fault of the oil companies as they have to adapt to the norm of the society they operate in. This does not however excuse some of the oil industry's supply chain practices in these developing countries.

Pearce (2012) stated that a 2-year study conducted by the United Nations Environment Programme (UNEP) revealed that Shell's environmental management of Ogoni Land in the Niger Delta area of Nigeria was far below international standards and legislation. Even the so called remediation procedure of channelling spilled oil into creeks in the area has been criticized as unethical and damaging to the health of the people, environment, livelihoods of the local people and even the entire way of life of the Ogoni people. This kind of behaviour is unacceptable globally and would not be taken lightly if it happened in the developed world where most times, oil companies tend to act with care and caution when operating in these regions.

This watchful attitude by oil companies in developed countries signify that they are conversant with the expected sustainability standards and can strive to make their operations more sustainable, even though one-off incidences due to human error cannot be completely ruled

out, but proper checks can be put in place to avoid this from happening. Hence, why are there variations in the industries' supply chain sustainable practise between developed and developing countries or are the aforementioned examples peculiar to the country in question or is there a trend? Is it a case of Polycentricity; where an organisation adopts the host country perspective and goes by the saying "when in Rome, behave like a Roman" instead of adopting a global SSCM perspective (Geocentricity) or better still adopting home country SSCM perspective (Ethnocentricity). Is SSCM in the oil industry a function of societal values and societal awareness or is it dependent on regional economy (developed and developing economies)? In order to gain useful insight into the SSCM in the oil industry, it would be noteworthy to compare the oil industries' SSCM in developing and developed countries so as to better evaluate how sustainable the industries' supply chain really is and to better understand and highlight the focal points the oil industry should improve on to fully actualise a positively impacting SSCM.

The downstream oil sector like the upstream is not exempted from the detrimental contribution to sustainability dimensions. Vivian, Blamah and Ezemokwe (2012) in their investigation into the socio-economic effect of the Kaduna refinery (one of the four refineries) in Nigeria on a host community found out that the negative effects of the refinery location on the community far outweighed the economic boost the refinery brought to the area. More residents expressed their disdain at having the refinery in their community as it was indicated in the report that the refinery location was responsible for high crime rates in the area, high housing costs, poor health and low level of education amongst community members.

Refining processes also has social and economic implications. These manifests in form of destruction of the means of livelihood of communities where these pipelines travel through via accidental oil spills and leaks from damaged pipelines as well as human rights violations and cumulative income-diminishing effects. These effects are more profound in developing countries (Jernelov 2010, O'Rouke and Connolly 2013and Karl 2004). O'Rouke and Connolly (2003: 602) cited the case of the Chad-Cameroon pipeline construction and the concerns raised by pressure groups on the associated violence, alongside human rights and corruption issues that the project was brewing up in the Chad region.

In Nigeria, where refined products are increasingly being transported via road by the use of large trucks and sometimes by sea due to increasing rise in pipeline vandalization. A larger

percentage of refined products are conveyed through road transport across the country (Ehinomen and Adepoju 2012). The use of heavy-duty trucks and tankers in transporting products has led to the loss of many lives and property, damaged roads and caused a lot of environmental related problems in the country.

Table 2.4 Some Oil Pipeline Vandalisation Related Fire Disaster in Nigeria between 1998 and 2006

S/ NO	Date	Location	State	Death toll	Observed consequences
1	17 October1998	Jesse	Delta	At least 1 000	Damage to farmlands, environmental pollution, dozens of people injured
2	22 April1999	Bayana, Ijaw Community	Delta	At least 10	Damage to farmlands, pollution (air and water)
3	8 June 1999	Akute Odo	Ogun	At least 15	Damage to farmland (land and air pollution)
4	13 October 1999	Ekakpamre, Ughelli	Delta	Undetermined	Damage to farmland, destruction of flora and fauna, environmental pollution
5	14 January 2000	Gana Community	Delta	At least 12	Damage to farmlands and the environment
6	7 February 2000	Ogwe Community	Abia	At least 15	Damage to farmlands and the environment
7	20 February 2000	Lagos	Lagos	At least 3	Damage to farmlands, destruction of a canoe, environmental pollution
8	14 March 2000	Umugbede Community	Abia	At least 50	Environmental pollution, damage to farmlands
9	22 April 2000	Uzo-Uwani	Enugu	At least 6	Damage to farmlands, environmental pollution
10	3 June 2000	Adeje	Delta	Undetermined	Damage to forest, destruction of a high-tension power cable of two electricity plants, youths/ police clash
11	20 June 2000	Okuedjeba	Delta	Undetermined	Damage to farmlands, environmental pollution
12	10 July 2000	Adeje/ Egborode, Okpe	Delta	At least 150	Damage to farmlands, environmental pollution
13	10 July 2000	Oviri Court	Delta	At least 300	Damage to farmlands, environmental pollution, dozens of people injured
14	5 November 2001	Umudike	Imo	At least 3	Several burnt bicycles, more than 17 people injured
15	19 June 2003	Onitcha Amiyi – Uhu	Abia	At least 125	Dozens of people injured, damage to farmland
16	6 January 2004	Elikpokwodu	Rivers	Undetermined	About 200 hectares of farmland and properties worth millions of Naira destroyed
17	30 July 2004	Aghani	Enugu	At least 7	Several people injured, environmental pollution
18	16 September 2004	Ijegun	Lagos	At least 60	Air and water pollution
19	December 2004	Imore Village	Lagos	At least 500	Environmental pollution
20	30 May 2005	Akinfo	Oyo	At least 1	34 persons were injured, 15 died after eleven days
21	13 January 2006	Iyeke	Edo	At least 7	Six persons injured, damage to farmland,environmental pollution
22	12 May 2006	Ilado Village	Lagos	At least 150	Pollution of water, incineration of everything within a 20 metre radius, dozens of people injured
23	2 December 2006	Ijeododo	Lagos	At least 1	Environmental pollution, damage to farmland.
24	26 December 2006	Abule Egba	Lagos	At least 500	Incineration of 40 vehicles, a dozen homes including a mosque and two churches, and innumerable business ventures comprising auto mechanic workshops, a saw mill and network of timber shops

This has sometimes resulted in other cumulative effects on the livelihood of the population. Such problems can be inform of shortage of refined products as a result of the often deplorable state of roads caused by poor maintenance and the constant use of domestic roads by these trucks as well as the sometimes poorly maintained trucks in the country; making them a risk to the occupants as well as the society.

Schneider *et al*. (2011) evaluated ten global companies in the petroleum refining industry and concluded that despite the oil industry ranking as one of the top global lucrative industries, the industry is still plagued with inconsistencies in their sustainability practise. The authors reported variations in regulations as the oil industry lacked clear-cut regulations that applied to the global oil industry, thus causing oil companies to adopt varying sustainability stance especially in non-rigorous and less-stringent environment. They further stated that reported achievements of the oil industry in answer to the growing agitation of the modern age on sustainability were more a reiteration of the EHS management and not essentially sustainability.

The sustainability issues in the Nigerian downstream oil sector for example is often overlooked as the country seem to be faced with more perceived pressing problems such as the overwhelming environmental degradation in the oil rich Niger-Delta region, civil unrest and militancy of the oil communities against the oil multinationals and the Nigerian government, social problems brought about by oil exploration and making refined petroleum products available to meet the growing local market demand. This does not however mean that the Nigerian downstream oil industry is without its own sustainability issues as it is plagued with various challenges and cumulative negative effects that travels with the oil. Table 2.4 shows a trend in pipeline vandalisation related fire disaster in Nigeria between 1998 and 2006.

The regular supply of refined petroleum products is a big concern to the Nigerian National Petroleum Corporation (NNPC) as the country's refining capacities till date is insufficient to meet local consumer demand. Hence, despite the country being a major crude oil exporter, the country remains an ardent importer of refined products (Obi 2007 and Adelabu 2012). An approximated annual growth of 12.8% is envisaged in the demand for refined petroleum products in the country (Adelabu 2012: 193). The NNPC subsidiary PPMC (Pipelines and Product Marketing Company) is responsible for the regular and undisrupted supply of petroleum products in Nigeria. The task of meeting the national petroleum product consumption of the country at a uniform price is an arduous and economically tasking one which "……Nigerians have come to take for granted" (NNPC 2010).

There have been accusations of the Nigerian government's negligence and failure in ensuring that the state-owned refineries are up and running (Bowie 2012) as well as high level corruption

and mismanagement in the oil sector. The importation of refined petroleum products at international market price and subsequent price subsidization in order to make them available and affordable for the country's population, is a task the Nigerian government has declared is cutting into the economic revenue of the country and a reason for the nation's underdeveloped economy. Oil subsidies can exist as tax breaks for local oil producers or products price cap to allow consumers buy at reduced prices while the government bears the rest of the cost (Greeley, 2014). This has led to a call for the complete deregulation of the downstream sector in the Nigerian oil industry. Incessant increments in the price of petroleum products in the retail market as an aftermath of the government's effort to cushion the effect of fluctuating oil prices and cost of subsidising imported petroleum products has been a cause of several civil uprising in the country (Balouga 2012). Over the years, there have been recommendations for energy subsidy removal by the World Bank and the International Monetary Fund (World Bank 2010 and IMF 2013a) to harness economic growth and encourage use of alternative energy sources. This recommendation has been accepted by the Nigerian government and effort is being geared towards its actualisation (Kolawole and Oritse 2013).

Many works have focused on the oil industry's upstream supply chain but not so much on how the downstream supply chain can be tuned towards a more sustainable terrain. Hence, there is an imminent need for a well-structured strategic plan to improve SSCM performance in the downstream sector of the industry. Even at that, sustainability in the downstream oil industry supply chain is a pressing issue both in the developed and developing world (Asif and Muneer 2007, Obi 2007 and Ketola 2007). However it seems that developing countries are far behind in their journey towards achieving a sustainable supply chain both in the upstream and downstream sectors as sustainability issues in the oil industry seem to be more profound in developing countries most specifically, oil producing countries as it not only impacts the environmental dimension, but observably the economic and the social aspects as well.

2.4 Identified Gaps

As stated in section 2.2.1.3, social sustainability remains an area lagging behind in sustainability discussions and this shortcoming is evident in the oil industry's sustainability practice. The measurement of social sustainability has proved challenging even for academic experts as the concept is still overwhelmed by definitional in-clarity and the need for a measuring system that captures key societal issues as it relates to sustainability. The

development of a framework for analysing social sustainability along the oil industry's supply chain would provide quantitative and qualitative measurement of the concept in oil producing areas and all areas where the industry's footprints can be seen as a result of their supply chain activities. This measurement can serve as a benchmark for improvement or can be used as a model for other regions with similar characteristics.

The measurement of sustainability performance along the oil industry's supply chain is essential for the reassessment of upstream and downstream sustainable supply chain activities as well as evaluating positive efforts geared towards sustainability practice. To actualise this foregoing, it is vital that an industry-specific framework for estimating sustainability performance along the supply chain is developed. This would yield useful information on sustainability improvements and achievements in key processes and operations in the industry as well as serve as a useful tool for industry executives to improve their business processes. In order to measure sustainability performance, it is important to adopt sustainability indicator sets that capture in detail sustainability issues as it relates to the oil industry's supply chain. As mentioned in section 2.2.3, sustainable indicators being used currently in the oil industry are in line with the generic indicators of Global Reporting Initiative (Moneva, Archel and Correa 2006; 130). However these indicators have not fully captured in detail some lingering issues in sustainability. It is therefore important to know how these indicators have evolved over time; how they are monitored and controlled and if they are truly representative of and fully capture sustainability issues in the industry.

Modern day supply chain managers are remodelling their supply chain activities by adopting innovative strategies such as Lean and Agile in their bid to cut down on cost, stay competitive and ensure customer satisfaction. Lean is the reduction or complete elimination of waste and Agile is the ability of organisations to respond to demand (Mangan 2012). At the centre of all these, is supply chain integration as discussed in sections 2.3.1 and 2.3.2. SSCM in the oil industry transcends the integration of all supply chain links as it has at its core, the initiation of sustainability from exploration all the way to the final consumer of the oil and gas products. The integration of sustainable practise and the various supply chain components like suppliers, contractors and the supply chain links will make the entire chain a single system and thus enable an effective SSCM. Various works have been done on the integration of supply chain activities in the oil industry, but the industry is still lacking a detailed holistic approach to SSCM (Akamp and Muller 2013). Also, there is a gap in knowledge with regards to oil-industry specific drivers

and barriers of SSCM as literature has only reported generic organisational SSCM drivers and barriers. These drivers and barriers are generic and there is currently no work (from studies conducted) identifying explicitly drivers and barriers for the oil industry's SSCM. It would be beneficial to ascertain the motivators for the extent to which the oil industry has adopted SSCM, as well as the barriers being faced by supply chain managers in integrating sustainability into their day-to-day activities. Such issues can influence strategic decision making in the industry and have the potential to direct the industry towards sustainable practice.

Discussion on SSCM in downstream oil industry is usually centred on general problems in the oil industry as a whole and the emphasis is on the upstream industry. Issues in the downstream sector are thus often overshadowed by the seemingly overwhelming environmental and social problems associated with the upstream sector. A detailed evaluation of the primary issues in SSCM in the downstream sector and its direct and indirect global impact is necessary to highlight areas that require improvements and strategically direct efforts towards such. Also, there is a lack of data on the levels of impact on exposed communities, especially those residing close to the refineries.

Accidents and disasters have been a part of the downstream sector and this has been attributed to the nature of crude oil and its derivatives. The industry claims it is already edging towards sustainable practice, but if so, results and performance show the opposite. A reassessment of sustainable supply chain activities and practise in the downstream oil industry is necessary to explicitly identify the level of sustainability performance and areas for improvement. Apart from this, the downstream oil sector still lacks a comprehensive performance measurement metric as what is obtainable now is inadequate to capture genuine improvements in sustainability performance. According to Schneider et al. (2011), the detailed measurement of sustainability performance is important to efficiently monitor and improve sustainability performance in the downstream sector. The development of a framework as well as a performance metrics that captures all aspects of SSCM in the downstream sector of the oil industry is crucial to the actualisation of a less negatively impacting oil industry.

Also, developing oil-producing countries seem to be more impacted by the unsustainable SCM practise in the downstream sector. Not surprisingly, this raises questions; Why is SSCM in developing oil countries doing poorly compared to developed countries? Are there variations in SSCM practice in developed and developing countries? What are the similarities in SSCM

practice in developed and developing countries? Is downstream sector SSCM practice in developing countries dependent on the GDP, industrialization and social development or is it simply a problem of oversight on the part of managers of state-owned refineries private oil companies? What are the specific drivers and barriers of downstream sector SSCM in developing countries? Identifying the militating factors and operational practices that favour and deter SSCM in the downstream oil sector would enable oil industry decision makers in developing countries to better facilitate and improve on their SSCM strategies. As the oil industry plays a crucial role in global economy, this would be beneficial to governments and world leaders in formulating and implementing policies that would address the environmental, social and the economic effects of the downstream sector activities.

A summary of the opportunities for research identified in this literature review is captured in Table 2.5

After careful considerations, the gaps that were focused on in this research work were gaps 12 and 4;

- A thorough investigation into the variations and similarities in downstream SSCM in developing and developed oil producing countries.
- Development of a framework to enhance SSCM improvement in the Nigerian downstream oil industry.

As discussed in section 2.3.3, the oil industry's SSCM practise has raised concerns in certain regions and though the industry's policies and efforts towards SSCM is believed by industry executives to be directed towards the actualisation of a more sustainable environment, society and economy, there still seem to be some unclear variations in the industry's approach to SSCM in certain countries and regions. It would be therefore advantageous to identify the variations and similarities in the methods adopted in achieving SSCM in developing and developed oil producing regions/countries.

This comparison of the oil industry's downstream operational standards and sustainability practises in developing and developed countries will provide detailed information on the influence of culture, GDP, government policies, gender equity and political stability on SSCM. In this analysis, it would also be very useful to evaluate how sustainable the industries' supply

chain is and highlight areas for improvement to actualise a positively impacting sustainable supply chain.

The development of a framework to adequately appraise the oil industry's SSCM is essential to ascertain if the sustainability effort of the industry is in the right path and to ensure that decision makers are able to strategically steer the industry into a more sustainable terrain by putting in place measures that encourage sustainable practise.

Table 2.5 Summary of Opportunities for Research

	IDENTIFIED GAPS	Area (Social, Environment and Economic)	Relevance	Likelihood of significant work	Ease of Obtaining Data	Originality of Work
1	How can social sustainability be measured along the oil industry's supply chain	Social Sustainability	This would provide a qualitative and quantitative measurement of social sustainability in oil producing areas and all areas where the industry's footprints can be seen as a result of their supply chain activities. This measurement can serve as a benchmark for improvement or can be used as a model for other regions with similar characteristics.	The social aspect of sustainability is the least discussed compared with the other dimensions. Past work on the oil industry is themed around Corporate Social Responsibility (CSR) and so far (from studies conducted), there is no work on the direct measurement of the impact of the oil industry's activities on social sustainability	Data would have to be obtained from oil producing communities (developed and developing regions), the Oil industry and government of the selected countries.	Original work can be done in this area because up until now, most work on SSCM has been generic and not industry specific. However, judging by the growing interest in the activities of the oil industry and the call for research in this area, future work may be in this direction.
2	Development of Indicators for Sustainable Development for the Oil Industry's Supply Chain	Supply chain management and sustainability	The reassessment of the upstream and downstream oil industry supply chain and the development of sustainability indicators is crucial in measuring sustainability performance and in the development of a good understanding of the relationship between the dimensions of sustainability and how they are influenced by human activities.	Currently, sustainable indicators being used in the oil industry are in line with Global Reporting Initiative (GRI). However, these indicators have not fully captured in detail some lingering issues with sustainability. It would be beneficial to know how the sustainability indicators used in the oil industry has evolved over time, how are they monitored and controlled and if they are truly representative and fully captures sustainability issues in the industry.	Primary data would be obtained from oil industry stakeholders and oil companies.	This gap is worth exploring in detail however, like every other gap, research work is always ongoing in the oil industry this gap may be of interest to other researchers as well.
3	Identifying the variations and similarities in SSCM in developing and developed oil producing regions/countries	Supply chain management and sustainability	A comparison of the oil industry's operational standards and sustainability practise in developing and developed countries will provide detailed information on the influence of culture, GDP, government policies and political stability on SSCM. It would also help to evaluate how sustainable the industries' supply chain is and highlight areas for improvement to actualise a positively impacting sustainable supply chain	There is opportunity for research in this area as no work has been done in this regard. The unsustainable operational practice of some oil companies have been mentioned in some work but this has been done in isolation and not compared to what is obtainable in some other regions. Research in this area would shed more light on the country specific factors that influence SSCM and how these can be mitigated or harnessed as the case may be.	Primary data would have to be obtained from oil producing communities (developed and developing regions), oil companies operational in these regions and government of the selected countries. Secondary data would be obtained online.	This gap is worth exploring in detail however, like every other gap, research work is always ongoing in the oil industry this gap may be of interest to other researchers as well.

	IDENTIFIED GAPS	Area (Social, Environment and Economic)	Relevance	Likelihood of significant work	Ease of Obtaining Data	Originality of Work
4	Development of a framework to determine how sustainable the oil industry's supply chain is	Supply chain management and sustainability	A framework to estimate the oil industry's SSCM is necessary to adequately estimate if the sustainability effort of the industry is in the right direction. This will enable decision makers to strategically steer the industry into a more sustainable terrain by putting in place measures that encourage sustainable practise. Also, with this knowledge, stakeholders can immediately identify the 'green-washing oil companies' and the companies that truly support and reinforce sustainability	There is opportunity for research in this area as limited work has been done on the development of a framework to measure all three dimensions of sustainability in the oil industry.	Primary data would be obtained from oil industry stakeholders and oil companies.	This gap is worth exploring in detail however, like every other gap, research work is always ongoing in the oil industry and may be of interest to other researchers as well.
5	Identification of drivers and barriers to SSCM in the oil industry (maybe country specific)	Supply chain management and sustainability	There is a gap in knowledge with regards to oil-industry specific drivers and barriers of SSCM as literature have only reported general organisational SSCM drivers and barriers. It would be beneficial to ascertain the motivators for the oil industry's adoption of SSCM as well as the barriers. This would influence strategic decision making in the industry and better direct the industry towards sustainable practice.	There is opportunity for research in this area as past work on the drivers and barriers of SSCM are generic and there is currently no work (from studies conducted) identifying explicitly drivers and barriers for the oil industry's SSCM	Primary data would be obtained from oil industry stakeholders and oil companies.	This gap is worth exploring in detail however, like every other gap, research work is always ongoing in the oil industry this gap may be of interest to other researchers as well.
6	Integration of sustainable practice with supply chain activities from exploration to the end consumer	Supply Chain management and sustainability	The integration of sustainability and various supply chain components like suppliers, contractors and the supply chain links will make the entire chain a single system and this will enable an effective SSCM.	Various works has been done on the integration of supply chain activities in the oil industry, but the industry is still lacking a detailed holistic approach to SSCM.	Data would have to be obtained from oil industry executives spanning across the entire supply chain link. This would involve comparing data from two/more oil industries and would entail travelling across locations.	SCM is a prominent area in the oil industry. SSCM is also a growing area in the industry and is attracting the interest of researchers all over the globe.

	IDENTIFIED GAPS	Area (Social, Environment and Economic)	Relevance	Likelihood of significant work	Ease of Obtaining Data	Originality of Work
7	Measurement of sustainability performance along the oil industry's supply chain (maybe country specific)	Supply chain management and sustainability	Reassessment of upstream and downstream sustainable supply chain activities and evaluating the sustainable practise in order to identify sustainability performance is a requirement necessary for oil industry executives to improve their business processes.	The development of a framework for estimating sustainability performance along the oil industry's supply chain is essential in estimating the sustainability improvements and achievements in key processes and operations	Data would be obtained from the oil industry spanning across the entire supply chain link. This would involve comparing data from two/more oil industries and would entail travelling across locations.	Original work can be done in this area because up until now, most work on sustainability performance is primarily focused on individual companies and not on entire supply chains. It would be noteworthy to evaluate industry specific sustainability performance along the entire oil industry's supply chain. However, judging by the growing interest in the activities of the oil industry and the call for research in this area, future work may be in this direction.
8	A need for reengineering the oil industry's supply chain towards efficient sustainable practise and standards	Supply chain management and sustainability	This is necessary for the development of a comprehensive sustainable strategy by the oil industry to obtain a competitive advantage, better stakeholder relationship and future growth of the industry.	Many authors have looked at the oil industry's SC, but the industry's business strategy operations and processes are still far from being sustainable and this is detrimental to the industry and all dimensions of sustainability	Data would have to be obtained from oil industry executives spanning across the entire supply chain link. This would involve comparing data from 2/more oil industries and would entail travelling across locations.	There is growing need for the oil industry to continually evaluate their policies and sustainability practice. This makes this research area attractive for researchers. That being said, there is currently little information on this area of research.
9	A reassessment of SSCM activities and practise in the downstream oil industry is necessary to explicitly identify the level of sustainability performance and areas for improvement.	Supply chain management and sustainability	This is necessary to identify areas for improvement in SSCM in the downstream sector to enable oil industry decision makers take a more sustainability enhancing stance in the downstream industry.	Various works on sustainability in the downstream sector has been focused on individual dimensions of sustainability. Evaluation of the downstream supply chain and its impact on all dimensions of sustainability will help identify performance levels and areas for improvements.	Primary data would be obtained from oil industry stakeholders and oil companies in the downstream sector	This gap is worth exploring in detail however, like every other gap, research work is always ongoing in the oil industry this gap may be of interest to other researchers as well.

	IDENTIFIED GAPS	Area (Social, Environment and Economic)	Relevance	Likelihood of significant work	Ease of Obtaining Data	Originality of Work
10	Identification of drivers and barriers to SSCM in the downstream sector of developing oil producing countries.	Supply chain management and sustainability	There is a gap in knowledge with regards to oil-industry specific drivers and barriers of SSCM as literature have only reported general organisational SSCM drivers and barriers. It would be beneficial to ascertain the motivators for the oil industry's adoption of SSCM as well as the barriers. This would influence strategic decision making in the downstream oil industry and better direct the sector towards sustainable practice.	There is opportunity for research in this area as past work on the drivers and barriers of SSCM are generic and there is currently no work (from studies conducted) identifying explicitly drivers and barriers for the oil industry's SSCM	Primary data would be obtained from oil industry stakeholders and oil companies in the downstream sector	This gap is worth exploring in detail however, like every other gap, research work is always ongoing in the oil industry this gap may be of interest to other researchers as well.
11	Identifying the variations and similarities in downstream oil industry SSCM in developing and developed oil producing regions/countries	Supply chain management and sustainability	A comparison of the downstream oil industry's operational standards and sustainability practise in developing and developed countries will provide detailed information on the influence of culture, GDP, government policies and political stability on SSCM. It would also help to evaluate how sustainable the industries' supply chain is and highlight areas for improvement to actualise a positively impacting sustainable supply chain	There is opportunity for research in this area as no work has been done in this regard. The unsustainable operational practice of some oil companies have been mentioned in some work but this has been done in isolation and not compared to what is obtainable in some other regions. Research in this area would shed more light on the country specific factors that influence SSCM in the downstream sector and how these can be mitigated or harnessed as the case may be.	Primary data would be obtained from oil industry stakeholders and oil companies in the downstream sector (developed and developing regions).	This gap is worth exploring in detail however, like every other gap, research work is always ongoing in the oil industry this gap may be of interest to other researchers as well.
12	Identification of variations and similarities in downstream oil industry SSCM in developing and developed oil producing countries by examining a specific product line along a supply chain link.	Supply chain management and sustainability	Same as identified in (11). However, focus is on a specific product line from refining up unto storage at distribution centres.	Same as identified in (11) but with the added advantage of being able to succinctly examine adopted SSCM practices along specific links in the supply chain.	Same as identified in (11)	This gap is worth exploring in detail however, like every other gap, research work is always ongoing in the oil industry this gap may be of interest to other researchers as well.

This tool would also assist senior management in the industry to better incorporate sustainability into every-day operations and activities of the supply chain. Also, with this knowledge, stakeholders can immediately identify the 'green-washing oil companies' and the companies that truly support and reinforce sustainability. Thus, this awareness would serve as a check for the industry's sustainability practise and highlight areas requiring improvements as well as provide a competitive edge for the more diligent companies.

There is opportunity for research in these areas as limited work has been done in this regard. The unsustainable operational practices of some oil companies have been mentioned in some work but this has been done in isolation and not compared to what is obtainable in some other regions. Comparative research in this SSCM area would shed more light on the country specific factors that might influence SSCM and how these can be mitigated or harnessed as the case may be. Also, most work on SSCM frameworks are not industry specific. It would be noteworthy to develop an industry specific SSCM framework along specific links in the downstream oil industry's supply chain.

Application of the outcomes of this research would help enable decision makers to put in place country-specific measures that encourage sustainable practice. It would also be beneficial in reducing the cost of managing conflicts and mitigating feud related operational losses arising from sustainability issues between oil companies and their stakeholders.

2.5 Summary

This chapter presents a literature overview of SCM and SSCM in the oil industry. It examined the upstream and downstream sectors of the oil industry and the supply chain activities undergone in these sectors. It also evaluated the drivers and barriers to SSCM adoption in the oil industry as a whole. The chapter also reviewed sustainability issues in the oil industry sectors and focused on disparities in SSCM in developing and developed oil producing countries. It further examined the downstream oil industry SSCM practice to identify gaps in literature as well as opportunities for research work in the sector. It also shows the basis for selection of research work and the possible benefits that can be derived from this study.

3 SSCM Framweworks and Major Elements in the Nigerian and UK Downstream Oil Industry Supply Chain for Case Study

3.1 Introduction

This chapter presents four existent SSCM framewroks from literature and reviews supply chain links in the Nigerian and UK downstream oil industry. Section 3.2 examines SSCM frameworks from literature. Section 3.3 evaluates the downstream oil industry supply chain links in the case study countries. This section begins with a brief overview of functional refineries and factors influencing refinery profitability in the UK. This was followed by a review of the supply chain links in the Nigerian downstream oil industry. The section concludes with refined product distribution and storage in the Nigerian oil sector.

3.2 SSCM Frameworks

A framework can be defined as an "…outline, or skeleton of interlinked items which supports a particular approach to a specific objective, and serves as a guide that can be modified as required by adding or deleting items" (BusinessDictionary.com 2016). It is a useful tool for assessing philosophical ideas on a field of study and provides guidance on the actualisation of set objectives (Creswell 2003). A SSCM framework can thus be defined as an outline of measures designed to improve sustainability dimensions with regard to the supply chain and the listed strategies of achieving and actualising these measures with a goal of improving overall business performance.

3.2.1 Frameworks from Literature

Various SSCM frameworks have been developed over the years as businesses are increasingly addressing and implementing sustainability strategies (Al-Odeh and Smallwood 2012 and Seuring and Muller 2008). This is attributed to rising new challenges associated with climate change issues, energy efficiency, business sustainability and increasing public interest in business practices and its diverse impact on sustainability dimensions (Teuteberg and Wittstruck 2010). With increasing attention to SSCM as a research area, there has also been a growing attention on SSCM framework development. These frameworks cut across the dimensions of sustainability and often focus on the integration of supply chain activities in order to bring about strategic benefits characterised by improved financial and operational performance alongside improved organisational reputation.

As SSCM continue to evolve as an interesting area of discussion both in the academic and industrial environment, so also have there been a growing trend in the development of frameworks addressing supply chain issues and proposing measures for developing and maintaining them. It is no news that

many discussions on SSCM are centred on environmental issues (Schwartz, Tapper and Font 2008 and Seuring and Muller 2008). Also discussions surrounding the social dimension usually revolve around CSR. This trend can also be observed in many of the existent frameworks in literature. Some of these works have looked at ways of scanning and deciding what is important and should be prioritised especially with regards to the environment when examining SSCM (Fabbe-Costes, Roussat and Colin 2011 and Costes et al. 2014). Some conceptual frameworks have also been developed from literature as can be seen in the works of Seuring and Muller (2008), Svensson (2007) and Carter and Rogers (2008) providing a starting point for supply chain managers to grasp an understanding of relevant and crucial aspects of sustainability especially in the context of adopting a positively impacting SSCM. Also, a number of industry-specific sustainability frameworks have been developed as can be observed in the works of Schwartz and Tapper (2008) and Azapagic 2004). These frameworks were developed to serve as tools for sustainability improvements in the industries in question.

In order to adequately justify the development of a framework specific to the Nigerian downstream oil industry, it is necessary to examine the structure and elements of existing frameworks. This is a necessary step in order to adequately understand what is available in terms of existing frameworks and its applicability to the industry's supply chain practice whilst not losing sight of some of the peculiarities defining the industry as a result of the country's level of development and associated social problems. In order to do this, a brief review of some existing SSCM frameworks is examined in subsequent paragraphs.

3.2.1.1 Conceptual SSCM Frameworks

Conceptual frameworks are derived from extensive literature review and informs the selection of important features and relationships required for making meaning and providing understanding in a study. They are derived from theory (Glatthorn 1998) and provide a good starting point into further enquiry into function and relationships that evolves from the study (Leshem and Trafford 2007). In the SSCM field, conceptual frameworks have also emanated from various authors.

In the work of Carter and Rogers (2008), a conceptual framework demonstrating the relationship between the dimensions of sustainability and the supply chain was developed. This framework was developed from conceptual theory-building which specifically involved an extensive review of literature on sustainability and the supply chain management paradigm. Data for this work was informed via a detailed iterative literature inquiry characterised by sustainability specific key-word search, database development and framework refinement through discussions with academic

colleagues over a seventeen month period. The conceptual framework was afterwards validated by engaging thirty-five industry professionals working in the capacity of supply chain managers from twenty-eight highly listed organisations in the USA and Germany. The authors identified risk management, strategy, transparency and culture as other aspects of sustainability emerging from literature and these aspects were also related and included in the framework. A strongpoint of this conceptual framework is the explicit recognition of all three strata of sustainability in the context of supply chain management as proposed in Elkington (1998) triple bottom line. The framework clearly identifies the relationship between the economic, social and environmental dimensions as opposed to some works which centre often only on the environmental dimension. The framework adequately defines SSCM concepts and elucidates relationships between sustainability and an organisation's supply chain. Thus, creating a starting point for a comprehensive and practical understanding of organisational sustainability in the context of SSCM.

Figure 3.1 SSCM Conceptual Framework (Source: Carter and Rogers 2008:369)
Figure shows the inter-relationship between the three dimensions of sustainability and the aspects of sustainability identified from the extensive review of sustainability literatures required for improved organizational SSCM performance.

However, despite the usefulness of this framework, its evolution from theory and satisfying many of the requirements of theoretical components as specified in the work of Weick (1989), the framework is however still lacking in evidence-based practical adaptability as it is yet to be tested with reality. The authors called for further research studies aimed at testing and refining the framework as required using both qualitative and quantitative research methods. It is also good to note that organisations

involved in the validation of this framework are top ranking organisations and are also situated in already developed economies, hence developed countries.

Schaltegger and Burrit (2014) also developed a conceptual SSCM framework that presented strategies for the management of a sustainable supply chain and also aid managers in the measurement of their sustainability performance. Five SPSC (Sustainability Performance Supply Chain) design strategies were proposed for the management and measurement of SSCM and sustainability performance goals. These strategies are: "… risk-and-opportunity-oriented SSCM, measuring sustainability risks for SCM, measuring sustainability opportunities for SSCM, SPSC impact level, improvements and side effects and basic strategies and SSCM" (Schaltegger and Burrit 2014: 235). The authors also identified three sustainability strategies for improving supply chains. The strategies identified are; efficiency, consistency and sufficiency.

Table 3.1 Sustainable Supply Chain Performance Management and Measurement Approaches (Source: Schaltegger and Burritt 2014: 236)

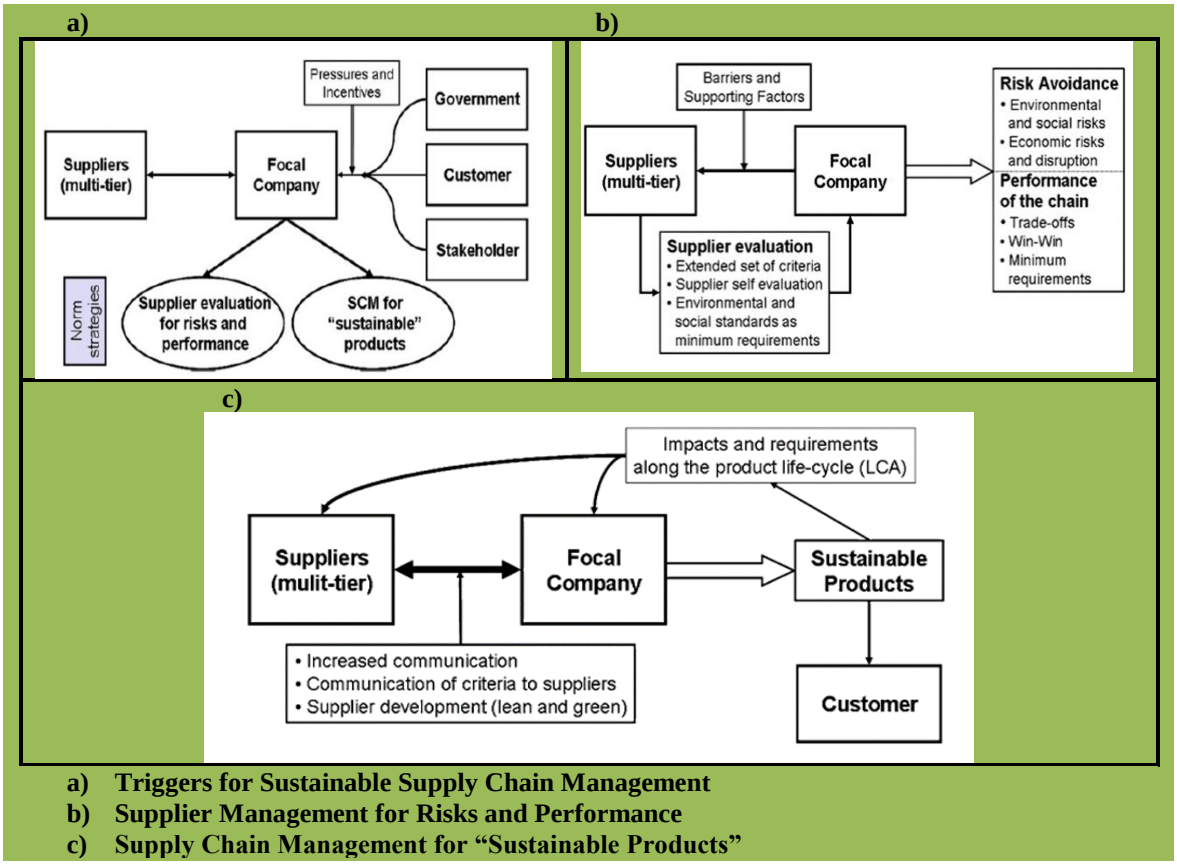
Tools scopes and foci	Tools for risk oriented SSC management	Tools for opportunity oriented SSC management
Scopes		
Internal supply chain and production (Scope 1)	Material flow cost accounting, production information system	Positive criteria list
First tier	Procurement checklist	Certification for green energy
Scope 2	Specific data form electricity provider/ data basis on electricity production	Material flow and flow cost optimization
Total supply chain	LCA, LCC	LCA optimization
Scope 3	Supplier audits and selection	Product design criteria
	…	Product stewardship
		Supplier development, education and training
		…
Foci		
CO2	Carbon footprinting	Carbon neutrality calculation
Chemicals	Toxic release inventory, REACH datasheets, etc.	Fair trade product (criteria met)
Social	Social audits	Organic agricultural production (criteria met)
Water	Water footprinting	Product design criteria
Biodiversity	Biodiversity risk monitor	Product-service-system design (e.g. effective reduction of number of cars)
…	…	…

Notes: LCA = life cycle assessment; LCC = life cycle costing

Table shows an analytical framework for SSCM performance measurement and management strategies with a focus on sustainability opportunities and risk and sustainable solutions required for recreating business models and development of innovative product-service-systems.

The framework by Schaltegger and Burrit (2014) as shown in table 3.1 examines possible SSCM strategies and performance measurement and highlights risks and opportunities as important features in sustainability supply chain management and performance measurement. Within the scope of this work, the focus here however, is on supplier risks and innovative products. In as much as these are

important elements for the attainment of a sustainable supply chain, the choice of supply chain strategy and by extension sustainable supply chain, is dependent on the product type, demand and market segment being covered by an organisation (Christopher, Peck and Towill 2006). In this instance, the local consumers and petrochemical industries constitute the demand market for refined products and product type is basically domestic products and other heavier distillates from the refining process. These products are fairly the same across the globe in the oil industry as the industry's supply chain and product is unique compared to its other counterparts (Chima 2007).



a) Triggers for Sustainable Supply Chain Management
b) Supplier Management for Risks and Performance
c) Supply Chain Management for "Sustainable Products"

Figure 3.2 SSCM Framework (Source: Seuring and Muller 2008: 1703, 1706)

Figure shows conceptual SSCM framework as proposed by (Seuring and Muller 2008). The framework (a) identifies government, customer and stakeholders as driving pressures for SSCM adoption by focal companies and strategies (b) and (c) depicts supplier development and risk minimization initiative and supply chain management strategies for innovative and sustainable products.

While developed economies such as the UK are already on the journey towards finding innovative replacements for the non-renewable energy sources such as (UKPIA 2014), a developing country like Nigeria is still struggling to cope with the demand for petroleum products despite being an oil producing country with four non optimal producing refineries (Ambituuni, Amezaga and Emeseh 2014). These peculiarities in the Nigerian downstream situation take the sustainability challenge to a different level from the proposed framework. It is not complementary to the challenge at hand as the

industry is still far from sourcing for innovative products but rather, what is required is a starting point for SSCM practice. This does not however negate the importance of supplier collaboration and risk management as these remain essential components for a successfully managed sustainable supply chain (Seuring and Muller 2008).

A conceptual framework for SSCM was developed by Seuring and Muller (2008) from an extensive review of 191 literatures published over a thirteen year period. A three-fold framework was developed as shown in figure 3.2, capturing; "triggers for SSCM practice, supply chain management for sustainable products and supplier management for risk and performance" (see figure 3.2). Legislation from government and regulatory bodies as well as pressure from customers act as triggers for SSCM practice in this framework.

The management of supplier risk and performance and development of sustainable products along the supply chain are two distinct but related strategies in the proposed framework. Companies can focus on minimizing supplier risks and improving their sustainability performance apart from providing training, monitoring, continuous evaluation and imposing sanctions where appropriate can better create sustainability awareness and integrate sustainability measures by introducing initiatives that allow suppliers to be evaluated based on sustainability criteria and set requirements. This assists in the reduction of supplier risks as well as avoidance of operational losses arising from supply chain disruptions. Managing supply chains for sustainable products are aimed at customer satisfaction and gaining a competitive edge in the market place.

The framework creates an expansive overview of SSCM and though a conceptual framework, it evaluates driving pressures for SSCM practice by focal companies and proposes approaches to sustainability risk minimization and sustainable products. The proposed triggers identified in this framework are not entirely comparable with those collected from the Nigerian downstream oil industry which will be discussed in the data evaluation section. Apart from this, the two strategies proposed in the framework cannot be implemented in the current state of the Nigerian downstream oil sector as barriers identified in the data collected in this research studies makes it a difficult task to implement.

As it is, SSCM has to start with the industry in question before it can be enforced on suppliers. Also, the global nature of the industry's products and the country's high dependence on importation of refined products in exchange for crude due to the low optimal production of the refineries (Aminu and

Olawore 2014 and Olukoju 2014) makes the second strategy far beyond immediate implementation based on the industry's current status quo.

Figure 3.3 A Summary of Framework for the Development of Organisational SSCM (Source: Al Odeh and Smallwood 2012: 88).
Figure shows a framework for SSCM obtained from a review of literature on sustainability and supply chain management. The framework is designed to help individual organizations to develop SSCM strategies that will enhance their supply chain as well as their long-term economic goals.

Al Odeh and Smallwood (2012) also developed a conceptual framework for SSCM development. The framework which was developed from reviewed literature summarizes observed SSCM strategies in literature. The framework as shown in figure 3.3 is one of the two main findings from a review of a random number of literature, with the second outcome being the progression and stages of SSCM development over a twenty year period. The framework advocates that clearly identifying SSCM benefits and linking these to sustainability initiatives are pre-requisite steps for organizational SSCM development. It also identifies the importance of government legislations in SSCM adoption.

A critical evaluation of the framework shows that the strategies identified for SSCM development can be applied across industry as these are generic strategies which are not specific to a particular organization. SSCM in today's world requires a clear definition of implementation strategies (Wolf 2011) and this in turn requires a detailed understanding of the current SSCM if any or simply the challenges to the adoption of SSCM (Schwartz, Tapper and Font 2008) especially in organizations that are still striving to attain minimum legislative requirements as a result of adverse economic and political climate required to foster organizational growth (Isehunwa and Falade 2005).

3.2.1.2 Industry/Country Specific SSCM Framework

Literature search shows that some authors have also examined and developed frameworks specifically for certain types of industry. Industry specific SSCM frameworks can be described as frameworks developed for a particular industry based on collected data from that industry and designed to serve as a guideline for the adoption and practice of SSCM.

Schwartz, Tapper and Font (2008) developed a SSCM framework for the tourism industry to be implemented by tour operators for the management and achievement of improved sustainability performance in the supply chain. The tourism industry though still a growing industry with regards to SSCM, is generally known to implement good practice but with opportunities for improvements especially with regards to operator led programmes and activities. Also, whilst focus is often on environmental performance measures, socioeconomic measures are often viewed by industry practitioners as costly, not easy to implement and difficult to assess. Framework development was done in three stages and these covered conceptual development, consulting with stakeholders and pilot implementation which was done in phases. The Deming Cycle which is a "plan-do-review" structure utilised in quality and environmental management systems development and applied through ISO9001 and 14001 standards. The framework was planned, designed and developed with continuous input from industry associations and prominent tour operators via meetings and consultations. Six steps were proposed in the SSCM framework as shown in table 3.4 and this was based on industry policies, objectives, supplier performance evaluation, required actions and measuring progress.

The feasibility of the developed framework was afterward tested via stakeholder consultations which involved holding meetings with tour operators and from the three different EU countries. The implementation of the framework was done in phases and this was influenced by the need for collaborative actions between national associations for tour operators and personnel issues. The SSCM framework clearly provides a roadmap that has evolved from an iterative process that is not restricted to policies and supplier assessment, but rather is influenced by stakeholder input and evaluates the feasibility of the initiative.

Thus, the framework proposes a cycle of continuous improvement towards managing a sustainable supply chain in the tourism industry. That being said, the framework is specifically designed for the tourism industry in the EU and this is evidenced by the adopted policies, EU legislations, organisations, trade associations and industry personnel that contributed to and informed the development of the framework.

Table 3.2 SSCM Framework and Implementation Process for Continual Improvement in the Tourism Industry (Source: Schwartz, Tapper and Font 2008: 305).

Supply chain management framework	*Small tour operators*	*Large and medium tour operators*	
	Implementation	*Initial implementation*	*Full implementation*
Step 1. Engage your business	Appointment of a sustainable tourism representative, create goals, promote dialogue on the issues	Appointment of a sustainable tourism representative and management team, create goals, communicate business benefits to employees, directors and shareholders	Training for the sustainable tourism management team, with this cascaded down
Step 2. Create a policy for SSCM	Written SSCM policy document	Written SSCM policy document	Refined SSCM policy document
Step 3. Integrate your SSCM policy into your business	Identification of how SSCM procedures can be integrated into job roles	Review of job/role specifications, role profiles and working procedures	Investment in a sustainability management system
Step 4. Conduct a baseline assessment of suppliers	Evidence of use of assessment system (including informal systems) for suppliers	Use of formal assessment system (checklists, etc.) for some suppliers/in selected pilot destinations	Use of formal assessment system (checklists, etc.) for all suppliers
Step 5. Prepare and implement an action plan	Evidence of actions to implement the company's SSCM policy (including relevant internal management, staff training and customer communications)	Written action plan with clearly identified priorities for implementation of the company's SSCM policy (including relevant internal management, staff training and customer communications)	Refined action plan with clearly identified priorities for implementation of the company's SSCM policy (including relevant internal management, staff training and customer communications)
Step 6. Monitor and report on progress made	Evidence of monitoring of progress (including use of informal systems and feedback from tour leaders, etc.)	Use of formal monitoring system (checklists, etc.) for some suppliers/in selected pilot destinations	Use of formal monitoring and reporting system (checklists, etc.) for all suppliers, combined with some independent review

Table shows a six-step SSCM framework for continuous improvement in the EU tourism industry. Implementation strategies for small operators in the industry are also identified. Also initial and full implementation strategies required for medium and large tour operators are specified in the framework.

Though the proposed steps can be viewed as generic requirements for SSCM framework, as steps such as creating a SSCM policy, baseline assessment, implementing an action plan and evaluating progress are some of the requirements in developing a SSCM framework as well as evaluating level of adaptation and measuring performance. However, due to industry differences that clearly exists between the tourism industry and the oil industry in terms of supply chain type, type of stakeholders, policies and legislations, a more specific framework that addresses the oil industry's and specifically the downstream sector is required in this respect.

Wolf (2011) qualitatively analysed SSCM integration in the German Manufacturing industry by evaluating four case study manufacturing industry and evaluating important factors that act as barriers or drivers to sustainability integration in the management of their supply chains. The study was aimed at addressing the inter-relationship between an organisation's supply chain and its sustainability strategy (see figure 3.4).

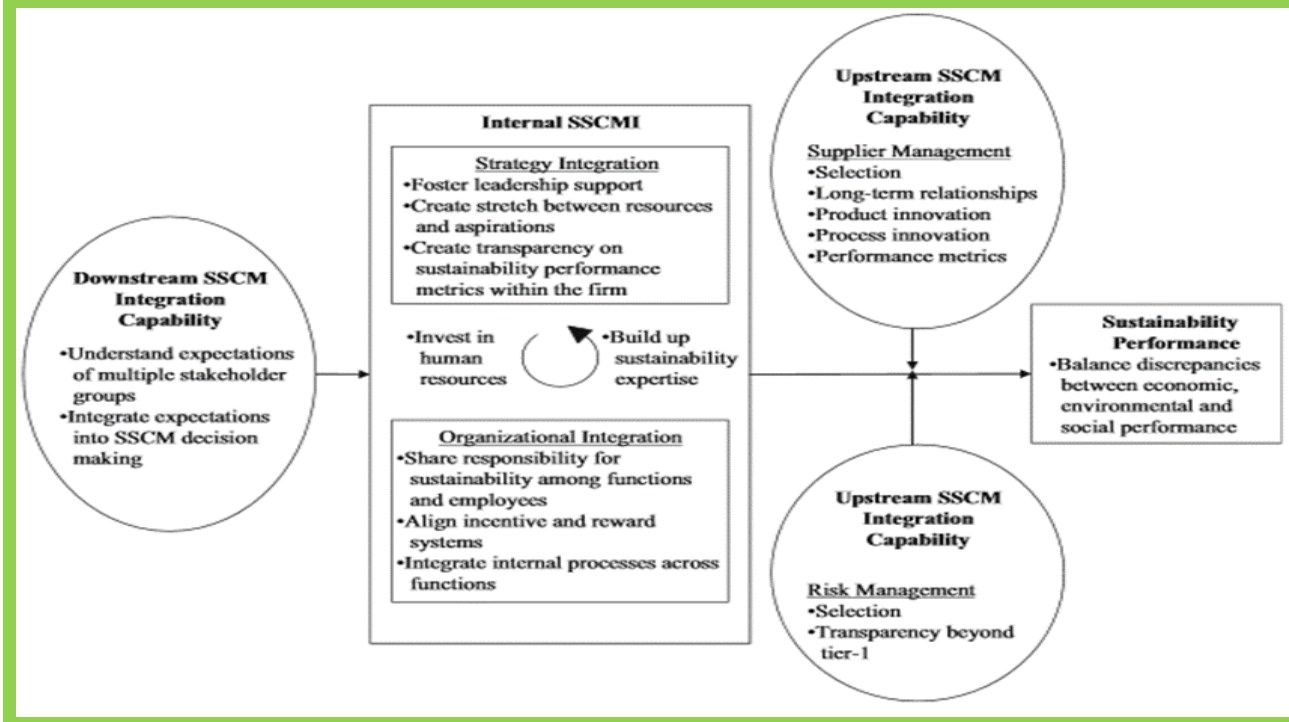


Figure 3.4 A Theoretical SSCM Integration Framework (Source: Wolf 2011: 231)*Framework shows strategies for SSCM integration as proposed by Wolf (2011). The strategies as shown in the framework are required for improved sustainability performance, internal integration of organizational sustainability goals and the management of downstream and upstream sustainable supply chain integration capabilities.*

This relationship extends from and includes the integration of the internal supply chain sustainability strategy of the organization and the external links of the supply chain which encompasses customers and suppliers. The framework was developed from both quantitatively collected primary data and secondary data from the case study companies. The selection criterion for the case study companies was based on two important dimensions which were "sustainability and supply chain integration". Findings from collected data confirms that sustainability integration in the management of supply chains positively impacts the supply chain by assisting organizations in identifying and understanding expectations of their multifarious stakeholders. The framework emphasizes the importance of

stakeholder integration as necessary criterion for SSCM integration. In order to foster internal SSCM integration, the framework advocates support from organizational leadership and a clear definition and merging of sustainability goals and available resources. Some other measures identified in the framework for improved sustainability performance are allocating sustainability responsibilities and functions to departments, inclusion of reward systems and incentives, supplier management, process and product innovation and adopting a sustainability performance measuring system.

3.3 Case Study Countries (UK and Nigeria)

There are over 100 oil producing countries with the United Kingdom ranking 19th on this list. Oil production in these countries span across both state owned and multinational corporations (Smith 2009). The availability of oil resource has adversely improved the economy of some oil rich countries such as Norway and Botswana and ironically has had little or in some cases, negatively impacted the economic development of some countries such as Nigeria and Venezuela (Martin and Subramanian 2003 and Torvik 2009).

The case study countries as identified in the previous chapter are the UK and Nigeria representing a developed and a developing country respectively. This is necessary to identify and evaluate country specific factors influencing the adoption of a sustainable supply chain.

3.3.1 Brief History of the UK (United Kingdom) Oil Industry

The United Kingdom is made up of four countries; England, Northern Ireland, Wales and Scotland. With an estimated population of 65.1million in 2015, the UK population growth rate currently rank highest in the European Union (ONS 2017).

The industrial revolution of the 18th and 19th century remarkably changed the productive capacity of the United Kingdom, America and Europe as a continent (Kreiss 2011). It is general knowledge that the UK pioneered the historic economic shift from the laborious, agrarian and hand-made method of manufacturing to the modern-day advanced machine dependent manufacturing, task specialization and factory dominated industrial economy.

Prior to World War I (1914 to 1918), UK's petroleum needs which was less than 50,000barrels per day (bbls/day) were fulfilled solely via importation. The earliest discovery of hydrocarbon in the UK was in Sussex, in Southern England where gas was discovered in water wells in 1836 and 1875 (UKOOG 2013). With the advent of World War I, oil supply became notably important with the demand for oil doubling between 1916 and 1917.

UK's first oil reservoir was discovered in 1919 at Hardstoft, in Derbyshire. Despite this early discovery, the first commercial discovery of oil and gas in the UK was in 1937 (UKOOG 2013). The largest onshore production of oil in the UK, the Wytch Farm Oilfield in Dorset was discovered in 1973. Offshore oil production in the UK was triggered by the 1959 gas discoveries in the Netherlands which led to the enactment of the UK Continental Shelf Act in 1964.

Despite crude oil refining activity taking place in the UK dating as far back as over 150 years (UKPIA 2016), it was not until the 1950s through to the 1970s that crude oil refining capacity rose to more than 100 million tonnes to satisfy rising UK market demand.

3.3.1.1 UK Downstream Oil Industry SC

Similar to many other countries, the UK oil and gas industry plays an important role in the UK economy (Haque, Green and Keogh 2004). The refining arm alone makes an annual contribution of over two billion pounds and an estimated 24,000 jobs and makes available petroleum product supply in the country (HIS Purvin and Gertz 2013).

There are over two hundred companies participating in the running of the refining, distribution and marketing links of the UK downstream oil industry (UKPIA 2016). These companies constitute oil multinationals involved in crude oil refining, independent retailers and supermarket chains.
The UK petroleum product market is categorised into commercial and retail sectors. The commercial market covers demand from industrial, transport, power generation, independent petroleum product distributors, government, military and public service customers while the retail market covers demand mainly from filling stations (UKPIA 2015).

The UK downstream oil industry as at 2014 was made up of "… seven refineries, thirty-one coastal supply terminals, fourteen inland terminals and a range of other supply assets" (DECC 2014: 5). However now, only six functional refineries remain in the UK even as the country still meets a substantial amount of its demand for petroleum products from crude oil imports (UKPIA 2016). The UK downstream oil supply chain operates alongside the midstream sector. The midstream is made up of companies that refine and import crude oil in order to supply fuel to the UK oil market. The downstream incorporates midstream companies with other companies such as haulage companies; filling stations and storage companies involved in the management and distribution of oil and it products.

The key players and elements involved in crude oil refining, and the transportation and storage of refined products in the UK downstream oil supply chain for gasoline production and availability are in-country (domestic) refineries, import terminals, primary distribution infrastructure, regional distribution terminals, and secondary distribution infrastructure (Deloitte 2012: 17).

Domestic Refineries are in-country refineries where crude oil is refined and converted to various petroleum products for industrial and domestic use. Domestic refineries also engage in crude oil and refined product importation. Import Terminals are often situated in coastal areas and are the first point of call for imported crude and products from outside the UK such as from Europe or other oil rich regions like the Middle East.

Primary Distribution Infrastructures are extensive network of pipelines travelling between domestic refineries and storage terminals. It also consists of rail and sea transport for the conveyance of refined products from UK refineries. Currently, there are about 3000 miles of pipelines in use and this is employed for conveying about 51% of the total volume of products from UK refineries to some fifty major terminals (UKPIA 2015). The remaining 49% is conveyed by sea and rail. Also employed are Secondary Distribution Infrastructures which are large and medium sized tankers that travel by road and employed in conveying petroleum products from regional distribution terminals to smaller secondary depots and retail outlets (UKPIA 2015).

Regional Distribution Terminals are located on land and include some secondary distribution depots. They receive refined products from import terminals and domestic refineries via pipelines, rail and sea transport. These products are delivered into big above-ground tankers to be transported to smaller depots and fuel stations by road based tankers.

The UK downstream oil industry supply chain in the past, that is, in the 60s and 70s can be described as being vertically integrated (Deloitte 2012). There was very little room for outsourcing as many of the supply chain activities was conducted by a singular organisation (Deloitte 2012). Thus, refineries and associated infrastructures for the processing of crude oil to the eventual delivery to end users in this era were in most cases facilitated and owned by particular major oil multinationals.

The UK downstream oil industry supply chain has however for some time been exposed to challenges ranging from oil market volatility and changing product demand. A typical UK refinery was designed to produce a high proportion of gasoline. This trend however seem to be currently detrimental to the

survival of the refining industry in the UK. Reports have shown that the demand for gasoline is increasingly reducing as more and more people now favour diesel powered vehicles and also partly due to innovations in the automobile industry, encouraging improved fuel economy in modern-day gasoline vehicles (Cuthbert et al. 2011). Figure 3.5 shows that the demand for diesel in the UK will increase from 29% in 2010 to 40% in 2030 even as gasoline demand will be halved by 2030. Author however disagrees with the projected increase in diesel demand. The reason being that, despite the decrease in gasoline demand, the projected increase in diesel demand may not be feasible as the UK government is currently pushing for a reduction in the use of diesel fuel even as a means of reducing the country's carbon emission. Thus, from a sustainability perspective and the current trend towards renewable energy, it is unlikely that the projected 40% demand will be actualised in 2030.

However, the current trend in demand, coupled with other factors such as strict legislations and environmental policies has led to reduced competitiveness of some UK refineries and caused the close down of some of the refining facilities in the country.

Between 1980 and now, the UK petroleum industry has witnessed a period of mixed progressive growth (Watson and Vandervell 2008). In 1979, there were 16 operational refineries in the UK, but this number has drastically reduced over time with the most recent refinery shut-down being the Murco Oil refinery in Milford Haven. Currently, there are six operational refineries in the UK and these are; ExxonMobil Refinery in Fawley, Petroineos Refinery in Grangemouth, Phillips 66 Humber refinery in Lincolnshire, Total Lindsey Oil refinery in North Lincolnshire, and the Valero refinery in Pembroke Wales.

Refineries in the UK account for 85% of total domestic petroleum products supply and about 33% of total energy consumed (hazardex 2013).

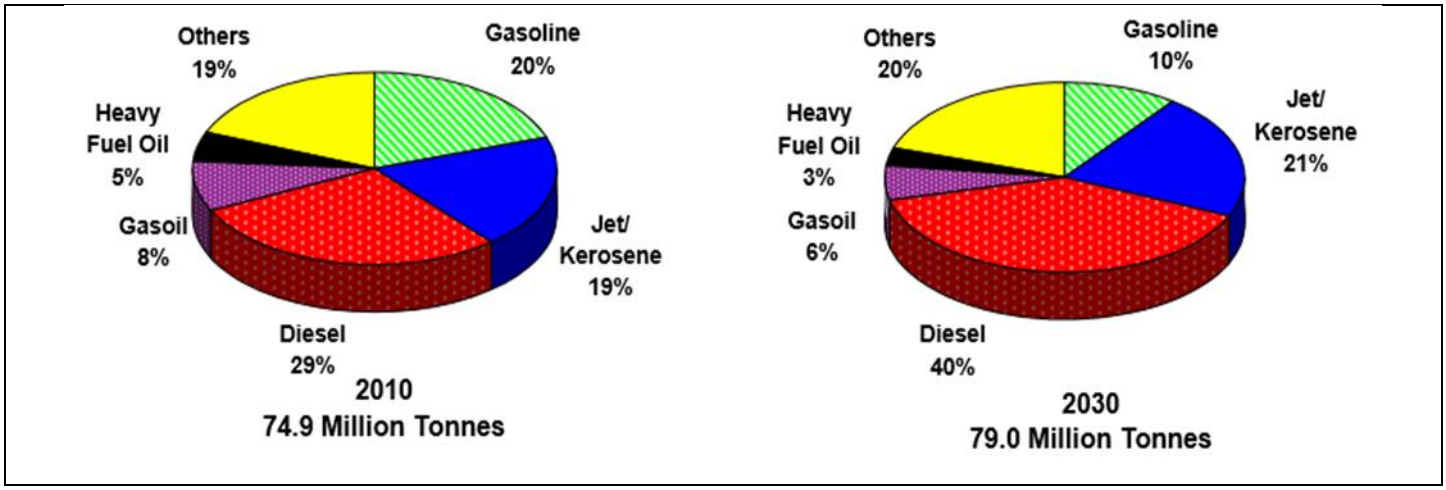
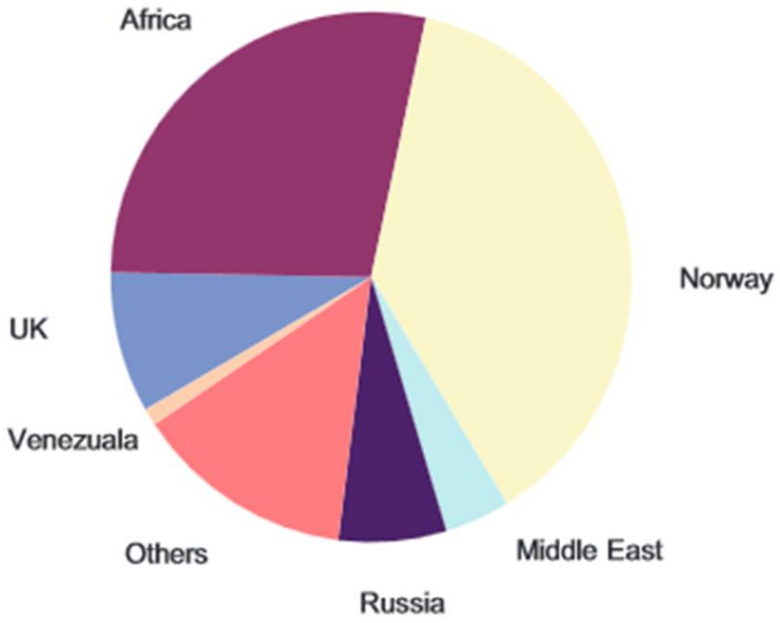


Figure 3.5 UK Product Demand and Product Shares: 2010 and 2030 Projections (Source: Adapted from Cuthbert* et al. *2011)

Figure shows the UK demand for refined products. It depicts the changing market demand with futuristic projections over a twenty year period. By 2030, going by the current trend, demand for gasoline would have been halved while diesel will be of high demand.

3.3.1.2 Refineries in the UK

Refinery construction in the UK witnessed an increased surge after the 2nd World War as the demand for petroleum products increased with the post-war economy-recovery (UKPIA 2015).



Source	UK	Norway	Africa	Middle East	Russia	Venezuela & Others
Produced/Imported	8%	38%	28%	4%	7%	15%

Figure 3.6 Sources of Crude Oil in the UK for the year 2013 (Source: Adapted from UKPIA 2015: 15)

Figure shows the 2013 sources of crude oil in the UK. Domestic production from the UKCS (United Kingdom Continental Shelf) only accounts for 8% of the total crude processed in 2013. Crude from Norway, Africa, and the Middle East account for 38%, 28%, and 4% of imported crude respectively. Total crude oil from the North Sea processed in the UK refinery in 2013 was 46% and this is the sum of the crude sourced from Norway and that produced in the UKCS.

As stated in previous section, refined products from UK refineries are conveyed via pipelines, rail and sea transports to distribution terminals. The southern part of the UK is supplied with petroleum products via pipelines through Fawley and Milford Haven while the northern parts rely on road terminals from the Humber refinery. Scotland is supplied from the Grangemouth refinery and imports from Northern Ireland (UKPIA 2015). Table 3.4 shows UK refineries and their refining capacity.

Table 3.3 2014 UK Crude Oil Refining Capacity (Source: Gov.UK 2014)

				Million tonnes per annum
Number	**Refinery**	**Distillation**	**Reforming**	**Cracking and Conversion**
1	Fawley Exxon	13.1	4.4	5.0
2	Stanlow Essar	9.5	1.5	4.0
3	Pembroke Valero	10.8	1.5	6.3
4	Grangemouth Ineos	10.0	1.8	3.3
5	Killingholme Phillips 66	11.9	2.6	10.7
6	Lindsey Total	10.1	1.4	3.8
Number	**Petrochem Refinery**	**Distillation**	**Reforming**	**Cracking and Conversion**
7	Harwich Petrochem Carless	-	-	-
8	Eastham Refinery	1.2	-	-
Total all refineries		**66.6**	**13.2**	**33.1**

A large part of refined crude oil in the UK is sourced from outside the country as shown in figure 3.6 In 2012, only 61% of demand was met by crude oil extracted and refined in the UK, while the remaining 39% of demand was fulfilled via crude oil imports (DECC 2012). Reports have also shown that in the year 2013 alone, 54% of processed crude oil was obtained from imports. This is a trend that has been ongoing for some time now (UKPIA 2015). Norway is the single largest crude oil exporter to the UK, with Africa following closely with an export volume of about 28% of the total UK import. The reason for UK's dependence on imports can be attributed to the dwindling volume of domestic crude oil supply, a trend that is believed to continue and has been occurring since 1999 (UKPIA 2015).

3.3.1.2.1 Esso Refinery Fawley

Esso Petroleum Company is the UK subsidiary of the global Exxon Mobil Organization. There are seven major production, refining and administrative facilities in the UK and these are found in different locations across the UK. The refining facility is however situated in Fawley, near Southampton and covers about five square miles (UKPIA 2012). This is the largest refinery in the UK (Corporate Watch 2014). Crude oil processing in the Fawley refinery dates as far back as 1921 and has witnessed various expansion over the years (Esso UK 2011).

Figure 3.7 Operating Refineries in the UK (Source: UKPIA 2015: 8)
Figure shows the six operational refineries across the UK in 2015

The Fawley refinery houses three atmospheric units, three vacuum distillation units, a fluid catalytic cracking unit, two sulphur extraction units, a lubricating oil manufacturing complex, five hydofiners, a polymerisation plant, an isomerization unit and a bitumen plant. The refinery is known to process about 270,000 barrels of crude oil per day (ExxonMobil 2014) and supplies about one fifth of the UK refined product demand. Refined products from the refinery include; jet fuel, petrol, diesel, lubricating oil, fuel oil and a variety of chemicals (ExxonMobil 2014). Supply of refined products from the Fawley refinery covers the London, Bristol, Midlands and the Manchester regions. This is made possible as result of its effective network of pipelines as well as well linked road and coastal terminals (Purtz & Gertz 2013).

3.3.1.2.2 Essar Stanlow Manufacturing Complex

A subsidiary of the Essar Energy limited, Essar Oil UK own and operate the Stanlow Manufacturing Complex located south of the Mersey estuary close to Liverpool (Essar Oil 2016). Established as far back as 1924, the Stanlow Manufacturing Complex was initially owned by Shell until 2011. Reputed as one of the biggest in Europe, Stanlow refinery has six main operating units; distillation units, vacuum distillation, fluid catalytic cracker, catalytic reformer, hydrodesulphurization units and LPG (Liquefied Petroleum Gas) Processing Units, and processes about 9 million Tonnes of crude oil yearly

(Essar UK 2016). Refined product output from the Stanlow Complex are petrol, diesel, kerosene, fuel oil LPG and petrochemical feedstocks. The refinery is also has an above average capacity for producing the much demanded diesel and jet fuel compared to its other counterparts.

The sourcing for crude oil and refined product distribution to both domestic and international markets is handled by a commercial arm of the company called the International Supply and Trading (IST). Crude oil is sourced from across the globe and this include the North Sea, North America, the Mediterranean and the western part of Africa. The refinery has excellent crude oil and refined product transportation links through a network of pipelines, road and port (Essar Energy 2016). Crude oil is received into the complex through a 15 mile pipeline from the Tranmere terminal situated close to the Mersey. The crude is afterward transported via pipelines to the storage (UKPIA 2012). A large proportion of refined products are transported mainly through a pipeline and road transport system and the rest over water through the Manchester Ship Canal (Essar UK 2016).

3.3.1.2.3 Petroineos Grangemouth Refinery

Initially owned by BP, the refinery was acquired by the Ineos group in 2005 (UKPIA 2012) and became in Petroineos refinery. Located in Grangemouth, Scotland, the Petroineos Grangemouth refinery stands as the only crude oil refinery in Scotland. The refinery supplies a large proportion of refined products used in Scotland, Northern Ireland and in North West England (Fuel Oil News 2016). This it does via its terminal distribution.

With a production figure of over 9 million litres of refined clean fuel daily and one million tonnes of chemical product annually, the refinery ranks as UK's 2nd largest refinery and one of the largest chemical companies across the globe (INEOS 2015). The Petroineos Grangemouth refinery was the first refinery to offer Ultra Low Sulphur Diesel (ULSD) and Ultra Low Sulphur Petrol (ULSP). Product range from the refinery include; petrol, diesel, kerosene/jet fuel, gas oil, fuel oil, LPG/Petrochemical feedstocks and fuel gas.

With over 4,000 kilometres of laid pipelines and the North Sea crude oil supply pipelines ending at the refinery, the pipeline system is utilized in transporting excess crude oil to tankers at the Froth loading terminal (INEOS 2016 and UKPIA 2012).

3.3.1.2.4 Phillips 66 Humber Refinery

Initially owned by ConocoPhillips, ownership of the refinery was transferred to Phillips 66 in 2012 (Fuel Oil News 2016). The refinery covers a 480 acre stretch in South Killingholme, North Lincolnshire, and ranks as one of UK's most complex refinery (Phillips 66 UK 2016). Established in 1969 with an initial processing capacity of 80,000 barrels per day (Fuel Oil News 2016), the refinery over the years has increased its daily and annual refining capacity 221,000 barrels per day and 11.5 million tonnes per year respectively (Phillips 66 UK 2016 and UKPIA 2012).

With a Nelson Index of 11.7, indicating high complexity, the refinery is reputed for upgrade and conversion processing facilities and capabilities (Fuel Oil News 2016). The refinery has facilities for high quality carbon coke production from heavy oil residues (UKPIA 2012) and is currently the only coking refinery in the UK as well as a leading anode coke producer and specialty graphite coke producer in Europe and across the globe respectively (Phillips 66 UK 2016). These are useful raw materials for aluminium and steel smelting processes (Fuel Oil News 2016).

Crude oil from the North Sea is transported to the refinery via marine tankers to the Tetney monobuoy at the Humber Estuary. It is afterward transferred through pipelines to the Tetney oil terminal from where it is piped to the refinery for processing (Phillips 66 UK 2016). Apart from carbon coke produced in the refinery, other products from the refinery include; petrol, diesel, kerosene/jet fuel, LPG, heating oil, and other industrial feedstocks (UKPIA 2012 and Phillips 66 UK 2016).

3.3.1.2.5 Total Lindsey Oil Refinery

Also located in North Lincolnshire at close proximity to the South Bank of the Humber Estuary, the Total Lindsey refinery was commissioned in 1968 with an annual processing capacity of 3.5 million tonnes (UKPIA 2012). Owned by Total, the refinery is the UK's 3rd largest and in recent years has been known to process about 11 million tonnes of crude oil per year. The Lindsey refinery covers a 500 acre stretch and comprises of distillation unit, vacuum distillation, thermal cracker, MTBE (Methyl Tertiary Butyl Ether) unit, fluid catalytic cracker, desulphurization unit, alkylation unit, gas recovery unit, visbreaker, isomerisation unit and polypropylene splitter (Hydrocarbons Technology 2016).

A major proportion of crude oil processed in the Lindsey refinery is sourced from the North Sea and this crude oil is transported from berths at the Immingham port to the refinery via pipelines (Hydrocarbons Technology 2016). The refinery is known to process over twenty crude types with a daily capacity of 220,000 barrels (Total 2015). Refined product output from the refinery include;

diesel, petrol, LPG, specialty products, fuel oil, bitumen, kerosene and jet fuel. The refinery also has an output capacity of 35 different finished product types (Hydrocarbons Technology 2016). With storage facilities across the UK, refined output from the refinery is transported via road, rail, pipelines and sea (UKPIA 2012).

3.3.1.2.6 Valero Pembroke Refinery

Initially owned by Chevron, the Valero Pembroke refinery was acquired by Valero Energy Ltd in August 2011. Located on the Pembroke coast in south west Wales, the refinery stand as one of Europe's largest refiner in north-western Europe (Texaco 2016). The Valero group own and operate four major pipelines and six terminals in the UK (Texaco 2016). The Pembroke refinery is connected to the midland part of the UK as well as Manchester via one of the company owned pipelines (Fuel Oil News 2013 and UKPIA 2012). The refinery also makes use of third party terminals for supplying refined products (Texaco 2016). Other means of refined product distribution are by road and sea with 90% of refined products transported by sea (UKPIA 2012).

With six main operating units which includes; a distillation unit, vacuum distillation unit, fluid catalytic cracker, catalytic reformer, hydro-desulphurisation unit and gas recovery unit (UKPIA 2012) and with a complexity index of 9.2, the Pembroke refinery is reputed as one of Europe's largest and complex refineries (Texaco 2016). The refinery has a crude oil processing capacity of 10.5 million tonnes per year and the product output include; petrol, diesel, fuel oil, LPG, petrochemical feedstocks, kerosene and jet fuel (UKPIA 2012).

3.3.1.3 Factors Influencing Refinery Profitability/Competitiveness in the UK

Downstream oil companies seeking to remain competitive have to devise strategic means of meeting market demand for refined products. Depending on market demand, some oil firms construct or make idle refineries, expand or decrease capacity of already existing refineries or simply import or export refined products (CRS 2014).

Competitiveness can be defined as the "ability of a firm or a nation to offer products and services that meet the quality standards of the local and world markets at prices that are competitive and provide adequate returns on the resources employed or consumed in producing them" (Business Dictionary 2016). From this foregoing, distinctive features that make a firm operate competitively, include the ability to provide high quality services or products as the case maybe at competitive market prices with a follow-up returns on investment committed into the business venture. Refinery competitiveness

therefore captures not just the ability of refineries to produce high standard quality products whilst ensuring that industry guidelines and regulations are adhered to, but also encapsulates the ability of such refineries to adequate returns on investment and remaining competitive.

Table 3.4 Classification Scheme for Refineries (Source: ICCT 2011:13)

Configuration	Complexity	
	Ranking	Range
Topping	Low	< 2
Hydroskimming	Moderate	2 -- 6
Conversion	High	6 -- 12
Deep Conversion	Very high	> 12

Table shows the four types of refinery configuration. Refinery complexity is ranked based on the configuration of the refinery. Topping refineries are refineries with the simplest form of configuration. They have only crude distillation processing units and basic support facilities and thus only separate the crude oil into basic product fractions such as; gasoline, diesel, naphtha, jet fuel, heating oil, residual oil and kerosene).

In UK and Europe in general, the refining industry is not competing profitably across the globe (Murano 2015). The reasons for this can be traced to increasing energy costs, global shift in demand patterns, severe regulatory burdens and excess global capacity (Beddoes 2014). As stated earlier, UK refineries has over the years been experiencing some set-backs and these has impacted the profitability of many of the refineries (UKPIA 2012). These set-backs can be attributed to factors listed in the previous section. A brief overview of these factors are discussed below;

3.3.1.4 Refinery Configuration

Refinery configuration is an important factor in determining how competitive a refinery is and is influenced by the refinery location, crude oil type being processed, market quality expectations and market demand for refined products (Cuthbert *et al*. 2011 and ICCT 2011). Refinery configuration is defined as "… the specific set of refining process units in a given refinery, the size (throughput capacity) of the various units, their salient technical characteristics, and the flow patterns that connect these units" (ICCT 2011: 13). Refinery configuration examines the size and type of processing units existent in the refinery.

Refineries are classified based on available processing units and processes employed in crude oil conversion to refined products and other useful feedstocks (Energy Institute 2016). Refineries differ in configuration, but comparable refineries are often grouped together based on their complexity. A refinery's complexity is a factor of how much secondary conversion it is capable of and is adopted as

an indication of the upgrading capability of a refinery (Kemp 2015). In order to adopt this measurement index, the capacity and complexity of every processing unit in the refinery is obtained. The complexity of an oil refinery is calculated as the "… sum of the product of each unit capacity and complexity factor divided by the crude distillation unit" (Cuthbert *et.al* 2011: 133).

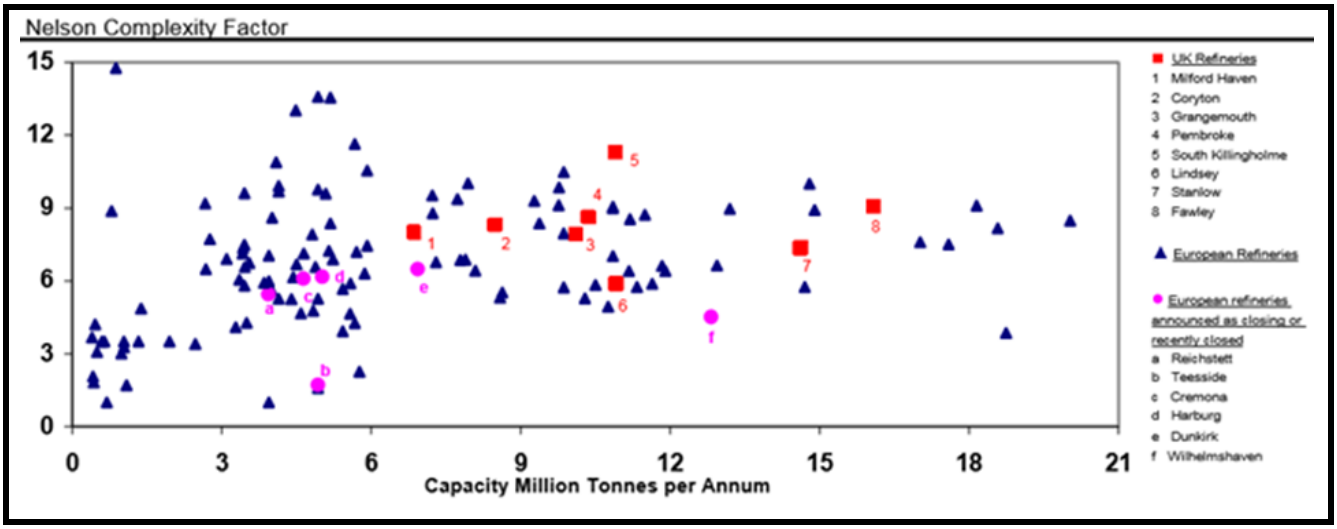


Figure 3.8 Nelson Complexity Factor of Refineries in UK and Europe in 2010 (Source: Cuthbert et al. 2011: 134).
The figure shows the plot of capacity versus Nelson complexity factor of UK and European refineries in 2011. On the average, it can be observed that UK refineries have a high complexity index than many of refineries in Europe. Currently, there are only six functional refineries in the UK as the Milford haven and the Coryton refineries have been closed down.

Table 3.5 Nelson Complexity Index for UK Refineries (Source: Abstracted from Kemp 2015)

UK Refinery	Petroineos Garangemouth	Valero Pembroke	Phillips 66 Humber	Total Lindsey	Essar Stanlow	Esso Fawley
Nelson Complexity Index	8	9	12	6	10	12

The higher the Nelson complexity index, the more complex the refinery is, and thus the higher the profitability of such refineries. Complex refineries have a higher profitability as they produce a higher fraction of valuable lighter products and hence higher competitiveness compared to refineries with lower complexity index (UKPIA 2013). Also, the type of complexity a refinery has in relation to what fraction of middle distillate is produced is important (UKPIA 2013). This is because refineries that have hydrocracking and coking facilities for producing a higher fraction of middle distillates are expected to have higher profitability margins and competitiveness compared to cat-cracking refineries only.

Across Europe, refineries in the UK have a high refinery index compared to some of their European counterparts. Figure 3.8 shows the complexity factor for UK refineries in 2010. Nelson complexity index for the six functional refineries in the UK as depicted in Table 3.5 above show Essar Stanlow

and Phillips 66 Humber refineries with a complexity index of 12, thus ranking as the highest in the UK.

3.3.1.5 Refinery Size

The size of a refinery has a huge influence on its competitiveness. This is because refineries are influenced by economy of scale, hence placing higher capacity refineries in a better cost competitive position compared to lower capacity refineries (Cuthbert *et al.* 2011, Purtz & Gertz 2013). Both large and small refineries have similar operating costs that cover refinery maintenance, manpower and salary costs. As would be expected, a larger refinery will process much more barrels of crude than a smaller one at a lower cost as a result of the throughput, whilst the operating cost per barrel of crude remains the same.

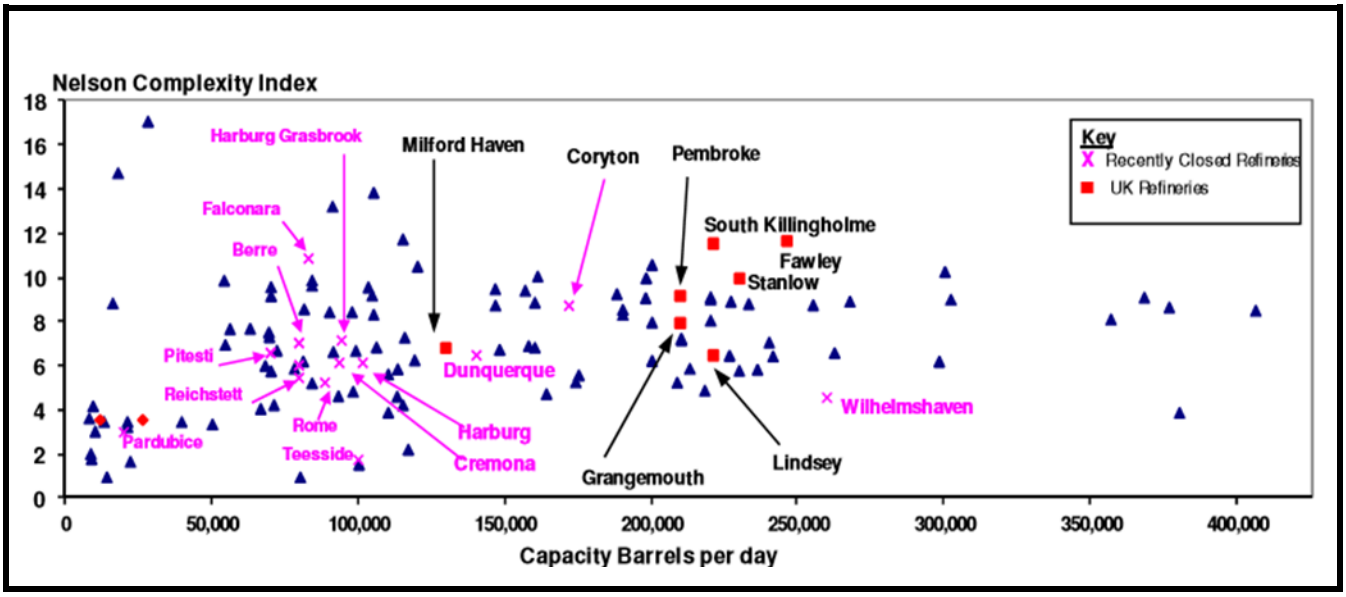


Figure 3.9 Complexity and Capacity of UK and other European Refineries in 2012 (Source: Purtz & Gertz 2013: 112)
The figure shows the capacity of UK refineries alongside some other European refineries in 2012. On the average, it can be observed that UK refineries have a high capacity than many of refineries in Europe. Currently, there are only six functional refineries in the UK as the Milford haven and the Coryton refineries have been closed down.

Compared to its European counterparts with an average refinery size of 144,000 barrels per day, the average size of UK refineries is put at a value of 175,000 barrels per day (Purtz & Gertz 2013). Hence on average, UK refineries are much bigger than the European average (see figure 3.9).

As can be observed in Figure 3.9, many of the closed down refineries across Europe and particularly in the UK are relatively small refineries with the exception of the Coryton refinery. The reason for the close down of the Coryton refinery has been attributed to financial problems in the parent company (Petroplus) and hence its closure cannot be blamed on the refiner's capacity which until its closure remained competitive (Pertz ancd Gert5z 2013). The same cannot however be said for the recent

close down of the Murco Petroleum owned Milford Haven refinery which had a daily capacity less down 150,000 barrels. Apart from being UK's smallest refinery and incapability of dealing with falling product demand in the UK market, the refinery was also incapable of competing favourably in the ever increasing competitive downstream market (Hazardex 2014).

3.3.1.6 Refinery Age

Despite the rising global demand for refined products, many countries tend to add refining capacity to meet demand (Janssens and Fitzgibbon 2015). With only one refinery built in Europe from the scratch in the last 25 years, many refineries across the UK are far from being new, but have over the years been expanded with new units and processing capacity added on as required (Cuthbert *et al*. 2011). This allows many oil companies the flexibility required in meeting changing demand requirements whilst still strategically positioning themselves for long term growth (CRS 2014).

The combination of various refinery units built at different times and varying sizes to make a wholesome refining capacity has its disadvantages. Though this adds on new capacity and gives more refining choices and products depending on the market demand, it is also however more expensive to operate as its operating cost is often higher than a newly built refinery with equal capacity (Cuthbert *et al*. 2011 and RatingsDirect 2014). Such refineries are also prone to develop operational faults due to the not so simple interactions between the various add-on units and thus requiring frequent maintenance than a similar sized new refinery. This introduces additional cost which may not be necessary for new refineries. Saying this, the construction of a new refinery from the scratch is usually capital intensive and is also often prone to risk and uncertainties surrounding demand and refining margin volatility due to fluctuating crude oil prices (RatingsDirect 2014).

3.3.1.7 Refinery Logistics

A refinery's access to crude oil, petroleum product market and a prevailing product market structure are also important determining factors in ascertaining the competitiveness and profitability of the refinery (Cuthbert *et al*. 2011). Refineries that benefit from close proximity to crude oil supply and end users tend to have the advantage of lower transportation and "*all-in feedstock"* costs (RatingsDirect 2014). Ideally, refineries requiring long distance crude oil supply for example from the Middle East to Europe, should be located along coastal areas so as to receive their supply via sea or ports in order to minimise freight cost as well as allow flexibility in sourcing for relatively low-cost crude oil. In the UK, a refinery like the Grangemouth refinery in Scotland, situated along the coast tend to receive crude oil supply from the North Sea via the Forties Pipeline network. This enjoyed benefit may however be short-lived with the reported dwindling of the North Sea oil (Energy Security

2004 and World Oil 2016). Logistic cost for crude oil transport by road and rail is also expensive as it cannot transport large volumes as is the case in the sea and pipeline transport. Transporting via road or rail may be inevitable especially when the crude oil supply is remotely located (Cuthbert *et al*. 2011).

Also oil companies that own and manage their own proprietary refined product pipeline tend to benefit from the added flexibility of supplying products to the market with the highest returns (RatingsDirect 2014). For example, the Pembroke refinery distributes over 90% of refined products by sea and the rest via road and company owned pipeline network (UKPIA 2012).

The prevailing refined product market structure is also a crucial factor in ensuring refinery profitability. Refineries situated close to high demand market will benefit from its proximity and reduced transportation costs. Thus standing in a better position to compete with refineries that have to factor in freight costs and other logistic related costs. However, closeness to the market may also be a disadvantage if the demand is low and the market is over supplied. This results in the increased need to export excess refined products or better still source for other demand markets, which may not be situated close by, thus, introducing additional freight and logistic costs. Therefore, influencing the refinery's ability to compete favourably.

3.3.2 Brief History of the Nigerian Oil Industry

Seated in Western Africa, the country has a population of over 140 million people (Idigbe and Bello 2013) and ranks 7th in the most populous country across the globe and 1st in Africa. Nigeria comprises 36 states and the country has been described as a sleeping giant by many authors. The reason for this description can be attributed to the volume of oil and gas wealth the country is known to possess, but yet, the nation still lingers in poverty and is categorised as a developing country.

Oil was discovered in the Niger Delta region of the country, Oloibiri precisely in 1956 by Shell-BP (Odularu 2007). The country afterward became an oil producing country after its first oil field began oil production in 1958. Nigeria ranks as a top global oil and gas exporter and ranks at the 6th position in 2015 for crude oil export and accounting for 4.8% of global export (WTEx 2016). This is due to the commercial volume of oil the country is known to possess and export to other parts of the world in need of the black gold (see figure 3.10). Nigeria derives over 90% of its foreign exchange earnings and well over 60% of the government's income from the importation and sale of crude oil

(Akpoghomeh and Badejo 2006). Thus, the country is largely dependent on revenue accrued from the upstream sector of the oil industry.

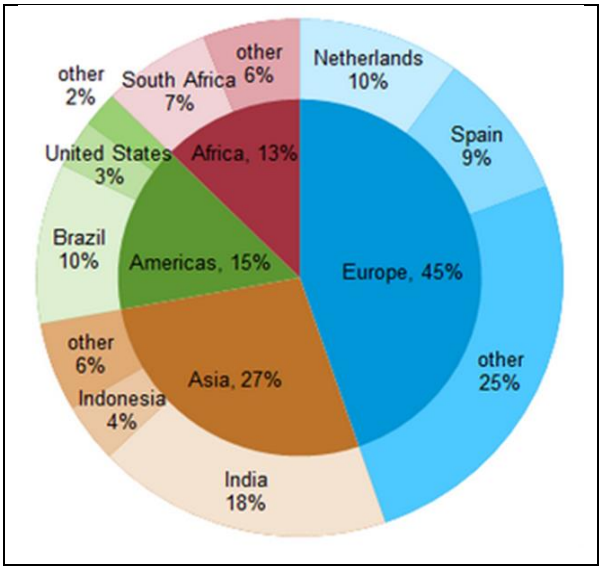


Figure 3.10 Nigerian Crude Oil and Condensate Export by Destination
Figure shows the 2014 petroleum export in Nigeria to various destinations across the globe.

The downstream oil sector on the other hand accounts for as much as 20% of the country's GDP (Gross Domestic Product) and thus impacts considerably on the economy of the country (Akpoghomeh and Badejo 2006).

Most of Nigeria's oil and gas resources are situated in the Niger Delta province of the country. The Niger Delta is located in the south-south geopolitical zone. The area is estimated to possess about 28.2 billion barrels of crude oil reserve and natural gas reserve aggregate of 165trillion standard cubic feet (Nigerian National Petroleum Corporation 2010). It holds 2.9% of total global oil reserve (Petroleum Insights 2012).

3.3.2.1 Nigerian Downstream Oil Industry Supply Chain

The Nigerian downstream supply chain is characterised by five refineries (four state owned and one owned by an indigenous private oil company to meet its domestic energy needs), a network of transportation systems and the distribution and marketing of products to consumers (DPR 2014). The Niger Delta Petroleum Resources (NDPR) refinery is a private refining company with a 1000 barrels/day capacity and a daily production of 120,000litres of diesel which is consumed internally and the surplus added to the national supply (DPR 2014 and Lawal 2014). The NNPC own and operate the Warri Refinery and Petrochemical Company (WRPC), Kaduna Refinery and Petrochemical Company (KRPC) and 2 refineries in the Port-Harcourt area of the country; Port-Harcourt Refinery and Petrochemical Company (PHRC).

Established in 1977, the NNPC is a state-owned oil corporation that manages and controls the downstream operations in addition to the upstream activities in the Nigerian oil industry (see figure 3.11). It is made up of eleven subsidiaries, which are the; Nigerian Petroleum Development Company (NPDC), Nigerian Gas Company (NGC), Products and Pipelines Marketing Company (PPMC), Integrated Data Services Limited (IDSL), National Engineering and Technical Company (NETCO), WRPC, PHRC, Duke Oil, NNPC Retail, Hydrocarbon Services Nigeria Limited (HYSON) and KRPC. These subsidiary companies cover the entire catalogue of activities and cooperation within and outside the Nigerian oil industry, ranging from "… exploration, production, refining, distribution/marketing, gas development, petrochemicals, engineering and commercial investments" operations (NNPC 2010).

NNPC business units that oversee downstream operations are specifically; the four refineries and the PPMC. The total combined capacity of all these 4 refineries is estimated at 445,000barrel of crude oil per day. In recent years, this capacity has been far from being achievable by these refineries as a result of uprising operational problems and management issues that have defined the downstream sector of the Nigerian oil industry. A table compiled by Lawal (2014) showing the performance trend in all state-owned refineries in Nigeria (see Table 3.6), evidenced an aggregate mean of 20.50% of refining performance in the country. According to Ehinomen and Adeleke (2012), the production capacity of all four refineries is often in the margin of approximately 61% of the total refined product demand in the country. Thus, the country's deficit in refined product demand for domestic consumption (see figure 3.7) is met through importation (Akpoghomeh and Badejo 2006) and the cost of some of these products especially domestic-use products are subsidized by the government of Nigeria.

Prior to 1986, there was hardly any importation of refined petroleum products as the local refineries were able to meet the domestic consumption demand for petroleum product. Then, the refineries were functioning efficiently and also enjoyed regular maintenance (Akpogomeh and Badejo 2006).

Table 3.6 Production Performance in State-Owned Nigerian Refineries (Source: Lawal 2014)

Annual Refinery Production (%) of Installed Capacity				
Year	PHRC	WPRC	KPRC	Combined
	Operating capacity %	Operating capacity %	Operating capacity %	Operating capacity %
2001	60.73	48.29	31.39	25.10
2002	52.17	55.53	34.95	35.67
2003	41.88	14.27	15.96	18.03
2004	31.04	9.10	26	16.54
2005	42.18	54.85	33.08	32.53
2006	50.26	3.85	8.34	15.61
2007	24.87	0.00	0.00	6.22
2008	17.84	38.52	19.56	18.98
2009	9.08	43.01	20.02	18.03
2010	9.17	43.36	20.46	18.25
Mean over the period				20.50

However, importation of refined products to meet domestic consumption in Nigeria began to rise and started becoming a part of the industry in 1990 as production capacity in the domestic refineries began to drop leading to an increasing dependence on imported refined products, especially gasoline and DPK (Dual Purpose Kerosene) to meet the growing national demand.

This continuing trend has been blamed on the poor state of the Nigerian refineries which despite past turn-around maintenance has failed to adequately recover to its previous optimum operational state (Adenikinju and Falobi 2006). This fact was further buttressed by the Nigerian minister of petroleum resources; Dr Ibe Kachikwu, who stated that the current importation of gasoline is economically cheaper and will continue to be so, than producing it in the country's local refineries until "… the upgrade and total refurbishment of the refineries are concluded, as well as ensuring that the pipelines are fixed" (Vanguard 2016).

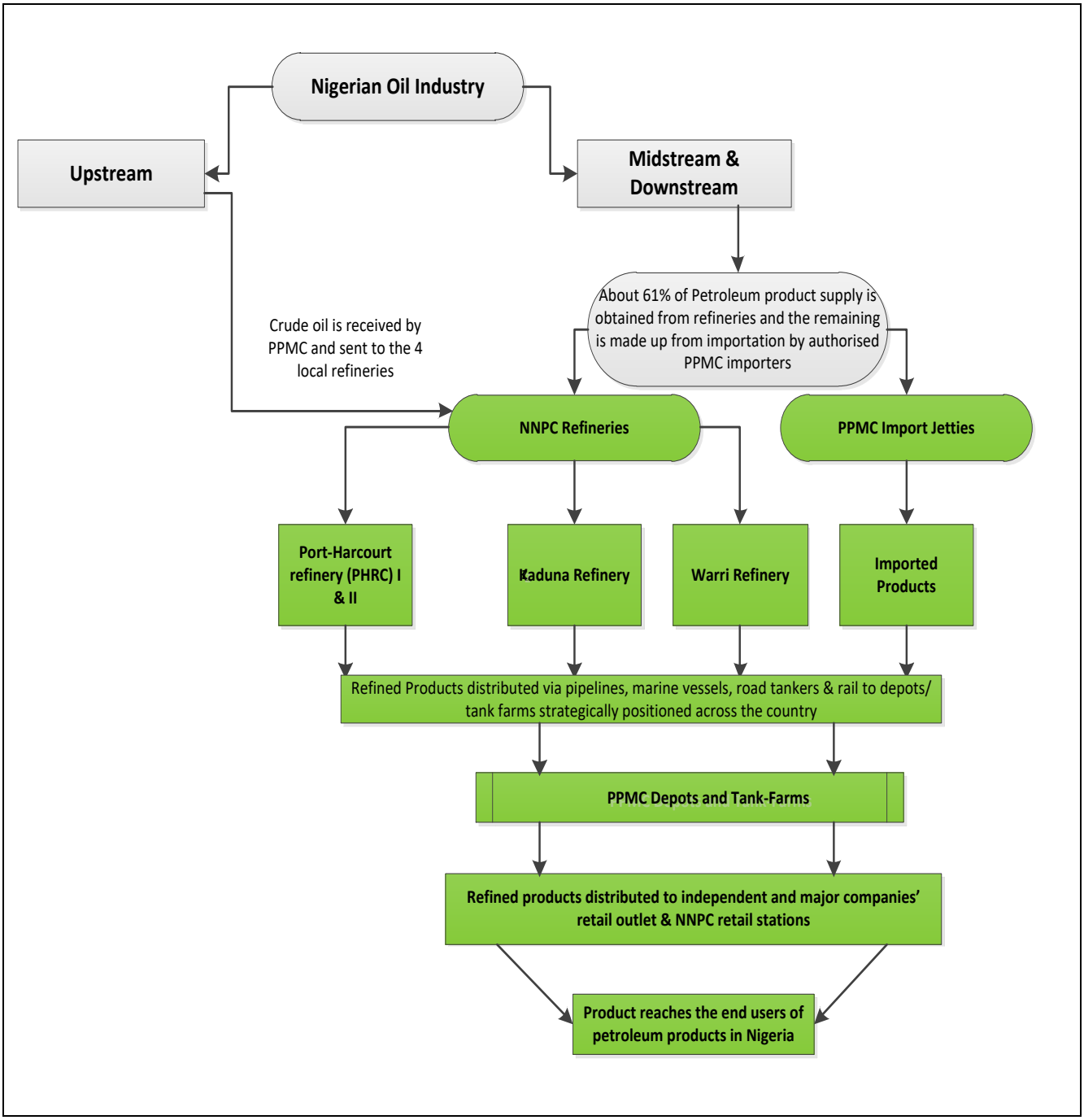


Figure 3.11 Physical flow of products within the Midstream and Downstream Nigerian Oil Industry (Source: Ehinomen and Adeleke 2012 and Ambituuni, Amezaga and Emeseh 2014).

The figure depicts the flow of oil and oil products from the upstream and within the downstream sector. As can be seen, petroleum product demand in Nigeria is met by the combined quantities of locally refined and imported products.

3.3.2.1 Refineries in Nigeria

Prior to 1979, the only refinery in the country was that jointly owned by the Nigerian government, British Petroleum (BP) and Shell Petroleum. This was the Port-Harcourt old process refinery managed by BP.

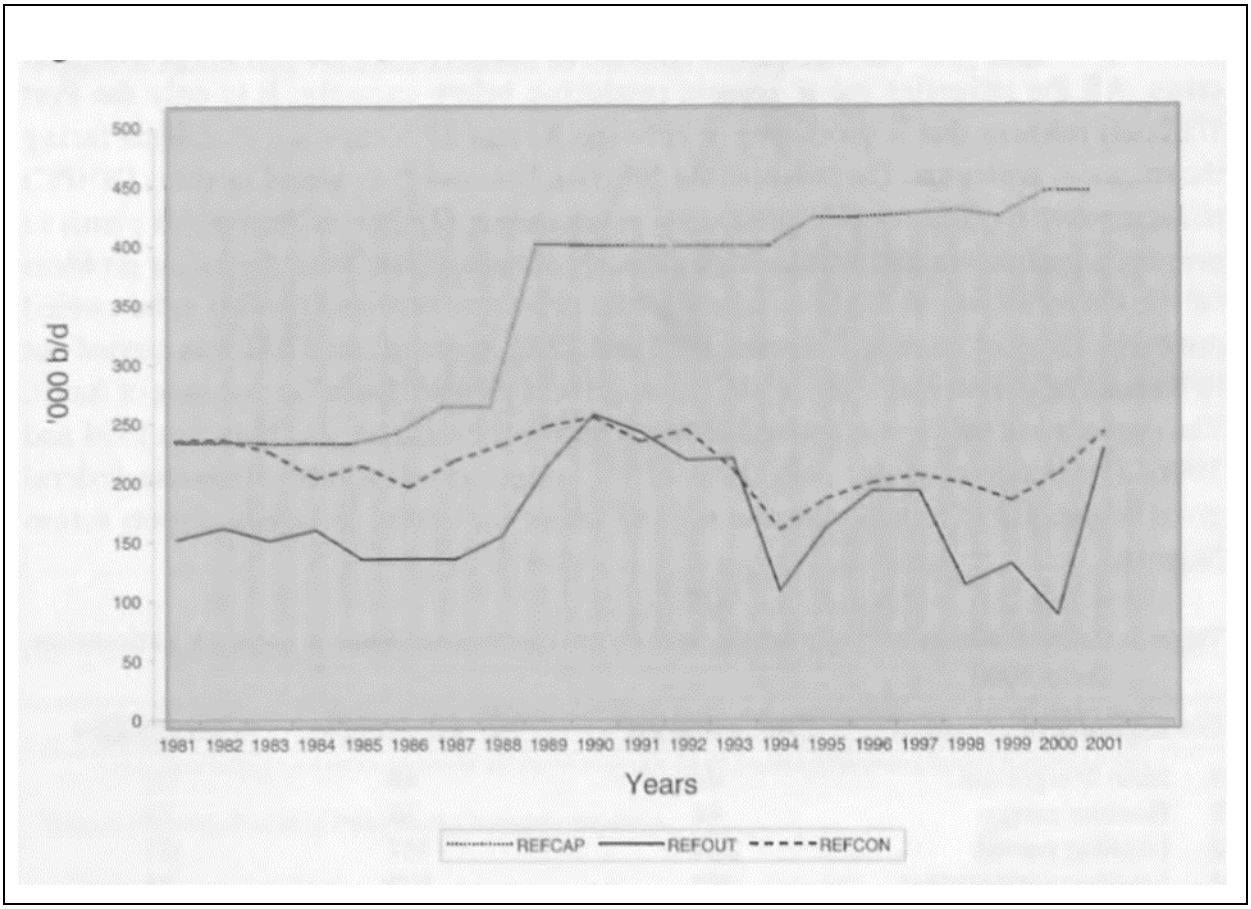


Figure 3.12 Refinery Output, Capacity and Consumption in the Nigerian Downstream Oil Supply Chain for the Period 1981 to 2001 (Source: Adenikinju and Falobi 2006: 7)

Figure shows a 20 year trend in refinery capacity, output and consumption in the Nigerian downstream oil industry. Over the 20 year period, refinery output peaked between 1989 and 1990 and during this period was sufficient to meet the refined product demand. Apart from this period within the 20 year study, there has been an unstable match in consumption and output with refinery output being majorly below refinery consumption despite the relatively stable refinery capacity over the study period.

The introduction of uniform pricing of refined products by the Nigerian government in 1973 was accompanied by the takeover of the downstream sector of the oil industry by the government. The sector afterward witnessed the establishment of two new refineries in 1980 and another refinery in 1989. This boosted the country's combined refinery capacity to 445,000bpd to meet the growing demand market. Over the years, this processing capacity has however been erratic and insufficient to meet refined product consumption in the country (Akpogomeh and Badejo 2006 and Isa *et al*. 2013).

About 300,000bpd (barrels per day) of crude oil is allotted to the NNPC by the Nigerian government (Adenikinju and Falobi 2006). This quantity is earmarked to satisfy the domestic demand for refined products. Some of this is processed in the four refineries (figure 3.13 shows the average capacity performance of the four refineries in 2014) while the rest is sold by the NNPC at the international market in exchange for imported refined products to meet up with local demand (Adenikinju and

Falobi 2006). In 2013, the total average of the production capacity of all 4 refineries went up by 1% from 21% recorded in the previous year (NNPC 2013).

Past reports have shown that, PMS (Premium Motor Spirit) also known as gasoline, HHK (Household Kerosene), AGO (Automotive Gas Oil) are the three refined products with the highest demand in the country. In April 2014, the demand for PMS, HHK and AGO was 77.69%, 9.75% and 6.58% respectively of the total average daily sales for refined products (NNPC 2014).

3.3.2.1.1 Warri Refinery (WRPC – Warri Refining and Petrochemical Company Limited)

The Warri refinery is situated in the Ubeji area of Delta state and occupies a land mass of approximately 11,040km^2 (Omoniyi and Oluwadare 2013). Delta state is a prominent oil producing state in the Niger Delta region of Nigeria. The state is home to a population of 4,098,291 people who are mainly fishermen, farmers.

The Warri refinery is the second oldest refinery in Nigeria (Akpoghomeh and Badejo 2006). The refinery which began operation in 1978 doubles up as a refinery and a petrochemical plant. Thus, it is responsible for the processing of crude oil into petroleum products as well as upgrades some of the produced petroleum products to make carbon black and polypropylene pellets (NNPC 2010). Products from the refinery include; LPG (Liquefied Petroleum Gas), PMS (Premium Motor Spirit), Kerosene (aviation fuel and for domestic cooking), AGO (Automotive Gas Oil), and Fuel Oil. Processes that involve the distillation of crude oil into intermediate products and finished products is classified as primary processes while, processes that involve the use of catalysts in the conversion of intermediate products to high grade finished and petrochemical products (WRPC 2014).

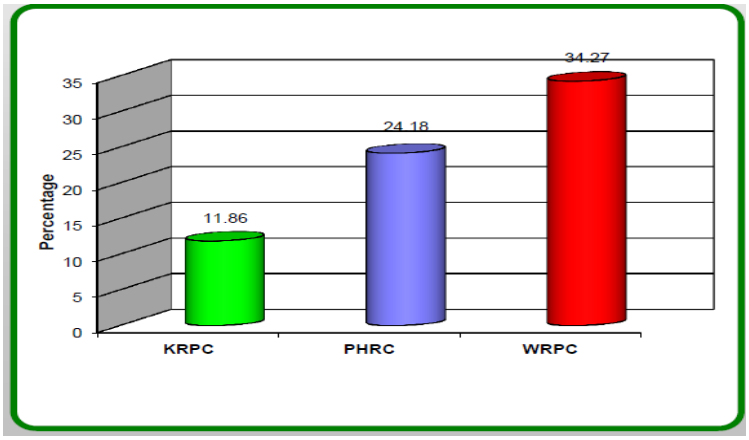


Figure 3.13 Refinery & Capacity Utilization for the Period April 2014 (Source: NNPC 2014)
Figure shows the average capacity performance of KRPC (11.86%), PHRC (24.18%) and WRPC (34.27%) in April 2014. These figures emphasize the under-utilization of the refinery capacity and thus, the need for imported refined products to make up for the deficit in demand.

3.3.2.1.2 Kaduna Refinery (KRPC – Kaduna Refining and Petrochemical Company Limited)

The Kaduna refinery is located in Kaduna state, situated in the central northern part of Nigeria. The refinery is situated in the Chikun LGA area and occupies a land mass of 2.89km^2 (Bako, Chukwunonso and Adamu 2007). The refinery was the 3rd built refinery in Nigeria (NNPC 2010).

The Kaduna refinery was previously designed as a 'hydro skimming' refinery with a 60,000barrels of crude per day capacity. The refinery design and construction emanated from a desperate need to meet domestic demand for petroleum products. A hydro skimming refinery is a simple refinery designed to produce fixed product yields based on the crude specification by performing distillation, reforming and desulphurization operations (Al Zarooni and Elshorbagy 2006). The refinery however now has a production capacity of 110,000 barrels of crude per day after undergoing an upgrade (NNPC 2010). Production facilities in the refinery consist of a fuels plant which processes 60,000BPSD (Barrels per Stream Day) of domestic crude oil and a lubes plant which processes 50,000BPSD of imported paraffin-base crude oil (KRPC 2006). The fuels plant produces PMS, kerosene, AGO, gas oils and sulphur flakes. The lubes plant comprises of 8 processing units and its product streams are basically waxes, asphalt (bitumen) and base oils (NNPC 2010 and KRPC 2006).

3.3.2.1.3 Port-Harcourt Refinery (PHRC – Port-Harcourt Refining Company Limited)

Port-Harcourt doubles as the commercial hub and the capital of Rivers State in Nigeria. There are two refineries in Port-Harcourt with a combined capacity of 210,000BPSD. The most recent refinery was commissioned in 1989 with a nameplate capacity of 150,000BPSD and the old refinery was established in 1965 with a capacity of 60,000BPSD (NNPC 2010). The city of Port-Harcourt is situated in Rivers state, which is located in the Niger Delta area of Nigeria. Thus, the Niger Delta region is home to 3 of the state owned refineries. Between the two refineries, there are 5 processing units as illustrated in Table 3.7. Refinery products include unleaded gasoline, LPG, Kerosene (for cooking and used as aviation fuel), AGO, Low and High Pour Fuel Oil (LPFO/HPFO).

3.3.2.2 Refined Product Distribution in Nigeria

The distribution of crude oil and refined products from the Niger Delta region and refineries respectively is administered via a matrix of oil pipelines connecting upstream off-shore terminals and jetties to downstream refineries, and storage depots. Two types of pipelines are used for the transportation of oil and oil products. These are; dedicated and multi-purpose lines.

Statistic reports shows that the Nigerian downstream sector has a total of 35 lubricating blending plants, 128 depots, 62 import jetties, 26,000 trucks for transporting products, 26,684 retail outlets and 27 crude oil terminals (DPR 2014).

Table 3.7 Port-Harcourt Refinery Processing Units (Source: NNPC 2010)

Area	Unit	Raw Material	Product	
			Finished	Intermediate
1	CDU (Crude Distillation Unit)	Crude Oil	AGO, Kerosene	Straight-Run Naphtha (SRN), Straight-Run Gasoline (SRG), Liquefied Petroleum Gas (LPG), Atmospheric Residue (AR)
	Vacuum Distillation Unit (VDU)	Atmospheric Residue	Vacuum Gas Oil (VGO)	Fluid Catalytic Cracking (FCC) Unit feedstock
2	Naphtha Hydrotreating Unit (NHU)	Naphtha		Hydro-desulphurised Naphtha
	Catalytic Reforming Unit (CRU)	Naphtha		Upgraded Naphtha for PMS blend
	Kero Hydrotreating Unit (KHU)	Kero	Aviation Fuel	
	Continuous Catalyst Regeneration Unit (CCR)	Deactivated Catalyst	Reactivated Catalyst	
	Hydrogen Purification Unit, Fuel Gas Vaporizer, Sour Water Treatment Unit, Caustic Treatment Unit			
3	Fluid Catalytic Cracking Unit (FCC)	VGO and Heavy Diesel Oil		FCC Gasoline for PMS blend
	Gas Concentration Unit, Gas Treating Unit, Mercaptan Oxidation Unit			
4	Dimersol, Butamer Isomerization and Alkylation Units			High Octane Gasoline blend component
5	This is the old refinery and consists of : Crude Distillation Unit (CDU), Platform Unit, LPG Unit and Utilities	Crude Oil	Kerosene, AGO, Electricity supply, Steam, Cooling water, Nitrogen, Air	LPG and Gasoline.

The transportation of refined products is done via oil pipelines, coastal vessels, and rail system and by road. The use of the rail mode of transportation for conveying refined products in Nigeria, though relatively cheap, is however not a popular option due to the deplorable state of the Nigerian railway

system as a result of years of inadequate maintenance (Akpoghomeh and Badejo 2006). Also, the long delay and unreliability associated with the Nigerian rail system does not encourage its use in refined product transportation.

The transportation of large quantities of refined products is sometimes facilitated by sea. This involves the use of tanker vessels such as ships and barges to convey high-demand products to storage depots within the country. Coastal vessels are utilised in conveying petroleum products from the Warri and Port-Harcourt refineries to Lagos.

Table 3.8 Strategic Locations of PPMC Area Offices, Depots, Terminals and Head-Quarters across Nigeria (Source: NNPC 2010)

	PPMC Area Offices	Depots	Pump Stations, Import/Export Jetties and Terminals	Head Quarters
1	Port-Harcourt	Port-Harcourt depot, Aba depot, Enugu depot, Makurdi depot, Calabar depot	Okrika jetty, Bonny Export terminal	Port-Harcourt
2	Warri	Warri depot , Benin depot	Warri jetty, Benin depot	
3	Mosimi	Mosimi depot, Atlas-Cove depot, Satellite (Ejigbo Lagos) depot, Ibadan depot, Ore depot, Ilorin depot	Atlas-Cove jetty	Mosimi
4	Kaduna	Kaduna depot, Minna depot, Suleja depot, Kano depot, Gusau depot	Abaji pump station, Sarkin Pawa pump station, Zaria pump station	Kaduna
5	Gombe	Jos depot, Gombe depot, Yola depot	Biu pump station	Gombe

Transportation of refined products from depots to retailing outlets and service stations is expedited by the use of road tankers and trucks. Road transportation is often adopted in conveying products to regions of high demand. The use of road transport does not however come without a setback. The

high number of accident related incidences sometimes caused by poorly maintained road tankers is a known contributor to supply shortages (Adenikinju and Falobi 2006).

3.3.2.2.1 Oil Pipelines in Nigeria

The use of pipelines in conveying refined products became prominent in 1978 after an inquiry into the 1974 and 1975 petroleum product shortages in the country. Pipelines were introduced into downstream operations to create and increase the number of adequate channels for refined product transportation (Akpoghomeh and Badejo 2006). The introduction of pipelines caused a rapid rise in its use for petroleum product transport, but there was a decline in 1990 with an increase in sea transport (Akpoghomeh and Badejo 2006).

Crude oil and products to and from the refineries are transported via a network of pipelines covering 16,000km (DPR 2014). Products pipeline alone accounts for 5120km (NNPC 2010). The PPMC also make use of chartered marine vessels to transport refined products to 'water-fed 'facility (Adenikinju and Falobi 2006). PPMC convey refined products using a network of multi-purpose pipelines from the refineries and importing jetties to the storage depots which are strategically located across the country.

There are 21 storage depots in Nigeria and all are overseen by the PPMC. Product transport through pipelines is facilitated through mainline and booster pump stations (NNPC 2010). These stations alongside export/import facilities, pipelines and storage depots are managed by the PPMC under five geographical zones called Operations Areas (see table 3.8). The five operation area offices are situated in Warri, Port-Harcourt, Mosimi, Kaduna and Gombe and they are responsible for overseeing the activities of over 20 oil depots and imported product jetties. Some of the major oil depots are situated in Lagos, Port-Harcourt, Warri, Aba, Benin, Enugu, Ibadan, Gombe, Ilorin, Jos, Kaduna, Kano, Maiduguri, Makurdi, Mosimi, and Ore (Oladepo 2014). Booster pump stations are located along the product pipeline course or between nearby depots. These pump stations enhance the flow of products along the pipeline (Ehinomen and Adepoju 2012).

3.3.2.2.2 Storage

Storage and dispensing facilities across Nigeria are categorised into three categories based on the owners of the infrastructure which are the NNPC, major marketers and independent marketers. As stated in the previous section, the PPMC subsidiary controls the downstream distribution centres via 5 area offices. These area offices are responsible for the 21 petroleum product depots spanning across the country (see Table 3.8). These distribution depots have a combined capacity of "… 71, 99 and 108

nationwide days sufficiency at the consumption level of 18, eight and ten million litres per day for PMS and AGO respectively" (Akpogomeh and Badejo 2006: 33). Thus, with a 30day minimum and 90day maximum refined product capacity to meet national demand. These distribution depots receive refined products from the 4 refineries as well as imported petroleum products from the NNPC-PPMC import terminal at Atlas Cove. Imported products are afterward pumped to the Mosimi-Shagamu depot from where it is pumped to other depots via pipelines (Ehinomen and Adeleke 2012 and Adenikinju and Falobi 2006).

3.3.2.3 Regulations and Standards in the Nigerian Downstream Oil Industry

Regulations are developed from policies into legally governed obligations that are controlled and exercised by a public agency to ensure adherence (Selznick 1985 and WHO 2016). National regulations are usually developed within the context of the country's constitutional framework in order to add societal value or tackle an issue of concern. The Nigerian oil industry as a whole is regulated by industry regulations and laws. These regulations evolved over the years and became a necessity following pollution related issues that seem to historically define the industry as it expanded in profits and size (Green, Nwakwo and Ikechukwu 1998). Literature has shown that the emergence of HSE awareness and administrative regulations in the Nigerian oil industry was a gradual process that can be said to replicate the trend in developed economies (Adegoroye 1994). Despite this similarity, the response by the industry to emerging regulations cannot however be described as similar.

HSE issues have been captured in Nigerian legislations as far back as the 1960s, as can be observed in the Nigerian Petroleum Act of 1969 where matters regarding safe workplace practice, adoption of precautionary measures to avoid pollution and remedial measures were captured and laws enacted in this regard (Green, Nwakwo and Ikechukwu 1998). Despite this long history, a remarkable turning point in the Nigerian oil industry environmental legislation was the *Koko site* toxic dumping incident of 1988 (Adegoroye 1994). This incident led to the enactment of the Harmful Wastes Decree and the Federal Environmental Protection Decree (Adegoroye 1994 and Ambituuni, Amezaga and Emeseh 2014 and Ogri 2001). In the Nigerian downstream oil industry, this laid down precedence for environmental regulations has led to the emergence of various laws and legislations in addition to the already existing industry laws. In the investigation into environmental regulations in the Nigerian downstream oil industry conducted by Ambituuni, Amezaga and Emeseh (2014: 49), the authors categorized and discussed laws governing the Nigerian downstream oil industry under three headings, which are; "constitution and environmental laws, petroleum industry laws and downstream specific environmental and safety laws". The preceding two categories are general constitutional petroleum

industry laws and thus, makes provision for other industries alongside the petroleum industry (both upstream and downstream). In this regard, the Nigerian constitution recognises the importance of keeping the environment safe by putting in place a regulatory framework to safeguard against unsustainable environmental practices.

An assessment of the downstream specific environmental and safety laws as identified in the work of Ambituuni, Amezaga and Emeseh (2014) shows that the current legislation in place guiding the activities of the sector is adequate in this regard. Some of the downstream specific legislation in Nigeria are; the Hydrocarbon Oil Refineries Act and the Petroleum Products and Distribution (Anti-Sabotage) Act of 2004.

3.3.2.3.1 The Hydrocarbon Oil Refineries Act

This is primarily concerned with the licencing and control of crude oil refining activities in Nigeria. Sections in the act make provision for allowable conduct for the refining link of the supply chain and this also covers some aspect of environmental protection. It states clearly that only licenced refineries are allowed to perform crude oil refining activities and to this effect, a refiner's licence will be issued. This was captured in *section I* of the act, where it was categorically stated that "…no person shall refine any hydrocarbon oil save in a refinery and under a license issued under this Act…" (Hydrocarbon Oil Refineries Regulations 2004). Thus, all refining activities are only permitted within the confines of a licenced refinery and all forms of make-shift refineries by pipeline vandalisers are hence illegal under this law. Also, under this act, refineries are mandated to put in place safety measures and facilities for pollution prevention.

3.3.2.3.2 Petroleum Products and Distribution (Anti-Sabotage Act)

This focuses on the production and distribution of refined products and is concerned with offences of sabotage and destruction of downstream infrastructures, a negative development that seem to characterise the Nigerian downstream oil industry. This captures activities such as pipeline vandalism which is a major cause of pollution across downstream installations and surrounding communities. The law categorically states that any wilful "… intent to obstruct or prevent the production or distribution of petroleum products in any part of Nigeria…be guilty of the offence of sabotage under this Act" (Petroleum Production and Distribution Act 2004).

3.3.2.3.3 Refinery and Hydrocarbon Processing Guidelines

Also, the DPR (Department of Petroleum Resources) which is the Nigerian oil industry regulatory body has set guidelines for establishing and operating a refinery in Nigeria. The guidelines make provision for HSE as well as social issues which surrounds refinery construction and operations. The

HSE section of the guideline have set milestones for refinery establishment and this includes safety concerns, environmental impact assessment and process hazard identification. These are also captured in the process safety measures (DPR 2007). Apart from HSE concerns, the scope of the guideline also stated that refinery licensee that plan to engage in refining operations must have a clear understanding of "… the industry, the technical and economic implications of the project, the sociological and environmental impact of the plant, and the maintenance provisions required to protect the health of the operating staff and safety of the plant" (DPR 2007).

Thus, with respect to the Nigerian downstream oil sector, there are legislation and regulatory frameworks in place for ensuring social and environmental management. Despite these, the Nigerian oil sector is for example still behind in cutting down CO_2 emissions (see figure 3.14). According to Ambituuni, Amezaga and Emeseh (2014), these regulatory frameworks though existent are however plagued by; coinciding regulatory functions between agencies, where too many agencies perform same functions; incoherent laws; and legislation overlap across institutions.

Thus, the availability of these regulatory frameworks on one hand is a good development, but the questions that remain pertinent are; how sufficiently do these frameworks in addition to the oil industry generic legislations define the necessary measures to ascertain safe practice and sustainable operations in the Nigerian downstream oil industry and how efficiently do the mandated agencies enforce these laws. These are questions that require further analysis and which cannot be discussed within the scope of this work.

3.3.2.4 HSE in Nigeria and the UK

Managing HSE is primarily concerned with "…the protection of people, the environment and the assets" (Visser 1994: 395). The management of risk and safety in organisations is majorly influenced by the safety culture towards accidents in such business establishments. Generally, a positive safety culture has been linked to safety performance improvements (Lawrie, Parker and Hudson 2006).

At the operational level, HSE is intended to reduce or completely eliminate injuries, negative health effects and impact on the environment (Azadeh, Farmand and Sharahi 2012). Organisations are motivated by legislative requirements and ethical and moral considerations (Visser 1994) even as some "… go beyond the boundaries of the prevailing HSE standards to achieve a better performance and to build a polished public image (Azadeh, Farmand and Sharahi 2012). Human factor also plays an integral role in organisational safety performance (Bottani, Monica and Vignali 2009).

The awareness on HSE in Nigeria was brought about by problems associated with oil spillages as well as occupational health and safety problems (Dublin-Green, Nwakwo and Ikrechukwu 1998). This aside, stakeholder perception of the Nigerian oil industry as an exploiter of resources with non-lasting economic contribution to the country also caused a shift towards the development of HSE policies that would safeguard the health and safety of the environment, people and the industry itself.

However despite set HSE guidelines and policies (see table 3.9), results still show some deviation from positively impacting practice. In the Kaduna refinery for example, a study into the water course from the Kaduna River to the refinery and resultant effluent released into the environment showed a considerable level of air, water and land pollutants, thus making activities of the refinery have a detrimental effect on environmental parameters and health of host communities in the Kaduna vicinity (Aderogba 2011, Al-Amin 2013 and Vivan, Adamu and Ayuba 2012) especially in the long term.

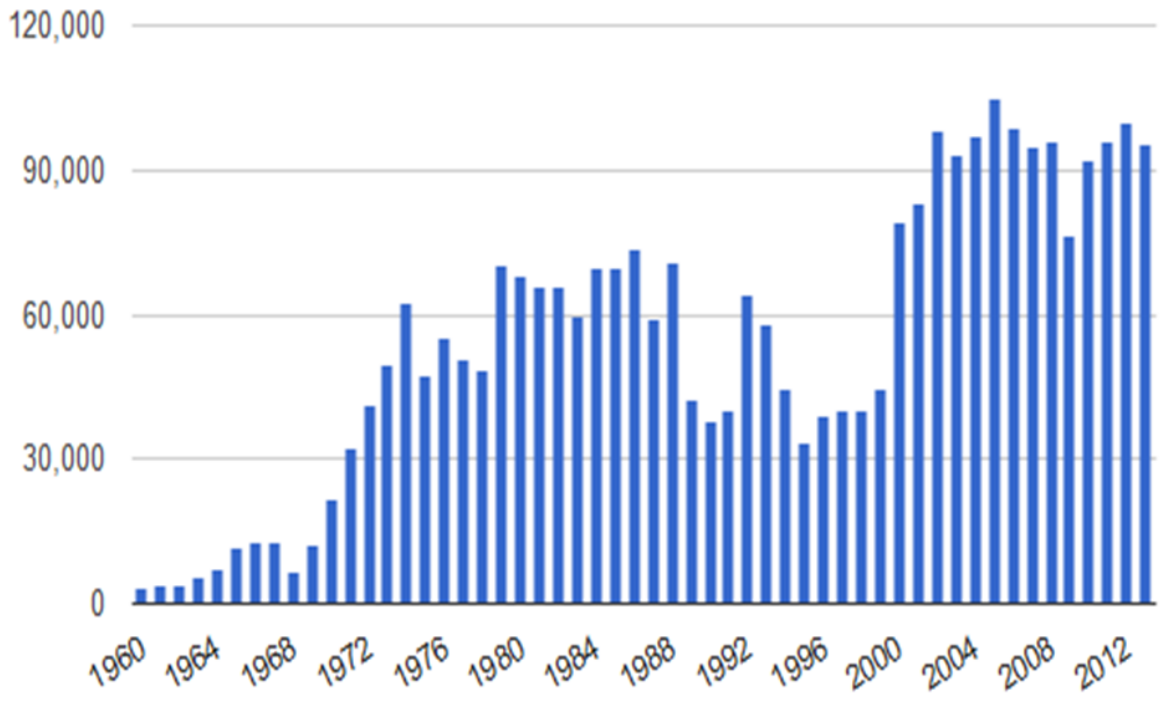


Figure 3.14 **CO_2 Emission in Nigeria between 1960 and 2012 (The GlobalEconomy 2017)**
Figure shows average carbon dioxide emissions in Nigeria in kilo tonnes from 1960 to 2013 in Nigeria. These include emissions from burning of fossil fuels and gas flaring. Minimum and maximum emissions occurred in 1960 and 2005 with emission values of 3406kilo tonne and 104689kilo tonne respectively.

In theory, the refinery has in place a Waste Water Treatment (WWT) unit which supposedly treats used water to reduce and mitigate ecological pollution, this however is not the case (Aderogba 2011: 92).

Table 3.9 Some HSE Related Acts and Regulations Governing the Nigerian Oil Industry (Source: Green, Nwakwo and Ikechukwu 1998: 4)

Oil Pipeline Ordinance 1956	Relate to granting of licences for pipeline installation and maintenance
Criminal Code 1958	Relate to Air Pollution
Forest Ordinance 1960	Forestry conservation and rational exploitation of forest resources
Mineral Oil Safety Regulation 1963	Rules for safe drilling, production, storage and handling of mineral oils
Petroleum Regulation 1967	Provision for the importation, exportation, shipping, loading, storage and transportation of petroleum
Act 34 of 1968	Relate to Control of Water Pollution
Petroleum Act of 1969	Provision for the ownership and control of petroleum, exploration from the Nigerian continental shelf and territorial waters
Petroleum Refining Regulation 1974	Guidelines for the establishment of refineries and petrochemical plants
DPR Guidelines of 1981	Relate to the monitoring, handling, treatment and disposal of effluents, oil spills and chemicals
Decree 58 of 1988	Established the Federal Environmental Protection Agency
Act No 36 of 1991	Environmental guidelines and standards for the regulation and control of petroleum industry activities
Decree 86 of 1992	Relates to Environmental Impact Assessment

In the UK, as an aftermath to the Buncefield explosion of 2005, investigations into events that led to the incident, showed that despite the high standards put in place in the industry sector, there was still room for improvements especially in the area of uniform standards, sharing best practice and experience across the industry (UKPIA 2016). Report from the Buncefield explosion investigation conducted by the BSTG (Buncefield Standard Task Group) evolved safety and storage standards for fuel storage terminals aimed at preventing a future occurrence (BSTG 2007). Following the completion of the BSTG report, the Petrochemical Process Safety Leadership Group was formed to facilitate continuous commitment to safety standards by the sector (UKPIA 2016).

Safety in the UK downstream sector is categorized into process safety and occupational health and safety as shown in figure 3.15. These two distinctive categories; Process safety and occupational health and safety are regulated by the 1999 Control of Major Accident Hazards Regulation (COMAH) and the 1974 Health and Safety at Work Act respectively. Process safety evaluates large scale hazards that are capable of causing environmental damage, impacting safety and leading to business losses

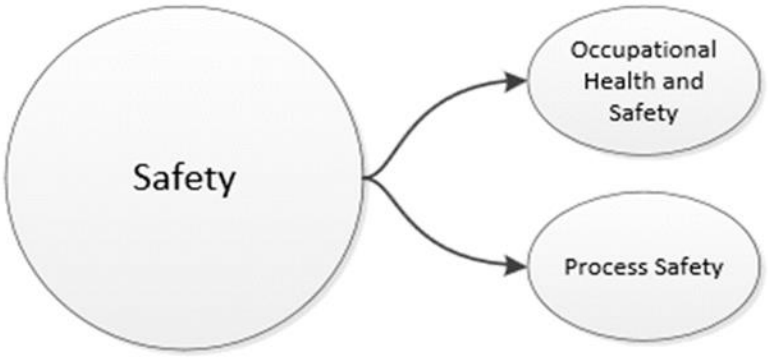


Figure 3.15 Distinctive Areas of Safety in the UK Downstream Oil Sector (UKPIA 2012)
Figure shows the two distinct categories of safety in the UK downstream oil sector; Occupational health and safety and process safety. Process safety focuses on the development of systems and procedures to reduce or mitigate the possibility of negatively impacting hazardous releases while Occupational health and safety focuses on operational safety so as to avoid accidents and ensuring safe working conditions

3.3.2.5 Economic Importance of the Downstream Oil Sector in Nigeria and the UK

The UK downstream oil industry plays a major role in the financial and socio-economic balance in the country. This is achieved by a combined contribution of the industry and its collaborative effort with other industries in the country. Thus, ascertaining a stable and readily available feedstock supply for petrochemical industries and everyday use and thereby contributing immensely to the national economy (UKPIA 2016). Apart from the industry's product contribution to meet industrial, energy and transportation needs, the sector also directly and indirectly provide jobs for about 150,000 people across the UK. It also engages in various partnerships with academic and research institutes with the aim of improving safety, developing innovative technology and enhancing value adding skills in the sector and as an offshoot, in the country (UKPIA 2012).

With an estimated contribution of about 7% into the UK national treasury accrued from around £36 billion in yearly VAT and fuel duty, the UK downstream sector is an integral contributor to the country's economic growth (UKPIA 2016)

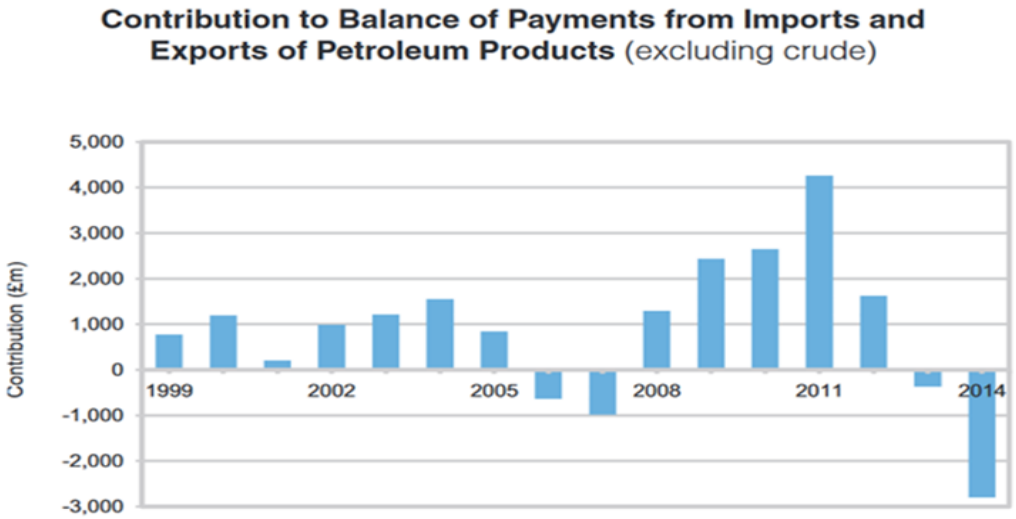


Figure 3.16 Balance of Payments Contribution from Refined Products Importation and Exportation in the UK (Source: UKPIA 2016)

Figure shows the contribution of refined product importation and exportation over a 15-year period (1999 to 2014). The graph shows a decline in contribution in 2013, a trend that has continued in recent times.

As mentioned earlier, increasing legislation on allowable emissions, product specifications and changing consumer needs has continuously affected the rates of return on investment compared to some other industries in the country such as manufacturing, services and even upstream oil sector (UKPIA 2016) as shown in figure 3.17). The comparison shows a consistent negative return on

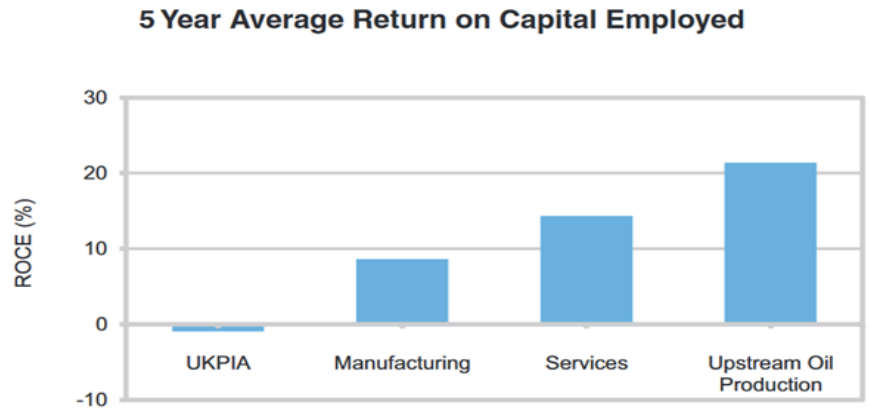


Figure 3.17 An Overview of Average Return on Capital between 2010-2014 in the UK Downstream Oil Sector and some other Industries (Source: UKPIA 2016)

Figure shows the return on capital invested in the UK downstream oil sector represented by UKPIA and some other industries (manufacturing, services and upstream oil sector) over the period 2010 to 2014. In this period, return on investment in the UK downstream sector has remained negative with an estimated value of -0.94% whilst return on investment in manufacturing, services and upstream oil sector for the same period was estimated as 8.6%, 14.3% and 21.3% respectively.

investment for the UK downstream oil sector over a five-year period (2010-2014) when compared with the other industries which reported an average return of 14.8% altogether.

The UK downstream oil sector is currently characterised by a reliable and secure refined products supply and the dwindling volume of refined middle distillates in the UK is supplemented via importation to meet increasing demands for this product type.

Where there has been calls for a "… strong and healthy refining sector, able to process a range of crude oil's from diverse sources, domestic or overseas" (UKPIA 2011: 21) in the UK to offset the increasing dependence on importations, the downstream sector is defined by a reliable supply chain with an excellent track record for unanticipated emergencies and disruptions (UKPIA 2011). This is in sharp contrast to its Nigerian counterpart which has over the years been characterised by epileptic supply of refined products despite continuous importation to complement locally refined crude oil.

Similar to the UK, the Nigerian downstream oil sector plays an important role in the country's economy. Despite numerous initiatives and programs put in place by various governments aimed at diversifying the Nigerian economy in order to nudge it off its heavy dependence on petroleum as the main source of revenue generation, petroleum still accounts for an estimated 95% of the country's revenue earning (Majekodunmi 2013). This dependence coupled with the country's persistent need to import refined petroleum products and recent fluctuations in global crude oil price has had significant effect on the country's balance of payments and the economy as a whole (Adelabu 2012).

Also, the aspect of making available refined products by the sector has over the years been challenging and has been described as underperforming evidenced by incessant fuel scarcity (Akinola and Wissink 2017, Akpogomeh and Badejo 2006 and Bazilian and Onyeji 2012). This insecurity of refined product availability has been blamed on non-functional and below-optimal refinery production, global crude oil price fluctuations, government domination of the sector, fuel subsidy practice and non-deregulation of the sector (Soile, Tsaku and Yar'Adua 2014).

Many studies have focused on the deregulation of the Nigerian downstream sector (Abu 2016, Ibanga 2005, Ezeani 2014, Okpaga, Chijioke and Innocent 2012, Owoeye and Adetoye 2016 and Sani and Kouchy 2014) even as there has been mixed reactions and debates regarding the benefit and effect this may have on the country's GDP and development.

Deregulation can be defined as the withdrawal of regulations and other barriers to the private control of goods and services and free interactions between the forces of demand and supply in order to allow the evolution of a liberated economy (Bankole 2001 and Okpaga, Ugwu and Eme 2012). It permits the privatisation of previously government dominated aspects of the economy by encouraging private sector participation and resulting in efficiently managed market operations, well utilized national revenue, competitive market, revamped public establishments and economic advancement. In the context of the Nigerian downstream oil sector, deregulation is the withdrawal of oil subsidy and government control of the prices of refined products, thus institutionalising the legal framework for price determination by market forces (Kalejaiye, Adebayo and Lawal 2013). This encourages public participation and competition with the goal of an efficient and reliable sector evidenced by a secure supply mechanism and improved economy (Kalejaiye, Adebayo and Lawal 2013, Okpaga, Ugwu and Eme 2012 and Owoeye and Adetoye 2016).

3.4 Summary

This chapter presents an overview of downstream supply chain activities in the downstream oil industry of the case study countries. It discussed refineries and factors influencing refinery operations and profitability in the case study countries. It also reviewed some of the challenges in the downstream sectors of the case study countries.

4 Methodology & Data Collection

This methodology chapter addresses the achievement of the aim and objectives identified in the literature review. It sets the route by which the aim and objectives of this research study will be achieved. This chapter describe in detail the method undertaken for the collection, measurement and analysis of data for this research study. It also maps out the data collection process and the techniques implemented in this research. It details the planning and collection of data via interviews and the administration of a survey by questionnaire and also the results obtained from these data collection techniques.

Section 4.1 introduces the research strategy adopted. Section 4.2 gives an overview of research paradigms methodology. Section 4.3 explains the research approach and the justification for research approach adopted in this study. Sections 4.4 and 4.5 elaborates on research methods and the justification for the research approach adopted in this study. The conceptual model for this study was developed in section 4.6 based on analysed literature. Section 4.7 and 4.8 discusses data collection and pilot study. Selecting study participant was examined in section 4.9. Sections 4.10 examined the interview process and procedure while section 4.11 discussed the design of the questionnaire and its administration. Section 4.12 examined secondary data collection and section 4.13 concludes the chapter with a summary.

4.1 Research Strategy Overview

The focus of this research study is to understand the variations in SSCM in the downstream sector of the oil industry, specifically in the transportation, refining and storage supply chain links of a developing and developed oil producing country and to develop a framework that will have the potential to enhance the levels of sustainability in this sector of the oil industry supply chain.

A mixed method of research was adopted for this research work. This is because, both quantitative and qualitative research methods were employed. The embedded mixed-method design consists of two data sets which were mixed at the design phase with one data set taking a supporting role within the overall design (Creswell and Plano Clark 2011). The embedded design can either be one-phase (concurrent) or two phase design (sequential) where both data types are collected at the same time or where both data types are collected at different times respectively. In this study, the qualitative research method was conducted before the quantitative research method. The two methods were afterward connected in the evaluation stage of the study. The motive for this approach is that the

quantitative data and its resulting analysis provided answers to some of the research questions identified in this work. The qualitative data on the other hand provided answers to specific questions directed at supply chain managers in the Nigerian downstream oil industry and thus, capturing their experiences and perception of SSCM. Both methods together, provided a wholesome perspective and insight into SSCM practice and required improvements in the Nigerian downstream oil industry (Creswell and Plano-Clark 2011 and Tashakori and Teddlie 1998).

The adoption of the embedded mixed-method involved the use of case study and survey research methods. A comparison of SSCM between the downstream sectors of a developed oil-producing country (UK) and a developing oil-producing country (Nigeria) was conducted and the similarities and variations in SSCM practise evaluated. These countries have been selected based on their Gross National Income (GNI) Per Capita, Human Asset Index, Economic Vulnerability Index and Population (United Nations 2008 and International Monetary Fund 2012). These indexes indicate the level of development of a country.

The step-by-step methodological approach employed in this research work is based on the research model proposed by Saunders, Lewis and Thornhill (2016). The authors in their work represented the critical areas in research and data collection methods as an 'onion' with corresponding stages in research design and distinct options depicted by layers of the onion (see figure 4.1).

4.2 Overview and Definition of Research Paradigms and Methodology

Research is guided by a number of paradigms that a researcher can select from based on the type of research, aim and the expected outcome of such studies. Research in itself can be defined as an activity that contributes to existing body of knowledge via a logical and systematic method of finding solution to a particular problem (Kothari 2004 and Rajasekar, Krishnaswami and Satyaprasad 2010 and Philominathan and Chinnathambi 2013).

This is achieved through well-defined research problem(s), hypothesis formulation, information or data collection, analysing and evaluating collected data, making deductions, conclusions and proposing solutions to the initially identified research problems (Kothari 2004 and Saunders, Lewis and Thornhill 2016).

Figure 4.1 The Research 'Onion' (Saunders, Lewis and Thornhill 2006)
Figure shows business research paradigms and methodologies of how research should be undertaken.

The Research Onion (figure 4.1) indicate the diverse philosophical stance, research approach, strategies, choices, time horizons and techniques that a research can adopt in the course of undertaking a research.

Whilst research is an activity directed towards discovery of knowledge, research methodology describes how to undertake such an activity to ascertain the reliability and validity of such studies. Many works use the term research method and research methodology interchangeably as connoting the same concept. Saunders, Thornhill and Lewis (2016) however in their work, categorically differentiated between research method and research methodology by describing research method as the approach or procedure adopted for data collection and its analysis, and the term methodology connoting how research will be undertaken. Research methods thus encompasses schemes and techniques for collecting facts and this includes experimental studies, quantitative techniques such as statistical procedures and non-statistical techniques such as qualitative methods (Rajasekar, Philomminathan and Chinnathambi 2013 and Saunders, Thornhill and Lewis 2016). Research methodology on the other hand provides a systematic footprint for carrying out a research study. A similar clarification was observed in the work of Rajasekar, Philominathan and Chinnathambi (2013) and this same stance will be adopted in this research study.

4.2.1 Research Methodology

As stated in the previous section, research methodology describes the systematic steps and work-plan required for a researcher to engage in a research study from start to finish (Rajasekar, Philominathan and Chinnathambi 2013). Thus, in addition to identifying a suitable research method, research methodology also looks at the formulation of the research question, type of data required, analytical technique to be selected and required scientific tools and materials for solving the research problem at hand. When choosing a research methodology, it is required that a researcher delves further past the practicalities of the '*how of research*' to embrace the philosophical notion of '*why research*' (Holden and Lynch 2004) and this is captured under two broad theories; the nature of science and the nature of society (Burrell and Morgan 1979). The nature of science is anchored on two important philosophies; the subjective or the objective research approach (Holden and Lynch 2004) and these approaches has also over the years found its way into business and management research (Huizing 2006).

Discussions regarding business and management are often centred across the two extremes of subjectivism and objectivism (Saunders, Lewis and Thornhill 2016). Subjectivism and objectivism also described as Positivim and Interpretivism paradigms in Corbetta (2003) and Positivism and Social Constructivism in Easterby-Smith, Thorpe and Jackson (2008) are described as polar opposites with differing philosophical standpoints. Subjectivism and objectivism are research approaches outlined by "… several core assumptions concerning ontology (reality), epistemology (knowledge), human nature (pre-determined or not) and methodology" (Holden and Lynch 2004: 3). A paradigm is a philosophical perspective that "… determines the criteria according to which one selects and defines problems for inquiry and how one approaches them theoretically and methodologically" (Husén 1997: 17). Table 4.1 shows the contrasting characteristics between subjective and objective research paradigms.

Subjectivism which has over the years been accepted as a worthy alternative to the more scientific oriented objectivism (Huizing 2006) seeks to understand truths and meaning of events and phenomena in the context of cultural and physical experiences (Diesing 1966). Thus, the motivating concern in subjectivism is the consciousness that truths and meanings can be derived from human accounts and experiences rather than objective truths which is devoid of influences from external forces, regarded as social actors (Huizing 2006, Putman 1983 and Saunders, Lewis and Thornhill 2016).

Objectivism on the other hand is anchored on an impersonal but rather, rational knowledge based on scientific facts that are verifiable and not subject to influences of social actors or *individual psychic processes* (Ellwood 1916). Hence, in social research and research in general, researcher is faced with the decision of making a selection of between the two extremes of subjectivism or objectivism. This decision however also requires a detailed understanding of available research assumptions and philosophies to evolve an appropriate methodological choice appropriate to the phenomenon understudy.

Table 4.1 Contrasting Implications of the Objective and Subjective Research Paradigms (Adapted from Easterby-Smith, Thorpe and Jackson 2008)

	Objective	**Subjective**
The Observer	must be independent	is part of what is being observed
Human Interests	should be irrelevant	Are the main drivers of science
Explanations	Must demonstrate causality	aim to increase general understanding of the situation
Research progresses through	Hypothesis and deductions	Gathering rich data from which ideas are induced
Concepts	Need to be defined so that they can be measured	Should incorporate stakeholder perspectives
Units of Analysis	should be reduced to simplest terms	May include the complexity of '*whole*' situations
Generalizing through	statistical probability	Theoretical abstraction
Sampling requires	Large numbers selected randomly	Small numbers of cases chosen for specific reasons

Research philosophy describes the approach and assumptions undertaken towards knowledge development (Saunders, Lewis and Thornhill 2016), even as organisational theories are based on "… a philosophy of science and a theory of society" (Burrell and Morgan 1979: 1). In the selection of a research methodology and progressing through the search for knowledge, assumptions are made even as the researcher is faced with various school of thoughts (Saunders, Lewis and Thornhill 2004). These assumptions relate to ontology, which evaluates the basis of what is being investigated; epistemology, which describes in what context the world is understood and passed on as knowledge; human nature, which evaluates how humans relate with their environment; and methodology which forms the basis of how a researcher aims to pursue knowledge (Burrell and Morgan 1979).

The selection of a logical and rational set of assumptions is crucial in obtaining a well-articulated research design evidenced by a progressive research process that adds to the body of knowledge (Saunders, Lewis and Thornhill 2016). In order to fully appreciate the elements guarding these philosophies and to take an astute position in relation to this research study, a critical view of assumptions made in research philosophies as described in literature is examined.

4.2.1.1 Ontology

Ontology is that aspect of philosophy that examines reality and its organisation (Guarino and Giaretta 1995). Ontology can be defined as the "… study of the organization and the nature of the world independently of the form of our knowledge about it" (Guarino 1995: 628). According to Guba and Lincoln (1994), ontology examine questions such as; *what makes up reality? What is the nature of reality and what is there to be known about it?* Thus evaluating the features that characterise humans. Assumptions here deal with the nature and form of reality (Corbetta 2003 and Guarino and Giaretta 1995). In organisational research, it refers to how a researcher views an organisation, events in the organisation and the entire management of the business enterprise. It examines how things really are and how things actually work (Scotland 2012).

4.2.1.2 Epistemology

Derived from two Greek words; "*episteme*" meaning science or knowledge and "*logos*" meaning theory or knowledge (Johnson and Duberley 2000). Epistemology is the branch of philosophy that examines the sources and the meaning of knowledge (Guriano 1995 and Guarino and Giaretta 1995). Assumptions in epistemology examines "… how knowledge can be created, acquired and communicated, in other words what I means to know" (Scotland 2012: 9). Epistemology stemming from scientific research methods has over the years found its way into social sciences (Bracken 2006). It examines features and principles guiding the process of knowledge acquisition and the possibility of the replicability of the process to ascertain reliability (Gialdino 2009). Many organisational-study focused research has been based on the premise that reality is objective and waiting to be explored and that discovered knowledge can be established and disseminated to others (Holden and Lynch 2004).

4.2.1.3 Human Nature

This examines the role of man as a "controller" or the "controlled" (Holden and Lynch 2004). It investigates the interaction between humans and the environment. It is based on several assumptions about humans and this include humans perceived as a social constructor, an actor, an information processor, an adaptor and a responder (Morgan and Smircich 1980).

4.2.1.4 Methodology

Described as the "*researcher's tool kit*" (Holden and Lynch 2004). Methodology can be defined as the research strategy or designed plan of action guiding the principles behind the research approach and the selection of a particular method to carry out the research (Scotland 2012 and Tuli 2010). It examines the question "*how can social reality be studied*" (Corbett 2003). Methodology describes how the researcher also known as the "would-be knower" will pursue what is desired to be known (Guba and Lincoln 1994). In the journey towards knowing, a researcher is faced with a wide range of blueprints and adaptive methods to get to the desired destination of knowing. However as rightly stated by Guba and Lincoln (1994: 108), "… not any methodology is appropriate" even as "methods must be fitted to an appropriate methodology". There are a variety of research methodologies and there is *no size fits all* research problems as each methodology is characterized by strengths and weaknesses peculiar to it (Tuli 2011). Thus, a research method has to be carefully considered in relation to the phenomenon understudy. Methods are specific steps and procedures for collecting and analysing data (Scotland 2012).

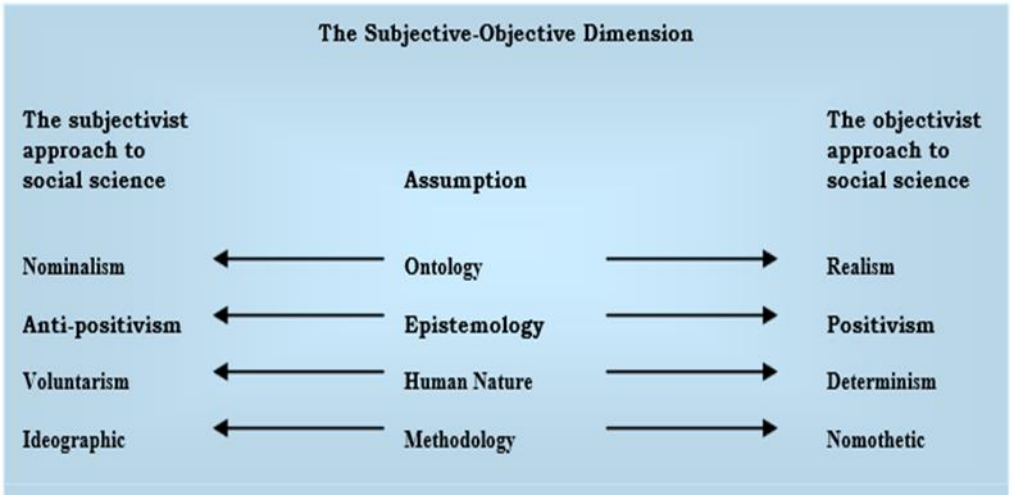


Figure 4.2 A Framework for Analysing Assumptions in Social Science Research (Source: Burrell and Morgan 1979 cited in Holden and Lynch 2004: 5)

Figures shows a scheme for the analysis of assumptions in social research. It shows assumptions for the subjective-objective approach to social science research.

In the research environment, these assumptions characterising ontology, epistemology, human nature and methodology significantly influence each other as a researcher's view on ontology (reality) influences his epistemological stance (quest for knowledge) which also influences his view on human nature and resultantly his methodology choice (Corbetta 2003 and Holden and Lynch 2004). Saying this however, a researcher in his quest for finding answers will have to inherently adopt a particular position, either an epistemological or an ontological stance and these usually results in differing strategies towards the phenomenon understudy (Scotland 2012).

Social science studies can be examined in different ways as well as interpreted differently based on the assumptions governing the subjective-objective dimensions (see figure 4.2). Cohen, Manion and Morrison (2007) in their analysis of the social world based on the work of Burrell and Morgan (1979) identified four approaches emanating for the subjective (nominalism, anti-positivism, voluntarism, ideographic) and objective (realism, positism, determinism, nomethetic) dimensions respectively based on the ontological, epistemological, human nature and methodological assumptions.

Assumptions characterizing methodology examines how the researcher will go about his discovery for knowledge. The objective stance in this regard termed as the *Nomothetic* view adopts an experimental/manipulative approach which is characterised by scientific investigations directed towards evaluating relationships between elements present in the phenomenon understudy. It relies on quantitative techniques and measurements based on procedures and methods. The subjective stance for the methodology assumptions termed as the Ideographic view evaluates a phenomenon with emphasis on individual experiences and adopts various approaches based on the phenomenon being investigated. Thus, the focus is on individual perception, modification and the interpretation of the phenomenon. This allows the adoption of both qualitative and quantitative techniques.

Where one focuses on the scientifically inclined objective stance, a detachment from the phenomenon to be studied is encouraged and this guides the quantitative data collection strategy (Tuli 2011). A focus on the subjective stance which emphasizes human experiences directs the data collection strategy towards the qualitative approach which encourages the adoption of observational studies, in-depth interviews, and group discussions to mention a few.

4.3 Research Approach

Research approach plays an important role in the continued development of knowledge in management research (Scandura and Williams 2000). Kothari (2004) examined basic types of research and concluded that there are primarily two approaches to research, the quantitative and the qualitative research approach. In selecting of these two approaches, a revisiting of a researcher's philosophical stance and supporting assumptions as typified in figure 4.2 is necessary as these dictate the applicable research approach in management studies. This dependence is further elaborated upon in the work of Tuli (2010) where the author explored and interpreted distinguishing features between quantitative and

qualitative research strategies based on the positivist (objective) and the interpretative (subjective) research paradigms and assumptions of ontology, epistemology and methodology.

Quantitative research employs data to investigate a theory (Saunders, Lewis and Thornhill 2011). Based on a deductive approach, but can also be used for inductive research where the quantitatively acquired data is adopted in the conception of a theory. In deductive reasoning, research is based on theories which are usually tested by observations and theories (Blumberg, Cooper and Schindler 2014 and Walliman 2006). Quantitative research is aimed at theory testing and adopts an objective ontological stance where the data collection and analysis is characterized by quantification (Bryman 2016).

Qualitative research on the other hand follows an inductive approach whereby the emphasis is on theory generation (Bryman 2016). The research approach aims to provide answers to the 'why' and 'how' questions of social behaviour, opinion and experience, thus emphasising on the individualistic interpretation of the social world as opposed to its objective counterpart. It can capture meanings, feelings and emotions behind human behaviour which cannot ordinarily be acquired from quantitatively obtained data in order to establish the reason behind such behaviour. The collection of data is prone to change as it does not follow a standardised procedure. Questions and procedure however stem from interactive and natural happenings during the research process (Saunders, Lewis and Thornhill 2011).

The adoption of either of the two approaches is a function of the research design, type of data required, data collection and analysis methods (Walliman 2006). There are characteristic differences between the qualitative and quantitative research methods (Bahari 2010, Easterby-Smith, Thorpe and Jackson 2008 and Saunders, Lewis and Thornhill 2011).

A characteristic feature of the qualitative research method is its ability to "… describe and display phenomena as experienced by the study population, in fine-tuned detail and in the study participants' own terms" (Ritchie and Lewis 2003: 27). Hence allowing in-depth investigation into issues and exploring and understanding them from the perspective of the participant. Quantitative research on the other hand examines a phenomenon by exploring relationships between variables. These are numerically measured and statistically analysed to make reliable and valid predictions (Saunders, Lewis and Thornhill 2016). A summary of the contrasting attributes of the quantitative and qualitative research strategies is presented in Table 4.2. This was adopted from Steckler *et al*. (1992).

Despite the popularity of the two basic research approaches, that is the quantitative and the qualitative, there has also been an increasing popularity in the adoption of not simply either one of the approaches but rather the two approaches within the same research study (Rajasekar, Philominathan and Chinnathambi 2013 and Walliman 2006). This is regarded as the mixed method.

Table 4.2 A Contrast of Attributes of Qualitative and Quantitative Research Strategy (Source: Steckler* et al. *1992: 2)

Quantitative	**Qualitative**
Deductive	Inductive
Verification and outcome-oriented	Discovery and process-oriented
Measurement tends to be objective	Measurement tends to be subjective
Reliable	Valid
Technology as instrument (the evaluator is removed from the data)	Self as instrument (the evaluator is close to the data
Generalizable	Ungeneralizable
The outsider's perspective	The insider's perspective
Population oriented	Case oriented

4.3.1 Mixed Method

The use of multiple methods to study a phenomena is not new as many works have advocated its adoption in research studies (Bryman 2016, Greene, Caracelli and Graham 1989, Easterby-Smith, Thorpe and Jackson 2008, Onwuegbuzie and Leech 2005 and Ostlund et al. 2011). The mixed method involves the combined use of the quantitative and qualitative research methods within a research study (Bryman 2016 and Easterby-Smith, Thorpe and Jackson 2008) as shown in figure 4.3. Mixed method research employs more than one type of research method and this can further be elaborated to include a mix of data as well as "… a mix of quantitative methods or a mix of qualitative methods" (Brannen 2005: 4) apart from the combined use of both quantitative and qualitative strategies. One of the common reasons for employing a mix of the qualitative and quantitative strategies as well as designs and analytical strategies is centred on a researcher's goal of improving the validity and reliability of research findings via *triangulation* (Greene, Caracelli and Graham 1989).

Triangulation is the adoption of multiple methodologies in the study of a single phenomenon (Denzin 2012). This is aimed at obtaining in-depth understanding into the phenomenon understudy and ensuring that the research study undergoes a rigorous process to ascertain a rich and multi-perspective

knowledge on the phenomenon being studied. The use of triangulation is not limited to a combined adoption of the quantitative and qualitative research methods as it can also be applied to data collection settings and data sources (use of multiple or single sources) or strategies (Scandura and Williams 2000). A more critical view of the relevance of triangulation in research studies indicates that beyond the premise of validity and reliability, triangulation extends further to capture a more comprehensive picture of the phenomenon under study by unmasking "… unique variance which otherwise may have been neglected by single methods" (Jick 1979: 603).

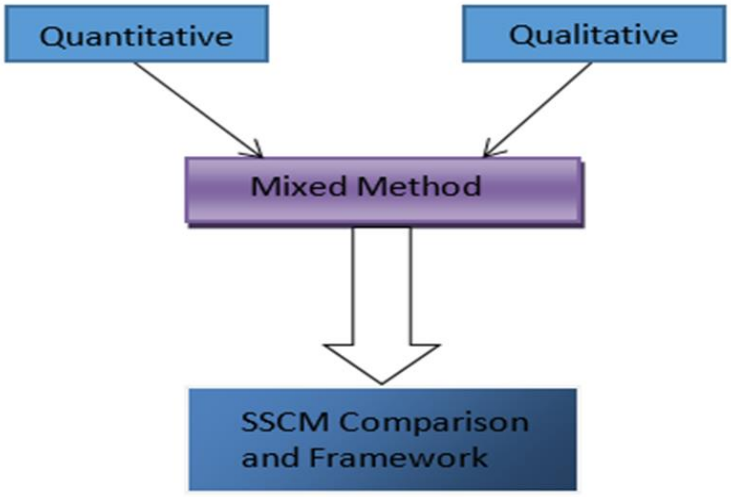


Figure 4.3 Mixed Method Research Design
The figure shows the combination of quantitative and qualitative research mono-methods.

Other purposes of the mixed method apart from triangulation as identified in the work of Greene, Caracelli and Graham (1989) are for complementarity, development, initiation and expansion. By *complementarity*, the mixed method makes it possible to examine different aspects of a phenomenon and allows the clarification of result from one method by the use of results from the other method. *Expansion* is the use of the two methods to add scope and depth to the investigation. The use of results derived from one method to inform the use of a second method is described as the *development* purpose of the mixed method (Tashakkori and Teddlie 1998). This is usually done sequentially. Mixed method is a good way to discover paradoxes and new perspectives in a study. This is described as *initiation* and it is achieved by the use of result from one method to generate or remodel questions from the other model.

The adoption of the quantitative and qualitative research strategies in studying a single phenomenon is however not without criticism in academia. These criticisms are often centred on the fact that each

strategy, have differing epistemological stance and are anchored on separate paradigms of objectivism and subjectivism respectively (Bryman 2016 and Rossman and Wilson 1985). These criticisms were also sighted in the work of Sale, Lohfield and Brazil (2002) where the authors stated that by reason of the fact that the two research strategies represent separate and different paradigms, they are therefore incommensurate but can be employed for complementary purpose in a single study where each phenomenon in the study for which the strategies are being adopted is distinctly labelled for clarification.

However going by the work of Bryman (2016), where the author presented two arguments on the debate, the technical version and the epistemological version. The epistemological stance is of the opinion that the two research strategies cannot be mixed because of their differing epistemological stance. The technical stance on the other hand perceives the research strategies as autonomous but with the capability of being employed with the other in the same study. Hence, despite the distinctive epistemological and ontological assumptions governing the two strategies, the two strategies are seen as connected and flexible. A similar stance was adopted by Morgan (1988: 363) who stated that the difference in paradigm should not stand in the way of adopting the two strategies when the purpose of employing the mixed method strategy is "combining methods within a clear-headed understanding of paradigms".

Thus, the two research strategies are viewed as compatible and their combined use possible and desirable. In this research study, the research strategy employed is the mixed-method and for this research study, the definition of the mixed-method strategy as given in the work of Greene, Caracelli and Graham (1989: 256) is being adopted. The authors defined mixed-method strategy as a method "… that include at least one quantitative method (designed to collect numbers) and one qualitative method designed to collect words), where neither type of method is inherently linked to any particular inquiry paradigm". The justification for the selection of the mixed method is discussed in section 4.3.1.1.

4.3.1.1 Mixed Method Design

There are a number of designs that can be adopted in the mixed-method approach as many works (Creswell and Plano Clark 2011, Greene, Caracelli and Graham 1989, Patton 1990, Morse 2017, Morgan 1998, and Tashakkori and Teddlie 1998) have come up with various options for research mixed method adoption in research studies. In making a selection of a design choice in the mixed-method approach, care must be taken to avoid ending up with *mixed-up models* due to the complexity of making a selection choice (Green, Caracelli and Graham 1989) and the lack of paradigm consistency for the approach (Datta 1994 cited in Tashakkori and Teddlie 1998).

Table 4.3 Deficiencies in Literature, Type of Mixed-Method Design, and Reasons for Using the Design (Source: Adapted from Creswell and Plano Clark 2011: 96)

Deficiencies in the Literature (or Research Problem)	Type of Mixed Methods Design	Reasons for Using the Chosen Mixed Methods Design
One form of data is insufficient by itself	**Triangulation Design** (convergence, data transformation, validation of quantitative data, multilevel)	To bring together the strengths of both quantitative and qualitative research to compare results or to validate, confirm, or corroborate quantitative results with qualitative findings
A second form of data is needed to enhance the study	**Embedded Design** (experimental, correlational)	There are different questions requiring different data
Quantitative results are inadequate by themselves	**Explanatory Design** (follow-up, participant selection)	Qualitative data are needed to help explain or build on initial quantitative results
Qualitative results are inadequate by themselves	**Exploratory Design** (instrument development, taxonomy development)	Qualitative data is only an initial exploration to identify variables, constructs, taxonomies, or instruments for quantitative studies

As distinctly differentiated in the work of Tashakkori and Teddlie (1998), mixed-methods is the combination of the quantitative and qualitative strategies in the research methodology, for example in

the data collection phase of a study, which is applicable to this research study. Mixed-models on the other hand is the combination of the quantitative and qualitative research strategies across all stages of the research process, that is, cutting across the conceptualization stage to the collection and analysis of data and making inferential deductions from the study.

Creswell and Plano Clark (2011) identified four types of mixed-method designs and their variants. The typology identified are; Triangulation, Embedded, Explanatory and Exploratory design (see Table 4.3).

4.3.1.1.1 Embedded Mixed-Method Design

The embedded design is the combination of both mono-methods in a one-phase or two-phase approach but with one of the methods playing a supplementary role to the other method. Thus, there is a primary method upon which the study is based and a subordinate method that provides a supportive outcome. The design is aimed at providing answers to different research questions requiring different data types. Thus, it involves the introduction of a quantitative data within a largely qualitatively study or vice-versa (see figure 4.4). Hence, qualitative data can be embedded within a quantitative study as done in experimental design or similarly, quantitative data can be embedded within a qualitative study as exemplary in phenomenological design (Creswell and Plano Clark 2011).

The research questions for this research study entails the collection of data from the Nigerian downstream oil industry and its stakeholders. Research questions as identified in section 1.5 in the Introduction chapter aims to provide answers regarding current SSCM practice in the industry sector, drivers and barriers to SSCM, influence of country's developmental level on SSCM adoption and the variations in SSCM when compared with a developed country (UK). In order to provide answers to these questions qualitatively collected data will be employed. The purpose for this selection will be expatiated on in subsequent section. On the other hand, research questions aimed at evaluating the impact of the Nigerian downstream oil industry and its SSCM effort from the perspective of stakeholders that are directly impacted by supply chain activities for the supply chain links being investigated will be examined with quantitatively generated data.

The embedded mixed method design is especially adoptive for this research study as it allows the supplementary acquisition of data from industry sector stakeholders in addition to the primarily collected qualitative data. The embedded design is a useful design when time and resources are critical to the research study. It is also more manageable as less data is required for one of the methods. The

design also has its shortcomings and this include the need to specify the purpose of collecting the supportive data set, difficulty of merging and adequately integrating results and the limited number of written publications on the design.

In order to overcome the limitations of the embedded mixed-method design identified in the previous paragraph, and adopt the design for this research study, strategies recommended by Creswell and Plano Clark (2011) were taken into consideration and employed in the course of this research work:

- Adequately specifying the purpose of the collecting the supplementary data as part of a larger qualitative study.
- The challenge of integrating the two results was mitigated by keeping the two sets of findings separate and evaluating them based on the research questions answered.
- Carefully considering the timing for the introduction of the supplementary quantitative data. A sequential timing method was adopted where qualitative data was collected and analysed after which the quantitative data was collected and analysed.

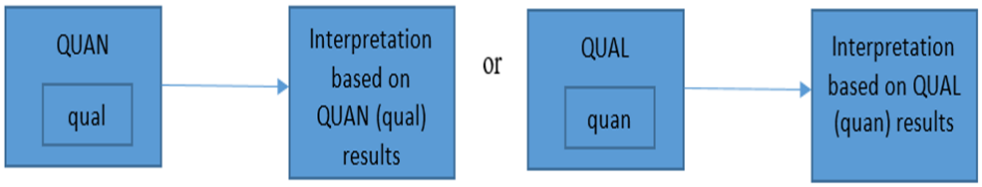


Figure 4.4 Embedded Mixed-Method Design (Source: Creswell and Plano Clark 2011: 68).
Figure shows the embedded design with the qualitative data playing a supplementary role for the quantitative study and quantitative data playing a supplementary role for qualitative study.

4.4 Research Methods/ Design

In adopting the mixed method approach with the goal of obtaining multi-level perspectives on the current practice and steps towards improvement in SSCM in the Nigerian downstream oil industry, it is imperative that real life contextual understandings of the concept of SSCM as understood and practiced by managers, with regards to its implementation and practice in the industry sector is derived. Comparing SSCM practice in the context of what it should ideally be is necessary to identify lapses and proffer landmark recommendations to help improve and alienate gaps in the achievement of a high performance supply chain. For this reason, the research method must incorporate a design that allows for information required for this purpose to be captured. In this case, the Nigerian downstream oil industry and the comparative organization where a high performing SSCM is already in place and being adopted were specifically focused upon.

Also, to obtain a wholesome view on the concept of SSCM, it is necessary to evaluate the supply chain actors and stakeholders pertinent to supply chain business processes and by extension the three dimensions of sustainability (Carter and Rogers 2008). For this purpose, this research work adopted case study and survey research methods that is, a survey within a case study. The Embedded Design approach where quantitative data is collected within a qualitative design or vice-versa (Creswell and Plano Clark (2011: 71) was employed. Yin (2009) stated that the use of case study research is appropriate when exploring subjects such as individuals, groups, organizations, communities and other related themes where features of real-life scenarios such as processes and practices are investigated to provide a holistic outcome. The case study qualitative research method was deemed especially suitable for this research work because of the complexity of the sustainability theme and the extended influence and impacts of unsustainable practice on its wide array of stakeholders. In order to cover the list and size of stakeholders affiliated with the oil industry, and also due to time and cost constraint, the use of surveys (quantitative research) within the case study design (qualitative research) was employed in obtaining data from some of the oil industry stakeholders. Sharma and Henriques (2005) adopted a similar approach in their study on sustainability practice in the Canadian Forestry industry.

4.4.1 Qualitative Research Area

Qualitative research examines and attempts to make sense of a phenomenon by evaluating cues and underlying reasons in order to gain important insight into a particular idea or to make future predictions (Tracy 2013). It leads to theory generation via data collected from the field of study through pattern or theme identification (Creswell 2013). Qualitative research is reflexive and is defined by a process of "… collecting and analyzing data, developing and modifying theory, elaborating or refocusing the research questions, and identifying and addressing validity threats" (Maxwell 2013: 2) which are all interwoven and simultaneously influencing each other.

Qualitative research provides a rich and holistic insight into studies with goals centred on understanding relationships, culture, identity, groups and organizations (Tracy 2013). This research work is organisation based and focuses on the downstream oil industry with the aim of understanding SSCM as practiced and implemented in the downstream oil industry. Also qualitative research is an adoptive approach when cultural influences are being studied. It serves as a useful tool when an explanation is required for specific actions or traits being displayed by an individual or a group. This makes the qualitative research strategy a worthy option especially for investigations into the influence of government policy, country's level of development and culture on the implementation of SSCM in the downstream oil industry in the country of study.

Studying the downstream oil industry SSCM practice requires that data will be primarily from the downstream sector managers and their stakeholders. This requires information centred on sustainability effort of the downstream oil industry in their supply chain, their sustainability perspective, current position, and challenges in the adoption of a sustainable supply chain, industry's relationship with local oil producing communities, social groups, local authority, contractors and other stakeholders. In order to adequately capture these information especially from the downstream oil industry managers as depicted in their everyday experiences, qualitative investigation is a useful strategy in this regard.

In order to adopt the qualitative research method, a selection has to be made in the various qualiitative designs available. With regards to qualitative research design, there are five main traditions; narrative research, phenomenology, ethnography, case study and grounded theory (Creswell 2013).

4.4.1.1 Narrative Research

This focuses on personal materials such as life biography, personal experiences, conversations, personal writing and other lived experiences (Connelly and Clandinin 1990 and Sandelowski 1991). It relies on written or spoken output of individuals as told through the individual's own story (ies). In narrative research, there is a temporal ordering of events and the researcher aims to make deductions based on the events in a plausible manner. Narrative research is a good way of collecting and comparing stories about an event or phenomenon. Stories in narrative research are however perspectival and this poses as a limitation when adopted as research data. Also, assessing deeper-truths is challenging as this task rests solely with on the researcher's cognitive reflex.

4.4.1.2 Grounded Theory

Grounded theory is a qualitative research method that adopts a systematic approach to data gathering and analysis (Butler-Kisber 2010 and Strauss and Corbin 1990). It makes use of a logically construed set of data collection and analysis strategies to inductively develop theory (Charmaz 1996). It can be argued that many of the qualitative research approach has to have a form of structure to be adhered to with regards to collecting and analysing data in order to ensure that deductions and overall findings are credible and their authenticity is not subject to questions that may arise from bias. This is rightly so, however, with regards to the grounded theory approach, sequence of specific techniques is employed in analysing the data (Creswell 1998). It follows set procedures to emanate meaning from a participant's experiences by providing a bridge between interpretative analyses and traditional objective assumptions. Its theory building characteristic and constant verification and comparison all

through the research project however differentiates it from other qualitative techniques (Strauss and Corbin 1994). Also, in contrast to many other qualitative methods where data analysis can be delayed until all data is acquired, data analysis begins immediately the first piece of data is obtained in the grounded theory approach (Corbin and Strauss 1990).

Limitations of the method however cuts across its objective (positivism) stance which limits its reflexivity and pushes the researcher's role to the background. Also, the suitability of the method for social research especially where real life experiences form the basis of the research has been criticised due to its set and strict systematic categorization and not especially suited for phenomenologically themed research questions (Charmaz and Henwood 2008).

4.4.1.3 Phenomenology

Phenomenology describes the meaning of lived experiences of a phenomenon by providing in-depth understanding of experiences through the exposure of taken-for granted details and assumptions (Starks and Trinidad 2007). It can be described as a philosophy and a methodology (Goulding 2004). As a philosophy, it examines assumptions of *what the world is, how it can be discovered* and *how it can be managed* (Berrios 1989). As a methodology, phenomenology investigates human experiences as part of everyday life captured through perceived meanings ascribed to such experiences (Starks and Trinidad 2007). Thus, in this regard, it examines how humans interact and are influenced by culture and the society they are in and the meanings created from these interactions (Goulding 2004 and Wilson 2002). A researcher adopting the phenomenological approach critically examine participant's experiences to elucidate subjective truths from meanings and common features of the experience or event through perception.

Phenomenology as a research methodology is also prone to some setbacks and this includes; its high dependence on participant skills and language used, generalisation issues and conclusions depend to a large extent on the participant selected for the study.

4.4.1.4 Ethnography

Ethnographic research can be described as a qualitative analytical method that aims to understand and translate cultural practice (Creswell 1998 and Thorne 2000). It involves data collection using interviews and observation over an extended period of time usually in the participant's naturalistic setting. It is characterized by "… participant and non-participant observation, focus on natural settings, use of participant constructs to structure the research, and investigator avoidance of purposive manipulation of study variables (LeCompte and Goetz 1989: 32). Defined by small number of cases which are explored in detail by the interpretation of actions to evolve meanings characterising such

actions with the aim of providing insight into a specific social phenomenon (Atkinson and Hammersley 1994), ethnographic research allows the researcher play an obvious or covert role in the participant's natural setting for a period of time, learning, observing, listening and asking questions as the participants go about their lives. Hence, collecting information on various aspects of the phenomena being studied and allowing in-depth investigation into it.

Participant observation is a data collection method where a researcher becomes involved in the daily activities of people in the cultural setting being studied over a period of time in a bid to study the day-to-day activities of the setting with the aim of understanding behavioural patterns and way of life of the people under study.

Ethnographic research promotes the discovery of new lines if inquiry since the method focuses on observation rather than predetermined tests. In analysing ethnographic data, verbal and written depictions are employed with statistical procedures simply receded to the background if used at all.

4.4.1.5 Case Study

Case study research can be described as a qualitative technique that provides in-depth analysis of an event or a phenomenon (Blumberg, Cooper and Schindler 2011). It is "… an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin 2003: 13). Many SSCM focused research work employ the use of case studies (Seuring 2008).

Yin (2003) identified four types of case-study designs; single-case (holistic) design, single–case (embedded design), multiple-case (holistic design) and multiple-case (embedded design). Single-case designs are especially suitable for longitudinal studies and it gives greater depth to the concept under-study since it investigations are limited to one case. It is however prone to biases and error based on wrong judgements of representatives of the single event (Voss, Tsikiriktsis and Frohlich 2002).

Multiple-case design however is able to limit observer bias and amplify external validity as it allows the in-depth study of similar and contrasting cases (Leonard-Barton 1989). Saying this, due to the mono-case nature of single case designs, a more detailed investigation can be conducted on the phenomenon compared to multiple-cases which is characterised by two or more cases and thus more resource is required and less depth is achieved. Despite this limitation, the use of multiple-cases is still an excellent way of delving into unknown concepts and providing reliable conclusions with a high degree of confidence based on findings from the cases analysed. The reason for this according to Miles, Huberman and Saldana (2014: 33) can be attributed to the fact that the use of multiple-case

sampling increases the likelihood of understanding single case findings and "…can strengthen the precision, validity, stability and trustworthiness of the findings".

4.4.2 Quantitative Research Area

Quantitative research is characterised by the collection of data or information which are analysed numerically and the results presented in tables and graphs. It follows a deductive approach, thus employing data for hypothesis and theory testing (Bryman 2016, Creswell *et al*. and Carr 1994). A researcher adopting the quantitative method views human behaviour as regular, predictable and can be described and explained if studied under controlled conditions by identifying statistical relationships existent in collected data. It is a good method for making predictions about a phenomena or a study as results from quantitatively conducted studies are said to be generalizable and thus, is applicable in other contexts and scenarios.

Quantitative research is regarded as a reliable investigative technique as it is anchored on an objective, systematic process which is aimed at result outcome which can be assessed by standardised testing (Carr 1994). Also it is often argued that the detachment of the researcher whilst maintaining an objective view is another strength of the quantitative method as this prevents any form of bias on the part of the researcher to ensure objectivity. Paradoxically, this can also be argued as a limiting factor in the use of the quantitative method and a strength for the qualitative technique, especially in studies centred on obtaining meaningful data and elucidating a participant's viewpoint on an important subject, based on a participant's first-hand experience (Steckler *et al.* 1992). In this regard, quantitative data as a methodology is described as a method that "… treat people merely as a source of data" (Carr 1994: 718).

There are three ways of collecting data in quantitative research and these are; through surveys, through observational methods and from databases (Easterby-Smith, Thorpe and Jackson 2008).

4.4.2.1 Data Collection through Observational Methods

This is a quantitative data collection technique adopted for coding and analysing the behaviour of a sample population (Easterby-Smith, Thorpe and Jackson 2008). Behaviour in this regard may be coded as it occurs or recorded for future coding. The researcher in this case often times take up the role of a non-participant. Quantitative observational method is also referred to as structured observation in quantitative studies while in qualitative studies, this type of approach is described as participant observation (Blumberg, Cooper and Schindler 2014). Strengths of the methodology as

identified in Blumberg, Cooper and Schindler include; collection of useful information from participants that are unable to adequately express themselves, reduction of retrospective bias and the advantage of capturing the event in its natural environment as it occurs. Despite these merits, the method is however time consuming and costly. It is also limited as a way of acquiring knowledge about the past and restricted when sourcing for information on attitude, values and opinion as these cannot be captured by simply observing.

4.4.2.2 Data Collection from Databases

This is the use of secondary data. Secondary data is data that has been collected by someone else for other purposes and has been archived or kept for future studies or reference. This is data collected by anyone other than the researcher himself. Data is often kept by businesses and individuals for various reasons which include; regulatory purposes, performance monitoring and follow-up or reference for past decisions (Easter-by Smith, Thorpe and Jackson 2008). It is a less costly way of collecting data as the information is already available. It is however prone to quality error as the data was primarily collected for other purposes. Thus in adopting secondary data for quantitative studies, a careful evaluation of the primary purpose of the data has to be established and this has to be objectively compared with the research study in order to ascertain relevance and adoptability.

4.4.2.3 Data Collection through Surveys

This is the use of questionnaires or structured interviews for the collection of data about the behaviour and opinion of a study population. The use of structured interviews allow the standardization of questions being asked and responses being recorded. Thus, reducing the possibility of error as a result of variations in questions and processing of responses.

Yin (2009) recommended the use of the quantitative-survey method when seeking answers to 'what', 'who', 'where', 'how many/how much' questions. Thus, for this work, the survey research method was adopted to provide answers to the *exploratory* 'what' questions identified from the research objective; what is the impact of the downstream oil industry activities on surrounding local communities? What are the challenges and drivers of SSCM in the supply chain sectors understudy in the case-study countries and their impact? How is the adoption of SSCM in the downstream oil industry influenced by the country's level of development?

4.4.2.3.1 Survey by Questionnaire

The popular use of questionnaire in research studies can be attributed to some of its advantages over interviews (Bryman and Bell 2003). The adoption of questionnaires for providing answers to some of

the research questions in this study is anchored on its advantages. Whilst harnessing the advantages of questionnaires in this study, considerable effort was made to reduce its limitations.

Questionnaires are cheaper to administer especially when the sample population is geographically dispersed (Blumberg 2011). In order to evaluate SSCM practice in the downstream oil sector, it is essential to evaluate the impact of the downstream oil industry supply chain activities on its stakeholders. As mentioned in previous sections, the oil industry stakeholders are numerous and it is unlikely that data can be obtained from all stakeholders. For this study, stakeholders were prioritised and selected based on some inclusion criteria (see table 4.6). Despite this classification, collecting adequate data to articulate the perception of some of these stakeholders for example local residents across the very many downstream infrastructures in Nigeria via interviews alone would be impossible. Such data can however be collected with the use of questionnaires. This is because questionnaires allow a wider coverage compared to face-to-face interview.

Also, it is much quicker to administer questionnaires to prospective respondents as a large volume of questionnaire can be sent out by post or mail (Bryman and Bell 2003) to various locations. The distribution centres in Nigeria are dispersed across the country. This kind of feat is difficult to attain with the use of interviews as face-to-face or even telephone interviews with as many as five hundred people will take a longer time.

Questionnaire use is not limited by interviewer's variability (Bryman and Bell 2003). The question structure in a questionnaire is usually the same for all respondents depending on the target population, thus, the same question is being asked in the same way compared to interviews where an interviewer may ask participants the same question in a different order or in different ways. This is double-sided, as discussed earlier, as it can be a plus to the kind of data collected as seen in the use of semi-structured interviews depending on the type of research questions to be answered and the phenomena being studied.

Questionnaires also provide an opportunity for respondents to participate in the research in a more conducive environment and under less pressure compared to an interview environment (Bryman and Bell 2003). Also, respondents are able to complete the questionnaire at their own convenience (Blumberg 2011). Respondents can thus decide to postpone the questionnaire completion till they are ready or to a more appropriate time. This worked both as an advantage and a disadvantage in this

research study as some completed questionnaires were not returned on time, and in some cases were never returned.

Another disadvantage in questionnaire use in research studies is that the researcher cannot be certain of who exactly provided answers to the questionnaire. This introduces bias into the study and may affect the quality of the data especially if the required information can only be provided by certain persons (Bryman and Bell 2003). In this study, the occurrence of this limitation was reduced as the questionnaires were administered by hand to stakeholders living around NNPC infrastructures.
Another possible limitation with questionnaire use is that, respondents can decide to read the entire content of the questionnaire before completing the questionnaire (Blumberg 2011 and Bryman and Bell 2003). This affects the quality of the data as responses provided to the questions cannot be said to be independent of the other. To eliminate this limitation, respondents were encouraged to answer the questions in chronological order.

There is also the problem of limited guidance and support by the researcher to the respondents while answering the questions. Thus, the questionnaire design was rigorously scrutinized to ensure that the questions were unambiguous and easy to understand.

Also, with questionnaires, it is often difficult to ask many questions as respondents often find long questionnaires tiring and is a reason for uncompleted questionnaires (Blumberg 2011). Apart from this, there is a reduced opportunity to ask respondents questions that are not salient to them as can be done in interviews to obtain additional information from respondents. To overcome this limitation, interviews were conducted with key people in the sample set, for example, local community leaders were also interviewed to complement data collected from local residents around downstream oil infrastructures being studied.

4.5 Justification for Research Approach/Design

In selecting a research strategy, studies have indicated that that there is no absolute strategy (Brannen 2005, Bryman 2016, Currall and Towler 2003 and Scandura and Williams 2000), thus selections made is largely dependent on the scholar's preference which is anchored on the research philosophy (Blumberg, Cooper and Schindler 2011) and the best strategy is that which efficiently answer the research questions whilst ascertaining trustworthiness and validity (Tashakkori and Teddlie 1998). In other words, there is no best strategy for investigating a phenomenon as both strategies have their individual strengths and likewise weaknesses (Blumberg, Cooper and Schindler 2014, Bryman 2016

and Seuring 2011) and the selection of a particular strategy is largely dependent on the objectives of the research (Currall and Towler 2003). Also, a common fact is that the quantitative and qualitative research strategies possess distinctive attributes as shown in table 4.2 and apart from its individual selection as a mono- method, there is also the opportunity to harness both strategies when combined in a management study. This combination is what makes the mixed method stand-out as a worthy method especially where the research questions are better answered by both mono-methods. Thus the mixed method "… is often more efficient in answering research questions than the QUAL or QUAN approach alone" (Tashakkori and Teddlie 1998: 167).

The combined use of both quantitative and qualitative methods provides a complementarity advantage as both mono-methods supplement each other's weaknesses to provide a more robust analysis (Green, Caracelli and Graham 1989, Ivankova, Creswell and Stick 2006, Miles, Huberman and Saldana 2014 and Voss, Tsikiriktsis and Frohlich 2002). Thus in this research study where an in-depth understanding of how SSCM is being practised and industry knowledge on the drivers and barriers to a high performing sustainable supply chain is desired, the mixed-method is a worthy option. This allows the capturing of experiences of industry professionals as well as other stakeholders that might be impacted or impacting the oil industry's sustainable supply chain practice. Thus, providing a clearer and understandable study in general.

The mixed-method has the advantage of being able to answer research questions that ordinarily would have been impossible with the use of only one technique by itself. This advantage and improved data quality that characterises the mixed-method is evident in the increasing number of studies in the management field employing the technique. Results from the work of Molina-Azorin (2010: 6), where the author evaluated the use and added value of the mixed-method in the management field by analysing 1,330 articles showed that, in the field of strategic management, the use of the mixed-method was higher than qualitative method and is an advancing technique in evaluating management concepts. SSCM is a strategic management research as it is examines the strategic, integration and attainment of an organization's sustainability goals through the management of supply chain processes for the achievement of long-term business improvements (Carter and Rogers 1998). Following this trend, the mixed-method is a suitable strategy for this research study.

Apart from being a good resource when complementary data is being sought, the mixed-method is useful when it is necessary to obtain quality data from "…multiple data independent sources, to offset or counteract biases from each method, in order to confirm, validate or corroborate the results and

conclusions of the study" (Bazeley 2008: 134). SSCM is the integration of the three dimensions of sustainability into the day-to day management of supply chain activities, thus in SSCM investigation, it is necessary that the interrelationship between sustainability dimensions, its element; such as sustainable processes, products and so on, and the supply chain has to be taken into cognizance (Green, Morton and New 1998 and Seuring 2008). For this research study, in addition to the data required from supply chain experts in the downstream oil industry links understudy, it is also pertinent to collect data from stakeholders who can directly impact the practice of SSCM or are direct recipients of the impacts of the downstream oil activities. In order to capture these data, it is imperative to adopt a mixed-method technique which in-line with its identified advantages would allow data collection from the multiple actors that characterise SSCM concept. This can be achieved by employing multiple data sources, in this case, the oil industry and their various stakeholders.

The use of mixed methods is not new to the sustainability and supply chain theme. Many authors have employed the use of mixed method of research in their work and particularly, in relation to sustainability practice. New, Green and Morton (2002) adopted the use of the mixed-method in their study examining similarities and variations in public and private sector adoption of green supply chain. Other authors who have adopted the use of the mixed-method in GSCM and SSCM study include Bowen *et al*. (2001), Aragon-Correa *et al*. (2008) and Sharma and Henriques (2005).

In conclusion to the justification for employing the mixed-research strategy for this study, this research study is aimed at evaluating SSCM in the downstream oil industry in a manner that allows the capturing of experiences as perceived by the focal company managers as well as supply chain stakeholders in the true sense of it. Employing the mixed method approach based on its benefits and the overall completeness that the method promises is a good way to ascertain that this research study is able to provide answers to the research questions and accomplish the aim of this work as identified in the introduction section of this thesis. The Embedded Mixed Method Design approach where quantitative data is collected within a qualitative design or vice-versa (Creswell and Plano Clark (2011: 71) was adopted in this research study. For this purpose, the case-study and survey research methods that is, a survey within a case study was employed. .

According to Yin (2009), case study and survey research method are especially beneficial to the researcher when a study is focused on recent happenings and when it is difficult to manipulate behavioural occurrences. It also serves as an essential tool for explanatory, exploratory or descriptive investigation. The use of case study research is appropriate when exploring subjects such as

individuals, groups, organizations, communities and other related themes where features of real-life scenarios are investigated to provide a wholesome outcome (Yin 2009).

Table 4.4 shows a summary of scenarios for research method selection as described by Yin (2009). The table covers conditions such as the type of research questions and the investigator's manipulation of events with corresponding research method that can be adopted.

Table 4.4 Basis for Research Method Selection (Source: Adopted from Yin 2009).

	METHOD				
CONDITIONS	Experiment	Survey	Archivial Analysis	History	Case-Study
Type of Research Question	How, Why?	Who, What, Where, How many, How much?	Who, What, Where, How many, How much?	How, Why?	How, Why?
Requires Researcher's Manipulation of Events	Yes	No	No	No	No
Centers on Current Events	Yes	Yes	Yes/No	No	Yes

The table is a summary of various applicable scenarios for selecting different research methods

Also, this research work being a comparative study between a developed and a developing country, require the use of the case study research strategy for the following reasons;

- In many research studies, the investigative method required to explore or understand a phenomenon in-depth is often dictated by the phenomenon itself (Leornard-Barton 1990). Where a study seek to answer "why" and "how" questions about a contemporary occurrence or happening (Yin 2003), as observed in this research work.
- The case-study methodology is a useful tool in providing in-depth understanding of an otherwise unclear phenomenon as it has the advantage of drawing data from multiple sources of evidence, which includes historical and current happenings (Eisenhardt 1989), Leonard-Barton 1990, Seuring 2008, Voss, Tsikiriktsis and Frohlich 2002), Yin 2003).

An important part of this research study is to understand why there are variations in the SSCM practice in the UK and Nigeria, as well as recognize and evaluate the factors that act as drivers or barriers to

SSCM performance in the refining, transportation and storage of refined gasoline in the downstream oil sector.

For this work, being a comparative study, the multiple-case design is the most suitable option to derive the investigative and comparative benefit of evaluating SSCM in two countries with differing developmental levels which is crucial to the research questions identified in this study. This is in line with Yin (2003), the author stated that the use of multiple-cases guarantee better chances of doing a valuable research and "…analytical conclusions arising from two case, as with two experiments, will be more powerful than those coming from a single case (or single experiment) alone".

Also, in selecting case-type(s) for a research study, one of the criteria described in the work of Voss, Tsikiriktsis and Frohlich (2002) is the selection of case-types based on sharply dissimilar characteristics that will accentuate the differences being studied. Eisenhardt (1989: 537) suggested that when selecting multiple cases, random selection should be avoided, but rather theoretical sampling where cases are selected for theoretical and not statistical reasons should be adopted. This according to the author allows a researcher to select cases which are inclined to replicate preceding cases or broaden the emergent theory. Yin (2003: 47) also emphasised this point by stating that in selecting cases for multiple-case studies, each case must be selected such that it predicts either identical results (literal replication) or predicts contradictory results but for predictable reasons (theoretical replication). This research work is analogous to theoretical replication multiple-case sampling typology as it seeks to understand the variations in SSCM in a developing and developed oil producing country. Apart from the similarity of these countries with regard to both being oil-producing countries, the level of development in both countries greatly differ and this stands as the basis of measuring the variations and similarities in SSCM practice as well as evaluating the drivers and barriers in SSCM. It is expected that contrasting results will be predicted based on the contradictory developmental levels in these countries. However, the focus of this research study is to understand how a country's level of development influences the adoption and practice of SSCM in the downstream sector of the oil industry.

4.6 Conceptual Model for Sustainable Supply Chain Management

Conceptual models guide research studies by providing a tentative theory on the phenomenon being studied aimed at clarifying in simple terms what is happening and why (Maxwell 2008). Such theoretical constructs are depicted via visual representation (Brathwaite 2002 and Creswell 1994).

Conceptual models can be defined as the "… the system of concepts, assumptions, expectations, beliefs, and theories that supports and informs …research" (Maxwell 2008: 222). Conceptual models critically evaluate the research issue understudy as well as the people and settings in the study. It also looks at past research studies, outcome, theories, beliefs and experiences that can directly or indirectly inform the research study in order to have a clear and detailed understanding of the issues and people being studied (Maxwell 2008). Based on the above, the conceptual model for this research study evolved from a detailed literature study covering sustainability issues in the Nigerian downstream oil industry supply chain and the factors driving and acting as barriers to the attainment of a sustainability focused supply chain. Past work on the Nigerian downstream oil industry as well as prior research work on sustainability were delved into in order to bring about a logical and systematic representation of the study.

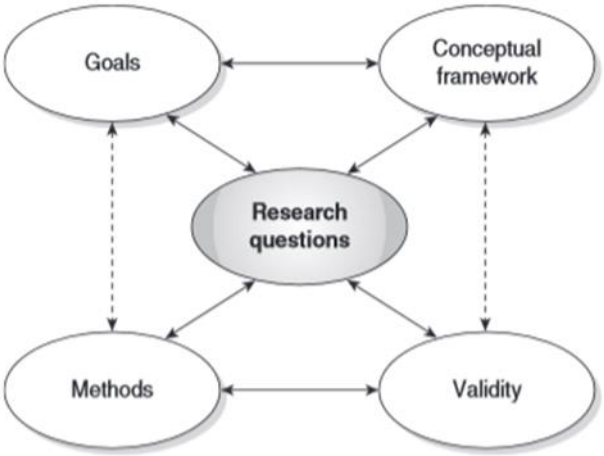


Figure 4.5 An Interactive Research Design Model (Source: Maxwell 2013: 5)

4.6.1 Conceptual Model Development

The conceptual model for this study is shown in figure 4.6. As previously stated, the conceptual model for this research study was developed from past literature on sustainability.

For the conceptual model development, it was important to recognise the important actors in the Nigerian downstream oil industry as well as the existing relationship between them. As rightly stated by Jackson (2009: 3), "… institutions are equally the outcome of particular constellation of actors and their interactions". The Nigerian downstream oil industry is state-owned and controlled by the Nigerian government. Thus, the organization is firmly and directly managed through government structured hierarchies (Mintzberg 1996). This positions the Nigerian government as an important actor in the national oil sector.

By virtue of the position of the Nigerian government in the running of the sector, the sector is funded directly and indirectly by public funding and is also influenced by government policies. This is because state-owned organizations often benefit from government investment and specified budgetary allocation of funds to ensure the availability of target goods and services to the populace (Pyke, Farley and Robb 2000). This strategically positions the Nigerian government as a key player in the management of its downstream oil supply chain. Also, the intent to adopt and transit to a sustainably managed supply chain by organisations require both tactical and strategic planning. This takes into cognizance the redesigning of operations and processes for a transformed and progressive supply chain (Prokesch 2011 and Van Lakerfeld and Van Tulder 2016) even as studies have shown that regulations and government policies are sustainability motivators for many organizations (Gupta and Palsule-Desai 2011) as well as play an important part in economic development (Frederking 2002). In the Nigerian context, this is "two-faced" as the government takes on two roles under different umbrellas; as *the organization* and as *the policy maker*. It is therefore imperative that in the road to a high performing sustainable supply chain in the Nigerian downstream sector, detailed insight into the effect of government policies on the sector is important.

With the globalisation of supply chains across both advanced and developing countries, sustainability adopting multinational organizations with supply chains spanning to developing countries are often faced with the additional burden of educating and monitoring suppliers in these countries to ensure improved standards and compliance to the organization's sustainability stance (Galal and Moneim 2016 and Murphy and Manitsky 2010). This is often caused by the educational, industrial, economic, qualitative and social gaps that exist between the industrialised and developing countries (Akamp and Muller 2013). This usually comes at a cost as such organizations apart from influencing their suppliers towards acceptable and positively impacting processes, also oftentimes have to educate the workers whilst also adapting to geographical and multicultural factors. This aside, another factor that such organizations have to contend with is the issue of government regulations in developing countries, which is often described as weak and mostly ineffective (Murphy and Manitsky 2010). This regardless, multinational organizations are expected to work earnestly towards a sustainable supply chain with the goal of progressively improving its mark on sustainability dimensions.

Thus, in contrast to its developed counter-part, supply chains in developing countries are characterised by socio-economic problems such as; unstable government policies, corruption across leadership cadres, high level of illiteracy, poorly developed transport systems and other problems such as high investment risks, low technological expertise and labour-demanding processes (Akamp and Muller

2013). These challenges further cast a shadow on the possibility of a high performing sustainable supply chain in developing countries. In general, quite a number of institutions in Nigeria are plagued by many of these identified "*developing country problems*" (Aluko 2002, Frynas 1998, Ibrahim, Price and Dainty 2006 and Lawrence 2016) and the Nigerian oil industry is not an exception (Karl 2007). Against this backdrop, it would be beneficial to understand how Nigeria's level of development influences its downstream oil industry adoption and practice of a sustainable supply chain.

Despite the increasing number of research on sustainable supply chain management in recent years, very few of these has focused on SSCM in developing countries (Aboelmaged and Ahmed 2009). Research has also shown that many studies on SSCM in emerging economies tend to fixate the study on one of the sustainability dimensions (Ehrgott *et al*. 2011, Kolk, Hong and Van Dolen 2010, Tate, and Ellram and Kirchoff 2010). The Nigerian downstream oil industry by virtue of its ownership (state-owned), located and thriving in a developing country, is influenced by quite a number of factors compared to its counterparts in developed economies. Investigations into the influence of the country's level of development, government policies and culture will be beneficial in understanding how SSCM can be effectively adopted and improved upon in the sector.

As a starting point in the development of a conceptual model for this research study, conceptual models from literature were reviewed. A more detailed analysis of some existing SSCM framework can be found in section 2.4. In order to understand the militating factors that drive or bar the adoption and practice of SSCM as well as investigate variations and similarities in SSCM practice in the downstream sector of the case study countries as specified in the research objectives, it is important to adequately explore how the three dimensions of sustainability are impacted by the sector's business practices and the extended effect of this on the sector's stakeholders.

In evaluating the motivation and barriers to SSCM in the Nigerian downstream oil sector, it would be useful to also investigate the influence of culture. Research has shown that culture can act as a behaviour motivator as well as justify human actions (Vaisey 2009). Culture is defined as the "collective programming of the mind that distinguishes the members of one group or category from another" (Hofstede 2001 cited in Franke and Nadler 2008: 255). Culture is an integral part of a society's perception of what is deemed right or wrong. It dictates the ethics, laws and moral values of a group or society (Franke and Nadler 2008) as differing views on morals, values and other issues at various levels may lead to management or legal problems for organizations or even societies. Culture as a concept exists in dual mode. Thus, having "individual characteristics, but also has emergent

properties that constitute a context that shapes individual thoughts and actions" (Caldas *et al*. 2015: 8157). The adoption of new technologies is linked to economic growth and development (Erumban and De Jong 2006). Making organizations adopt and integrate new ideas and innovations such as sustainability in their supply chains is a difficult task as they often have distinct objectives and differing operational techniques (So and Sun 2011).

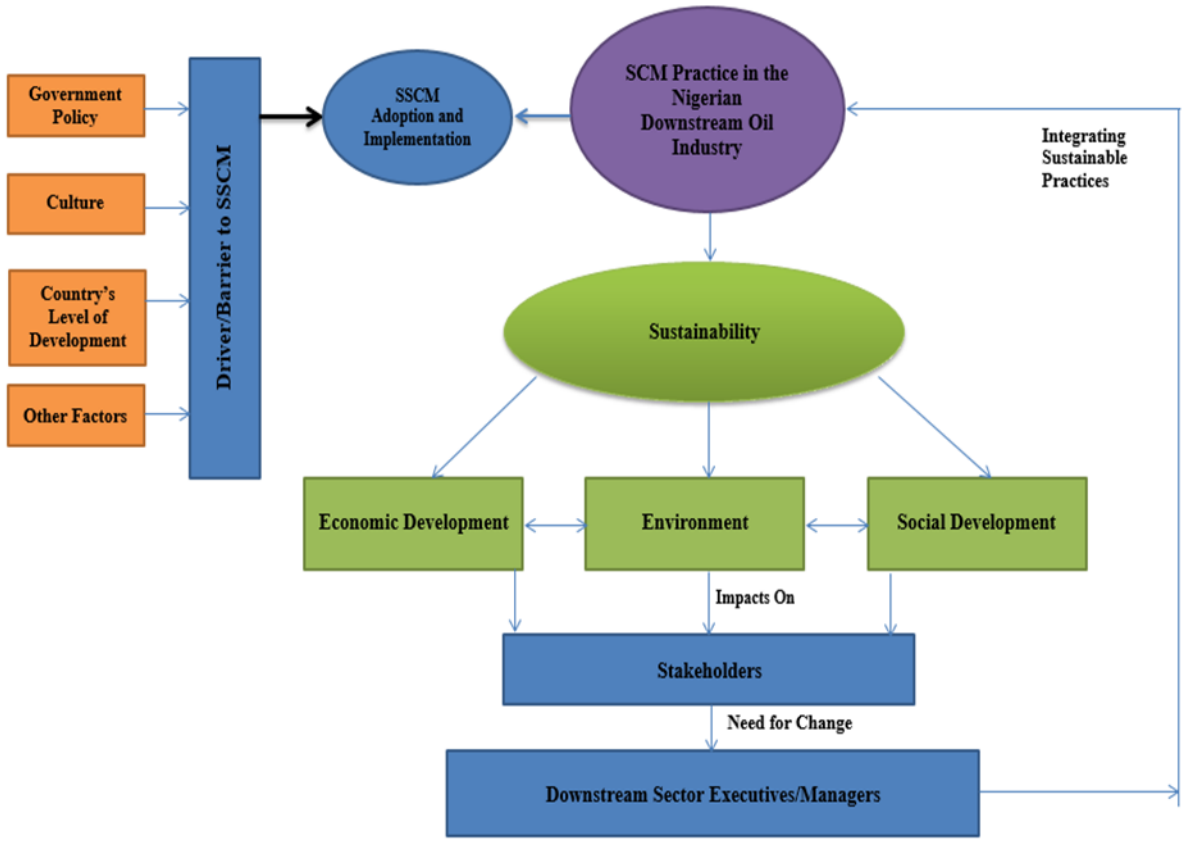


Figure 4.6 Conceptual Model for the Integration of Sustainability

In discussions regarding economic development, culture is deemed an important factor as certain traits and social patterns of a group have the potential of advancing economic activities and fostering development (Frederking 2002 and Grief 1994). Also, work by Caldas *et al*. (2015) indicate that culture plays a prominent role in the achievement of a fully integrated sustainable system and despite its complexity, should be accounted for in sustainability frameworks. The reason for this is not far-fetched as supply chain sustainability can be perceived as a "… business innovation, which represents new ideas or changes to current practices that potentially bring radical improvements to existing operations" (So, Parker and Xu 2012: 1). Hence, the successful adoption of the concept is governed by differing perspectives and values that define the cultural setting such as a nation, an organization or a group where the adaptive change is prescribed (Franke and Nadler 2008). This transcends to

enacting policies and practices necessary for sustainability adoption and implementation (Caldas *et al*. 2015).

4.6.2 Conceptual Model Explanation

SCM practices and activities in the Nigerian downstream oil industry impact on sustainability. The arrow from SCM practice to sustainability indicates this relationship. The relationship between business SCM activities and businesses is well documented in scholarly articles and studies (Agus *et al*. 2012, Beske, Land and Seuring 2014, Ellram and Cooper 2014, Hoejmose, Brammer and Millington 2013 and Lambert and Cooper 2000). This goes on to the three dimensions of sustainability; economic development, environment and social development. Double-ended arrows between the sustainability dimensions indicate the inter-relationship and corresponding influences existing between them. For example, a poorly managed land remediation activity will not only negatively impact the environmental dimension, but would also have an extended effect on the social and economic dimensions as well and vice-versa. The arrows from these sustainability dimensions points towards stakeholders who are impacted by the industry sector's activities. As indicated in the previous chapter, the downstream oil industry stakeholders are numerous. However, for the purpose of this research study, stakeholders investigated are the sectors suppliers and local communities situated around the sectors storage and refining infrastructures. Detailed reasons for this stakeholder selection are discussed in subsequent chapters.

The local communities are impacted by current unsustainable supply chain practices of the sector. A change is thus necessary to improve supply chain activities and reduce or completely mitigate its negative impact on the dimensions of sustainability. The arrow from stakeholders to downstream sector executives and managers indicate that strategic, tactical and operational decisions and actions are required from the sectors' high level leadership for a safer and high performing supply chain in the sector. These decisions would include SSCM initiatives that would enhance the effective integration of sustainable practices in the sector's supply chain, for the achievement of a sustainable supply chain and continued wellbeing of the sustainability dimensions.

In order to adopt sustainability enhancing practice, it is important that industry executives and managers integrate sustainable practices into supply chain activities via strategic and tactical decisions. This is depicted by the arrow from stakeholders to downstream executives. These high-level decisions are necessary for sustainability enhancing practice to cascade from top management down to low cadre employees and the supply chain as a whole (Epstein 2014). Thus, for there to be meaningful and

progressive change towards SSCM, top management commitment evidenced by a deliberate integration of sustainable supply chain practices into key processes in the industry sector is a necessity. This is depicted by the arrows from downstream sector Executives/Managers to SCM practice in the industry sector to SSCM adoption and implementation.

An important objective in this research study is the investigation of drivers and barriers to SSCM in the downstream sector of the case study country. Many studies have identified various SSCM drivers and barriers (Kurnia *et al*. 2014, Sajjad, Eweje and Tappin 2015, Walker, Sisto and McBain 2008 and Yusuf *et al*. 2012) in organisations and recently few studies have focused on SSCM in developing countries (Galal and Moneim 2016 and Silvestre 2015). However, investigations into country-specific motivators and challenges to SSCM adoption especially in a developing oil-producing country like Nigeria is still lacking. The arrow from drivers and barriers to SSCM adoption and implementation indicate motivators and challenges to the sectors SSCM practice. Arrows pointing from culture, government policy and country's level of development to drivers and barriers indicate that these factors can likely be motivators or barriers to supply chain sustainability as SSCM is influenced by government policies, country/organisational culture and the country's economic growth.

4.7 Data Collection

Data was collected for this study based on the selected research approach and design discussed in the previous section. The case-study research design was adopted for this study and going by recommendations made by Yin (2003), it is imperative that a case study protocol is designed prior to the actual data collection process. This is to ascertain the quality and reliability of the study.

4.7.1 Case Study Protocol

The case study protocol is an excellent way of enhancing the reliability and validity of case-study research data (Yin 1994). The case-study protocol is important in multiple-case research as it "… serves as a prompt for the interview and a checklist to make sure that all topics have been covered" (Voss, Tsikiriktsis and Frohlich 2002: 205). This is especially useful in the actual data collection process because although the case-study follows a formal procedure, the evidential information from case-studies are not readily known. Thus, a well-articulated agenda is necessary to ensure that participants are asked questions relevant to the study as well as drive the entire data collection process through collection of all necessary data required for the study.

The protocol for this case-study research can be found in Appendix H.

4.7.2 Research Instruments

Research instruments are tools or means employed by researchers to measure variables or obtaining reliable information about an event or an activity in the data collection process (Hsu and Sandford 2010 and Caspi *et al*. 1996). Variables in research can be categorised as objects or properties (Blumberg 2011: 339). Objects in this regard can be people, attitudes, opinions, and even casual things such as cars, and so on. Properties on the hand refers to the characteristics of the objects such as weight and intelligence. In data collection, instrument selection, design, construction, assessment and the terrain under which these instruments are administered all make up the research instrument (Hsu and Sandford 2010). Research instruments for data collection include questionnaire, interview, observation, and reading. To ensure the collection of accurate and adequate data, it is essential that the instrument chosen is both valid and reliable.

For this study, the research instruments employed as stated in the methodology chapter are interviews and administered surveys.

4.7.3 Types of Interviews (Qualitative Aspect)

Research interview is an important data collection approach in both quantitative and qualitative research. The use of interviews in qualitative research is aimed at seeing "… the research topic from the perspective of the interviewee, and to understand how and why they come to have this particular perspective" (King 2004: 11). In qualitative research, interviews are the most commonly employed method of data collection. The reason for this according to Bryman and Bell (2003) can be ascribed to the flexibility of interviews, as researchers often find it easier to fit interview sessions within their schedule depending on the availability of the interviewee. Interviews are useful tools for exploring experiences and meanings ascribed to such experiences by participants (Tong, Sainsbury and Craig 2007). Thus, making it possible for sensitive themes such as the sustainability concept (Vlek and Steg 2007) to be investigated in a manner that allows in-depth meanings and understanding to emanate from the study.

There are many different types of interviews in qualitative research, but these usually fall within two categories; unstructured and semi-structured interviews. Structured interviews which are characterised by clearly specified research questions are mostly found in quantitative research studies (Bryman and Bell 2003).

4.7.3.1 Unstructured Interviews

This is similar to semi-structured interviews, but quite different from structured interviews. This is because it totally embodies the flexibility and generality in "… the formulation of initial research ideas and on the interviewers' own perspectives" (Bryman and Bell 2003: 341). Unstructured interviews can be likened to a conversation between the interviewee and the interviewer. It does not follow a specific question set and the interviewee is allowed to answer freely with the interviewer simply prompting on points that seem to be worthy of further clarifications. It allows contextual intimacy between the interviewee and the interviewer such that, the interviewee is able to comfortably discuss the topic and tell his personal story as it relates to the discussion. The interviewee in this case has no prior knowledge on the direction the interview will follow and on how much information they may likely divulge in the course of the interview.

The use of unstructured interviews for sensitive topics has however been associated with certain risks such as; breaking of confidentiality agreement with possible social and legal consequences and interviewing on topics that may be distressing to the participant as it is being answered and events are being narrated (Corbin and Morse 2003). The reason being that the nature of unstructured interviews allow participants to tell personal stories and answer questions on sensitive topics, thus exposing them to the risk of sharing sensitive and personal information that may otherwise not be suitable for general knowledge or may later on make them uncomfortable. Unstructured interviews however have the advantage of providing greater clarity and breadth compared to other interview methods (Fontana and Frey 1994).

4.7.3.2 Semi-Structured Interviews

Typical of qualitative interview and in contrast to quantitative interview where the interview is designed to reflect the interviewer's concern, semi-structured interview focuses on the interviewee's perspective. A characteristic contrast between an unstructured and a semi-structured interview is the use of an interview guide in semi-structured interviews. An interview guide is a list of questions on topics to be covered in the interview. Thus, the interview progresses with the use of a set of predetermined questions (Whiting 2008).

Also, in contrast to structured interviews where the question wordings cannot be changed, in semi-structured interview, there is the opportunity to change the words but not the meaning of the question. It thus acknowledges the fact that some words may be interpreted in a different manner by the respondent (Barriball and While 1993). Hence, reliability and validity is dependent on the equivalence of meaning in questions and not on the repeated use of words (Denzin 1989).

In semi-structured interviews, interviewees can chose to answer the question the way they prefer and questions may not be asked in the order they are written in the interview guide, giving some flexibility to the whole interview process (Bryman and Bell 2003). This is especially important for this research work, as similar questions addressing the unclear factors inhibiting or advancing SSCM can be put to all interview participants and their individual point-of-view and areas of importance further prompted for clarity. This would enable the researcher to visualise SSCM practice and adoption in the case-study country through the eyes of the different respondents. Also, the participant is able to control the type of information divulged in the course of the interview and can withhold sensitive information as deemed fit (Corbin and Morse 2003).

A summation of all these perspective would allow new insights into the study and aid in drawing reliable conclusions from the collected data.

Table 4.5 Key Characteristics of Unstructured and Semi-Structured Interviews (Adapted from DiCicco-Bloom and Crabtree 2006 cited in Whiting 2008: 36 and Cassell 1980 cited in Corbin and Morse 2003: 340)

Semi-Structured Interviews	Unstructured Interviews
• **Scheduled in advance at a designated time**	• Guided conversations
• **Venue/location is normally**	• Originate from ethnographic and anthropological studies
• **Conversation is guided by predetermined questions**	• The interview agenda is determined by the interviewee through the events they choose to tell.
• **Interviewee may withhold sensitive and important information because the relevant question was not asked, may choose to answer in a perfunctory manner, or fully cooperate**	• Interviewee has control over the pace of the interview and the amount of information that will be disclosed and the emotional intensity
• **More questions emerge from participant's responses or dialogue**	• The interview experience can be enhanced by the interviewer via active listening and asking questions

4.7.4 Selected Interview Type

The selected interview type for this study is the semi-structured interview. The reasons for this selection is based on its characteristics as identified in Table 5.1. The complexity of the sustainability

paradigm (Wallner 1999) coupled with its challenging integration with SCM (Seuring and Muller 2008), calls for a holistic approach and well informed view that is not subjected to the rigidity or over-flexibility of the interview questions and process as is the case in the structured and unstructured interviews.

Hence, in order to gain in-depth understanding of SSCM regardless of its complexity and to elucidate a first-hand view of senior executives that are in the position to influence supply chain activities and the integration of sustainability into these activities, it is imperative that a semi-structured interview process is adopted. A data collection medium such as typified by semi-structured interviews is necessary to provide a platform for an in-depth exploration of the opinion of downstream oil industry participants nominated for this study. This selection is necessary to articulate the perception of these experienced personnel and understand how the level of development of the case-study country influence SSCM practice as well as evaluate country specific factors that drive or hinder a high performance SSCM. This point is further buttressed by (Barriball and While 1994: 330) who stated that semi structured interviews are "… well suited for the exploration of the perceptions and opinions of respondent regarding sensitive issues and enable probing for more information and clarification of answers".

The use of semi-structured interviews for this research work was aimed at understanding the drivers and barriers in SSCM adoption, the current SSCM measures being employed and how the level of development of the case-study country influences the practice of SSCM in the refining, transportation and storage links of the downstream oil industry from the perspective of industry practitioners. This is required for a critical evaluation of variations in SSCM in the case-study countries.

4.7.5 Interview Questions Design

A core part of all interviews is the verbal interaction between the person conducting the interview (interviewer) and the interviewee, the person to whom the question is directed (Berry 1999). In order to explore the actual practice of SSCM, a flexible, conversational but standardised interview question set is required. For this reason, semi-structured interviews with open-ended questions were employed in this study.

In order to develop an all compassing interview question set that addresses the research objectives in a study, it is essential that careful thought is put into the interview question design as any fault that goes into the design of a research tool will ultimately affect the final results (Denzin 1989). To

adequately cover the scope of the research objectives and to elucidate the influence of the level of development in the case-study country on SSCM practice, it is essential that the interview questions evolve in-depth enquiry (Barriball and While 1994).

The question sets also need to be standardized to enhance comparability of responses during data analysis. To achieve this, a detailed and rigorous review of literature on SSCM, the oil industry, government documentations in the case study countries was conducted and this informed questions for the interview. The questions were divided into sections to cover the three dimensions of sustainability and according to the research objectives. Following in the line of Walker, Sisto and McBain (2008), an interview protocol was designed based on reviewed literature and discussions with sustainability and supply chain management academicians, and industry experts in the pilot study stage of this study.

4.8 Pilot Study

A pilot study is an essential element in clarifying data collection plans with regard to the content of the research instrument and the procedures to be followed (Yin 2003). Conducting a pilot study prior to the actual data collection is an appropriate way of developing ideas and also allows for the exploration of the implications of these ideas. Maxwell (2008: 214) stated that pilot study does not only serve as a source of additional information for a research study, but also provides a researcher with an indept understanding of the meaning of the phenomena and how it is perceived by the actors. This explanation justifies the reason for conducting a pilot-study for this work. Being an exploratory study looking to understand causal-effect of a country's developmental level on a sustainable supply chain, SSCM drivers and barriers, a pilot-study is crucial to a deeper understanding of the study and to evolve responses from the participants as well as meanings that would formulate reliable and valid conclusions on the study (Barriball and While 1994).

Following the preparation of the interview questions, a draft copy was sent to oil and gas experts in the field of sustainability and supply chain management to evaluate the content, design and linkages between the research aim, objectives and questions. This process is described as internal testing (Mann 1985 cited in Barriball and While 1994: 333). Internal testing is an important pre-data collection assessment where draft interview questions or survey questionnaire are exposed to the judgement and criticism of academic experts and knowledgeable individuals in a certain field to sieve through the technical details, ambiguities, question format and template in order to evolve a complete question set that is appropriate for the study.

Three academicians in supply chain management and two experts in research study methodology were involved in the evaluation of the draft interview questions. They assessed the content of the draft question set for relevance and completeness with respect to its subject domain and research objectives. Feedback such as improving clarity and syntax from this exercise was incorporated and a second draft question set was designed. This ensured that the content of the interview question set was directed to addressing the research problems in this study.

The second draft of the interview questions was then sent to four oil industry professionals working in the capacity of supply chain and logistics managers ; one in the upstream sector, two in the downstream sector and one in oil and gas servicing firm. This was followed by a short telephone discussions lasting about 10 to 15 minutes on the aim of the research, benefits and their thought on the interview questions and the study as a whole. The reasons for this exercise were to firstly appraise the ease of understanding of the questions and its content. Secondly, to assess the applicability of the questions to the supply chain link under-study and the research aim and thirdly, to verify the industrial relevance of the interview questions in addressing factors influencing SSCM in the oil industry as a whole since the supply chain activities of both sectors are integrated. Feedback from these oil industry professionals was insightful in the reformulation of some questions for ease of understanding using less academic and technical terminologies. Also some of the interview questions for some of the supply chain links under-study were fine-tuned in order to generate responses that would answer research questions in this study. Many of the suggestions that emerged from this activity were deemed useful. These were integrated into the question set and further iterations made to guarantee that the interview questions were well articulated and aligned to the research aim and objectives.

A final copy of the interview questions was afterward forwarded to all reviewers; that is academicians and industry experts for a final review of the corrections and iterations made and to ensure that no important suggestion and information had been overlooked in the final set of interview questions. A positive response on the final content of the interview question set was obtained from the reviewers after which, the interview questions were regarded as final and *ready–to-go*.

Conducting a pilot study was not only a useful activity in fine-tuning as well as adding new and overlooked information to the interview questions, but it was also a useful activity for the researcher to identify areas where further probing would be required during the interview session and also know when the interview was going off its line of enquiry. It was also a useful way for the researcher to

gain more knowledge on the entire data collection process, the practical aspect of the oil industry activities and the research theme as a whole.

4.9 Informant Selection

Unlike in quantitative research approach, where the aim is to test defined hypotheses to emanate generalizable results via randomized or probability sampling of a population, qualitative studies aim to answer explore complex human issues by providing answers to "why" and "how" questions through the selection and probing of an appropriate sample size that are have the capacity to provide adequate answers to the research questions in the study (Marshall 1996). It is important to note here that the term "sampling" in qualitative research refers to participant and document selection (Polkinghorne 2005). The number of participants in qualitative research is usually small compared to its quantitative counterpart where a large sample size is required in order to make valid generalizable inferences on the population (Bryman and Bell 2003).

There are three broad approaches to sample selection in qualitative studies; convenience sampling, judgement sampling and theoretical sampling (Marshall 1996). Also, qualitative research is guided by the purposeful selection of participants unlike its quantitative counterpart where a random selection is made from a population for a generalized statistical analysis and opinion about the entire population (Miles, Huberman and Saldana 2014). Purposive sampling like probability sampling is designed to provide "… a sample that will answer the research questions under investigation" and is "…concerned with issues with generalizability to an external context or population" (Teddlie and Yu 2007). Though characterized by a small sample size, it however has the benefit of in-depth investigation and thus provides detailed information on the phenomenon being studied. Purposive samples can be of various types, however a common feature is that participants are chosen based on a predetermined criteria relevant to the research objectives (Guest, Bunce and Johnson 2006). Three key criteria adopted for this purpose were; *years of experience* which was (6 to 15years), *qualification* and *area of specialty/professionalism* (sustainability, SCM, SSCM, HSE and QM).

Sixteen types of qualitative sampling strategy were identified in the works of Miles and Huberman (1994: 28). Some of these strategies are; snowball, maximum variation, critical case, random purposeful, extreme or deviant case, criterion, politically important cases, theory based, opportunistic, convenience, and combination or mixed sampling strategy.

In order to address the limitation of bias of random respondent selection in qualitative studies and also ensure that respondents selected for this study are knowledgeable in SSCM practices in the downstream supply chain links under-study, the snow-ball sampling strategy (Creswell 1998, Miles and Huberman 1994, Miles, Huberman and Saldana 2014 and Patton 2002) was adopted in this study.

4.9.1 Snowball Sampling Strategy

This is a method often adopted in qualitative sociological research (Biernacki and Waldorf 1981) and is described as the most widely adopted sampling method in qualitative research (Noy 2008). The snowball sampling procedure also referred to as the chain referral sampling method is a data collection technique that allows a researcher access to informants via contact details provided by other informants (Biernacki and Waldorf 1981 and Frank and Snijders 1994).

The technique by nature is repetitive, as new respondents are referred to the researcher by a previously interviewed respondent. This new respondent is contacted and interviewed by the researcher after which contact information of a new respondent is provided to the researcher and the process continues. Lincoln and Guba (1985) recommended the use of the snowball strategy to add new participants as a study progresses. It is an advantageous technique due to its characteristic progression based on successive nomination of respondent after information from the previous source has been fully analysed and filtered. The snowball strategy is suitable for identifying knowledgeable people who are information-rich on the subject of discussion. Thus, new and knowledgeable subjects are introduced or recommended to the study by a previously interviewed subject, and the chain goes on like a '*rolling snowball down a hill*' (Lincoln and Guba 1985, Patton 2002).

Interview respondents were identified from initial contacts made with the corporate head office of the NNPC. As stated in chapter 3, the NNPC is a state-owned organisation responsible for the management of the Nigerian downstream oil sector. In order to make the initial contact, a formal letter introducing the study, researcher, the academic institution where the study was being conducted and a request for the participation and contact details of senior managers working in the capacity of supply chain and logistics management, HSE and sustainability and within the scope of the supply chain links of this research study was sent to the NNPC corporate head office. Specific emphasis was made to bear on the supply chain links of this study as well as the job roles, years of experience and cadre required for participation in the study. A contact person who worked in the capacity of a senior manager in the NNPC corporate head office was introduced to the researcher who identified the first respondent and from there, a network of other senior managers in the refinery, as well as the

transportation and storage links of the supply chain was built based on further referrals from the initial group of respondents.

4.10 Interview Process and Procedure

The sample size in purposive sampling is dependent on the point where theoretical saturation is attained (Bowen 2008 and Guest, Bunce and Johnson 2006). Unlike traditional sampling methods where the sample size is known before hand and stipulated as 'N' from a calculated formula, purposive sampling is different in that the sample size required for the research inquiry is not based on 'statistical confidence level' but rather is dependent on the stage at which information redundancy (theoretical saturation) is attained (Lincoln and Guba 1985). Theoretical saturation is the point where new or supplementary information is not being obtained from new sources and this is evidenced by data replication or redundancy.

Many works have recommended various numbers of interviews when adopting purposive sampling strategy (Guest, Bunce and Johnson 2006). As stated in previous chapter, this research work is based on the phenomenological paradigm. Creswell (1998: 122) stated that data collection in a phenomenological study entails in-depth interviews with as many as 10 participants. Morse (1994) recommends a minimum of 6 respondents for phenomenological studies. Dukes (1984) recommend a minimum of 3 up onto 10 respondents. Bowen (2008) and Guest, Bunce and Johnson (2006) in their work criticised the unclear and often evasive explanations on determining sample sizes and blueprints of how saturation can be achieved leaving the readers oblivious of the steps taken to arrive at information saturation. In order to estimate the point of data saturation and variability in a homogeneous study, Guest, Bunce and Johnson (2006) examined the perceptions of social desirability bias (SDB) using semi-structured, open-ended interviews in two-case study countries. Based on the data set, the authors found that saturation occurred within the first 12 interviews and basic elements of meta-themes were already present in the first six interviews.

A total of 13 respondents in the downstream oil industry supply chain link of study and their stakeholders were interviewed to explore how the developmental level of the host country influences SSCM practice and performance in the industry sector. The participants that were interviewed comprised of senior managers across the 3 NNPC refineries, 6 zonal distribution centres, the government regulatory body (Department of Petroleum Resources – DPR) and major downstream suppliers. The number of participants interviewed in this study can be justified based on the work of Guest, Bunce and Johnson (2006). Also in this study, similar to the discovery of the Guest, Bunce and

Johnson (2006), at the end of the transcription of the sixth interview, similar responses were being given by respondents and reoccurring themes were already being identified from the transcribed data before actual coding commenced.

Prior to commencing the interview session, the participants were briefed of the purpose of the research, how long the interview would last for, how the results will be used and the benefits of the study. This is in-line with recommendations given in the work of Creswell (1998). It is important to note here that the researcher had been in contact with the participant via emails and telephone calls to establish rapport and also to pass on the above information. A consent form had also been sent by email to the participants. This was signed and returned via email before the interview date.

Interviews were conducted in English language over the telephone and the average duration of the interviews was between 45minutes to 1hour and all interviews were audio-taped. The use of telephone interviews instead of the popular face-to-face interview (Novick 2008 and Opdenakker 2006) was based on its many advantages. Specifically for this study, some of the benefits of conducting the interview over the telephone are; reduced cost with regards to travelling to the case-study country; overcoming the challenge of difficulty in locating and interviewing these sparsely located respondents; and the safety of the researcher was not jeopardized as some of the supply chain links understudy are situated in terror-attack prone areas (Northern part of Nigeria and the Niger-delta area).

The argument for the use of telephone interviews in this research work would be inconsistent if some of the disadvantages of this technique are not highlighted. Many works have identified some of the advantages and limitations of telephone interview in their work (Bryman and Bell 2003, Carr and Worth 2001, Creswell 1998, Chapple 1999, Sturges and Hanrahan 2004 and Sweet 2002).

4.10.1 Telephone Interview

The use of telephone interview is beneficial in the area of cost as it is often cheaper to conduct an interview over the phone instead of accruing travel expenses especially where there are various locations and which often times are long distances from the researcher's location (Blumberg, Cooper and Schindler 2011, Bryman and Bell 2003, Creswell 1998, Novick 2008 and Opdenakker 2006). Also the telephone interview is useful in eliminating response bias in the part of the interviewee that may originate as a result of the interviewer's personality, class or ethnicity. The interviewee maybe intimidated by the interviewer's presence and may simply want to give responses that he feels the interviewer would like to hear. These type of responses would defeat the overall aim of the interview

process and the study. Issues like this can be eliminated using telephone interviews where the interviewer's personal characteristics are not visible to the interviewee, therefore reducing the occurrence of this type of bias. It is also easier to supervise and fix appointments for telephone interview. This was an observation by the researcher during the data collection process. During telephone interviews, interviewees have been described as being more relaxed, able to talk freely and in a better position to disclose sensitive information. Also due to the fact that telephone conversations can be had at any time of the day and also because senior managers worked within a tight work schedule, it was particularly easier to fix telephone interviews to times outside the normal working hours which could be late in the evening or very early in the morning so far it is a convenient time for the interviewee. This feat cannot however be achieved in face-to-face interviews as these kind of arrangement may be difficult to achieve especially on the part of the interviewee.

Despite these benefits, the use of the telephone interview has its limitations. To have an interview over the telephone, a primary requirement is for the interviewee and the interviewer to have access to a telephone. In some organizations, lower status employees do not have access to personal official phones and if they are the target of the study, it becomes impossible to have a telephone interview with them. This was however not a problem in this study as only senior managers were participants and all of them had access to official phones. Also, in cases where the interviews were scheduled to after office-hours, mobile telephone contacts were also provided so that they can be reached at the agreed appointment time for the interview session.

Another limitation in the use of telephone interviews, is the absence of visual cues (Carr and Worth 2001). Face-to face interviews afford the interviewer the opportunity to observe the interviewee that is being able to observe signs of discomfort, puzzlement or other facial or body expressions when asked or responding to certain questions (Bryman and Bell 2003). The luxury of this added information is not available in telephone interview as the interviewer is unable to physically see the interviewee during the interview session. This data loss due to non-visual cues according to Novick (2008) may not necessarily be important in studies where data analyses are more reliant on transcripts rather than field notes. Also, many at times, non-verbal information conveyed in gestures or expressions are misinterpreted and in such instances, this does not add any value to the study (Styurges and Hanrahan 2004).

In some instances, the absence or loss of rapport between the interviewee and the interviewer may limit the effectiveness of telephone interview (Sweet 2002 and Novick 2008). This is because for any form of interview, rapport is essential for detailed and useful data.

In order to considerably reduce the impact of the limitations of telephone interview in this study, structures were put in place to address some of the issues highlighted above.

Prior to commencing the interviews, rapport was built with participants via emails and followed by telephone calls. This was to introduce the research study in simple terms and also introduce the researcher. After the second telephone conversation, many of the participants were more comfortable to speak with the researcher and the only hurdle was finding an appropriate time for the interview. Also, this research study being an exploratory study that aims to identify how a country's level of development influences SSCM practice, is more dependent on transcripts and not necessarily on field notes. According to May (1991), most studies involving interviews are generally reliant on audio-taping which would afterward be transcribed and studies involving participant observation and informal interviewing are more reliant on field notes for data logging. The interview technique in this study though involves the use of semi-structured interviews, the interview process itself is formal. This is not to say that observations during interview sessions and notes made through the entire process was discarded as these are also useful sources of information, but the emphasis was on capturing the perception of downstream oil industry experts on SSCM practice; how they view the impact of the country's level of development on their adoption of SSCM and what drives or hinders their current SSCM performance.

4.10.2 Use of Audio-Tape

Audiotapes were used in this study to capture participant's responses verbatim. The use of audio tapes with the approval of the participant is an effective way to replicate interview discussions and thus, facilitate data analysis (Barriball and While 1994). Audiotaping of interviews is an important step in eliminating bias during data collection and analysis as it gives room for a complete and detailed review of collected data sets (May 1991). Also verbal cues such as long pauses, intonations and so on can be picked up with the use of an audiotape, therefore increasing the overall definiteness and completeness of the collected data. It is also a good way of eliminating logging mistakes on the part of the interviewer (Barriball and While 1994). The use of audiotapes during the interview sessions was particularly useful as it gave the researcher an opportunity to listen during the interview as he does not have to write everything being said by the interviewee, but only taking notes where necessary (Patton

2002). Listening and not writing during the interview helped to quickly identify areas for further probing from the interviewee's responses and these questions were put forward to the interviewee for further explanation.

4.11 Sample Selection (Stakeholder Selection)

The oil industry supply chain is characterised by numerous stakeholders. In order to prioritise stakeholders in supply chain links being studied and select respondents pertinent to answering the research questions and achieving the aim of this study, an extensive analysis and evaluation of the downstream oil industry stakeholders in the refining, transportation and storage links was conducted. Works of Clarkson (1995), Freeman and Reed (1983) and Mitchell, Agle and Wood (1997) were employed in the classification and selection of important stakeholders to this study (see table 4.6). This selection identifies NNPC, Department of Petroleum Resources (DPR), suppliers, Nigerian government, and local communities as important stakeholders in this study. Data collection via questionnaire was limited to local communities, NNPC employees and suppliers. Interviews were employed in collecting data from oil industry regulatory organization (DPR) which is owned by the Nigerian government, senior managers in NNPC and suppliers. As mentioned in earlier chapters, the use of the quantitative research technique is to complement the qualitative techniques being adopted in this work to ensure that a detailed and information-rich data is obtained.

There are four refineries and six zonal distribution terminals in Nigeria. The Nigerian government own, manage and regulate the downstream oil sector in Nigeria, thus senior managers from DPR and NNPC represent the interest of the Nigerian government and thus data was collected from respondents in this category.

Local communities around downstream infrastructures also emanated as important stakeholders with regards to SSCM. These are villages, towns and cities close to the refineries, storage and distribution terminals. These play a prominent role as primary stakeholders and are usually direct recipients of the impacts of the activities of the downstream oil industry. The reason for this can be attributed to the fact that they experience first-hand, the direct and cumulative effects of the downstream oil operations (Vivian, Blamah and Ezemokwe 2012)

Table 4.6 Stakeholder Classification(Based on the Works of Clarkson (1995), Freeman and Reed (1983) and Mitchell, Agle and Wood (1997), Type and Level of Impact of Oil Industry Downstream Activities on Stakeholder and Vice-versa).

Stakeholders	Clarkson (1995)	Freeman & Reed (1983)	Mitchell, Agle and Wood (1997)	Type of Impact	Level of Impact
Nigerian Government	Primary	Power (fomal, economic & political) and Stake (equity, economic & influencer)	Definitive	Direct	Significant
NGO	Secondary	Power (political) and Stake (influencer)	Demanding	Indirect	Insignificant
NNPC Employees	Primary	Power (economic) and Stake (economic)	Dominant	Direct	Significant
DPR	Primary	Power (fomal & economic) and Stake (equity)	Dominant	Direct	Significant
Trade Unions	Secondary	Power (economic & political) and Stake (economic)	Dominant	Indirect	Significant
Suppliers	Primary	Power (economic) and Stake (economic)	Dominant	Direct	Significant
Local Communities	Primary	Power (economic & political) and Stake (economic)	Dependent	Direct	Significant
Militants & Pipeline Vandalisers	Secondary	Power (economic) and Stake (influencer)	Dangerous	Direct	Significant
Marketers	Primary	Power (economic & political) and Stake (economic)	Dominant	Direct	Significant
Consumers	Primary	Power (economic & political) and Stake (economic & influencer)	Dominant	Direct	Significant

4.12 Questionnaire Design and Administration

Data reliability and internal validity as well as the response rate in a study depend considerably on the design of the questions for the study, sequence and structure of the questions and the effectiveness of the pilot test conducted prior to data collection (Saunders, Lewis and Thornhill 2014). Questionnaire design plays an important role in the percentage of completed questionnaires relevant to a study (Saunders, Lewis and Thornhill 2012). Bryman and Bell (2003) recommends an attractive questionnaire layout with distinct and readable questions for a high response rate. Two main objectives are crucial in questionnaire design and these are; to maximize the response rate and to collect detailed data for the study (Leung 2001). Non-response has been identified as a potential source of bias in survey research (Barclay *et al*. 2002).

The questionnaire design for this study was based on Blumberg (2011: 388) strategy for instrumentation design. Instrument design according to Blumberg (2011) is a combination of three phases. Phase 1 is characterised by four strategic concerns for questionnaire design; data type required to answer the research question, type of communication approach to be employed for the data

collection; choice of questions to be used, whether structured, unstructured or a mixture of both; and the choice of using disguised or undisguised questions (see Figure 5.1). The construction and refining of the questions in the questionnaire is the prominent feature of the Phase 2 classification. Phase 3 is characterised by the arrangement of the questions, adding instructions, further refining as required and pre-testing of the questionnaire.

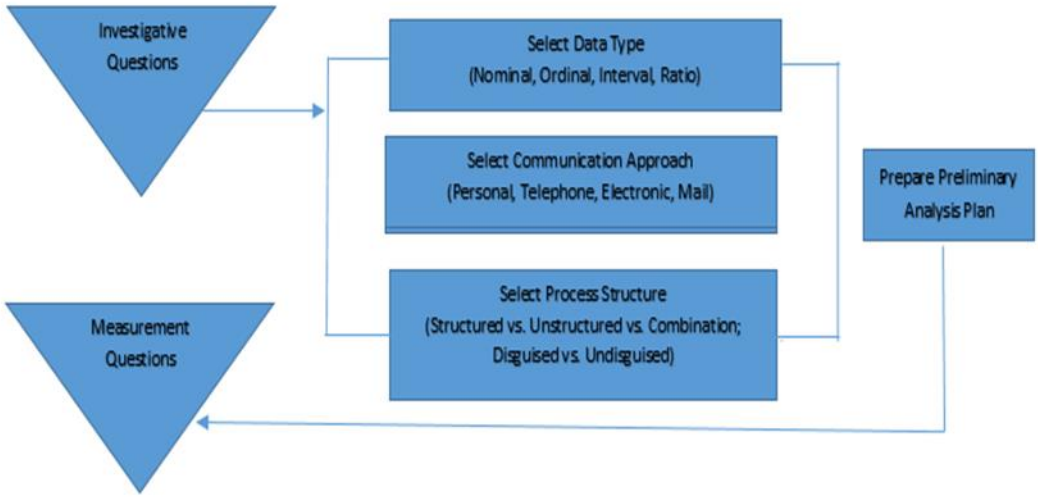


Figure 4.7 Flowchart for Questionnaire Design Based on the Four Levels of Strategic Concerns (Adopted from Blumberg, Cooper and Schindler 2011: 389)

The first step in the design of the questionnaire for this work was the revisiting of the research questions and aim for this study. This was done in association with an expansive literature search. This was to inform the required variables to be measured with the questionnaire and aid in identifying the type of data required and how the questions will be construed and analysed later. Data type acquaints a researcher on the analytical procedure in the data analysis stage of research (Blumberg 2011). Deciding on the kind and sequence of questions for this study was done rigorously in order to eliminate any form of bias especially with regards to internal validity and reliability of the responses from the study. Internal validity is the ability of a research questionnaire to measure what it is intended to measure (Saunders, Lewis and Thornhill 2012).

The questionnaire was designed using the BOS (Business Online Survey) survey made available by the University. Many of the questions for the questionnaire for this study were developed to specifically measure SSCM practice and the influence of the level of development of a country on SSCM. Also some of the questions were adopted from SSCM literature. Researchers are allowed to design questionnaire questions from their own questions or by adapting or adopting questions from

other questionnaires (Bourque and Clark 1994 cited in Saunders, Lewis and Thornhill 2012: 431). These questions mirrored the research questions, but in a manner that allowed sequencing and simplicity to meet the research objectives whilst eliciting detailed and knowledge rich responses from respondents.

Content validity which is the degree to which the questions in the questionnaire adequately addresses the scope of the concept under study was ascertained by exposing the questionnaire to academicians in the field of SSCM and discussion with experts in questionnaire design after a thorough literature review was conducted as recommended by Saunders, Lewis and Thornhill (2012).

Two questionnaires (*Questionnaire 1* and *2*) were designed for this study in order to provide a holistic outcome to the entire data collection process as was done by Bowen *et al*. (2001) and Sharma and Enriques (2005). *Questionnaire 1* was designed specifically to collect data from downstream oil industry supply chain links understudy in addition to the data collected from interviews in-line with the recommendation of Creswell and Plano Clark (2011: 71) while *Questionnaire 2* was designed to collect data from stakeholders in the supply chain links being studied in the case study country.
Similar to the interview questions, drafts of the questionnaires were exposed to rigorous internal and external evaluation. The first draft of the questionnaires were internally evaluated by the supervisory team and quantitative technique experts in the Coventry University for feedback on question structure, analysis methods and so on. Feedback from this exercise was inputted in the questionnaires. The questionnaires were afterward administered to five colleagues and three SSCM and sustainability experts in various departments within and outside the university. Suggestions and advice from this exercise was also useful in fine-tuning the questions and this evolved the 2nd draft questionnaire which was employed for the pilot test.

For the pilot test, the 2nd draft Questionnaires 1 and 2 were administered to six oil industry professionals in the downstream oil sector and six oil industry community locals in Nigeria. Results from this activity were discussed with the supervisory team. This exercise further informed some more changes in the question structure, added clarity in contents and the number of questions was further reduced to increase the response rate as suggested by some of the respondents. This was further incorporated into the final questionnaire.

4.12.1 Questionnaire 1; Downstream Oil Industry Senior Managers and Suppliers

As recommended by Leung (2001), in order to maximize the proportion of respondents answering the questionnaire for this study, careful consideration was put into the administration of the questionnaire. The questionnaire had a short introductory section, a section on the respondent's organization and three main sections. The three sections covered the sustainability performance, drivers and barriers to SSCM, and impact of a country's level of development, government policies and culture on SSCM. A combination of open-ended and closed questions was employed in questionnaire. This was to allow the exploration of a wide range of possible themes arising from the practice of SSCM and its drivers and barriers in the case-study country and to ensure that responses can be easily compared as well as ensure that respondent are not discouraged by the length of time it takes to complete the questionnaire (Leung 2001 and Saunders, Lewis and Thornhill 2012). Structured questions with closed responses were used to obtain responses from the respondents on their knowledge of SSCM, organizational view and attitude towards SSCM. Due to the sensitive nature of this study, especially to oil industry professionals, initial questions on each of the main sections collected information on less sensitive issues, while questions regarding more sensitive factors such as the industry's practice and their impact on sustainability dimensions were introduced in the middle of the section, where it is expected that the interest of the respondent has been caught and he is in a more comfortable position and right frame of mind to complete the questionnaire without being apprehensive and without any form of bias (Leung 2001).

Ranking and rating questions were also used to elicit responses on sustainability performance, drivers and barriers to SSCM and the degree of influence of the level of development of the case study country, government policies and culture on the SSCM performance of the organization.

Questionnaire 1 was administered via email using the BOS link. During data collection in the interview stage of this research study, interviewees were requested to give email details and telephone contacts of knowledgeable colleagues as well as give contact details of some of their suppliers. These contact details were compiled and where possible contacted over the telephone. Formal letters requesting their participation in the survey, informed consent, questionnaire online link and a softcopy of the questionnaire were afterward sent to these contacts. This was followed-up with telephone calls where telephone numbers were provided. Request letters and all documentations sent via email to the respondents were written on Coventry University letter headed paper and carried the name and signature of Head of Postgraduate and Research Office. Also, the researcher did not disclose her identity as a student. In order to improve the response rate, reminder emails with questionnaires were

sent every two weeks with follow-up telephone calls. All reminder documentations were also written on University letter headed paper and carried the name and signature of Head of Postgraduate and Research Office.

A total of forty eight questionnaires were mailed to respondents as this was the number of contact emails available. Eighteen completed questionnaires were received of which seventeen were well completed and thus deemed useful to supplement interview responses.

4.12.2 Questionnaire 2; Downstream Oil Industry Stakeholders

As would be expected, the questions here were different as the respondents are local people living around the downstream oil infrastructures under-study. All protocol observed in *Questionnaire 1*, were also adopted here with regards to the question structure and type of questions. Also, in '*Questionnaire 2*', technical terms and acronyms such as *SSCM* (even though definitions for this was provided where it was used) were completely avoided and the questionnaire was made as simple as possible so that the only requirements to complete the questionnaire was that the respondent should be able to read and should be residing around the oil industry infrastructure.

Questionnaire 2 was administered mainly by direct hand-to-hand delivery to the respondents. This was aimed at improving the response-rate and also due to the level of development in Nigeria, mixed levels of exposure and access to the internet in the category of respondents required to complete this questionnaire. Also, many authors (Blumberg, Cooper and Schindler 2011, Saunders, Lewis and Thornhill 2012 and Yin 2003) have iterated that questionnaires administered by hand often record a higher response rate compared to those administered by email or post. Many of the completed questionnaires were collected after completion while some were collected at later date.

A convenient sample of 100 was selected while maintaining the need to integrate an element of randomness in the selection of respondent across the downstream infrastructures. A total of 85 completed questionnaires of which 79 was deemed useful and well completed.

4.13 Secondary Data Collection

The use of secondary in research cannot be disregarded as it has been employed as a data collection method in many fields of knowledge such as; empirical economic research (Atkinson and Brandolini 2000), epidemiological research (Sorensen, Sabroe and Olsen 1998), medical research (Mann 2003) and educational research (Smith 2010) to mention a few. The reason for this may be attributed to the difficulty of obtaining valid primary data (Cowton 1998). Secondary data can be defined as "…

information or data that has already been collected and recorded by someone else, usually for other purposes" (Blumberg, Cooper and Schindler 2011: 236). It is data collected by someone other than the researcher. It is devoid of any specific hypothesis. Secondary data sources appropriate for research studies are existing information that are available in public domain and oftentimes already published (Clark 2013). Such data may be from government and regulatory organizations, company reports and documentation, media publications, pre-existing databases, brochures and academic journals and articles (Cowton 1998).

Many works have however criticised the use of secondary data in place of primary data in research studies (Smith, 2010, Sorensen, Sabroe and Olsen 1998 and Mann 2003). Secondary data are usually data collected for other purposes and thus may not be adequately suited for what the researcher intend to use it for and in many cases may be incomplete. The incompleteness of secondary data for other purposes other than what it was primarily collected for and the independent nature of the data set may lead to a high sample bias (Blumberg, Cooper and Schindler 2011 and Mann 2003). Also, it is sometimes difficult or impossible to guarantee the accuracy or much more the quality of secondary data especially if the source of the data is unknown (Blumberg, Cooper and Schindler 2011). This can pose serious problems if used for comparative studies as the content of the data set cannot be trusted and may defeat the entire purpose of the study. To reduce this limitation, Blumberg, Cooper and Schindler (2011) recommend the use of reliable data sources such as official sources and renowned research agencies. Another limitation of secondary data is the often mismatching of definitions and themes. Since the data was collected for other purposes, there is an increased tendency that definitions and headings will be different from the study that it is to be adopted for.

Despite these limitations, secondary data sources are many and have the potential to be rich sources of data (Mann 2003). Secondary data are known to save time and reduce cost. This is because the tedious task of collecting primary data and the associated cost is reduced since this form of data is readily available (Blumberg, Bryman and Bell 2003 and Cooper and Schindler 2011, Mann 2003). The adoption of secondary data for some aspects of this research work, specifically for the UK case study is anchored on three factors; time saving, availability of high quality data for the UK oil industry and availability of data to complement collected primary data (Cowton 1998). The nature of this research study being a comparative study requires that data is collected from two case-study countries. However, in order to carry out this exercise and obtain high quality data within the time frame of one year proved a challenge. Gaining entry into the UK oil industry was quite challenging as many of the downstream oil companies did not respond to letters of request to participate in the research study

and many did not give a favourable response when contacted by telephone. Those that responded declined to participate based on confidentiality agreement despite repeated assurance that all collected information will be treated as confidential and all participating companies and participants will remain anonymous. In order to proceed with the research, the researcher looked through various secondary data sources to ascertain that information regarding the UK downstream oil industry is readily available and can be accessed from these sources. Published data from governmental and regulatory bodies, oil companies in question, oil industry trade associations and other related companies, books, magazines, newspapers and reports prepared by scholars and academic researchers all serve as sources of useful data for the UK case-study country.

Many works have employed the use of secondary data specifically for investigations on the UK. Panagiotidis and Rutledge (2007) used secondary data to examine the relationship between UK oil and gas prices over a period of time; Davies, Peters and Caldeira (2011) evaluated CO_2 emissions in the downstream oil industry supply chain using secondary data sources; and Sorrell et al. (2010) conducted an extensive review of secondary data sources to estimate global oil depletion.

In order to make the use of secondary data in this research work worthwhile and serve the purpose of providing usable data, considerations recommended by Blumberg (2011 and Sorensen, Sabroe and Olsen (1996) were employed. According to the authors, efficient use of secondary data can be achieved by the merging of multiple secondary data sources; critical evaluation of research problems that can be investigated with the available data; and modifying the research problem to the available data. These recommendations apart from the latter were quite adoptable for evaluating the UK case-study country. Achieving the third recommendation however was a tricky task as it had the possibility of reducing the relevance of the research questions and the research itself, in a bid to fine-tune available data to match or answer the research questions (Blumberg 2011). This feat was however not required in this study as secondary data specifically for the case-study country in question was available in the secondary sources listed above.

Also, to adequately decipher the information in some of these data sources, the five-step data mining technique described in the work of Blumberg, Cooper and Schindler (2011:249) was employed.

4.14 Summary

This first part of this chapter evaluated the theoretical background for research methods selection and possible research methods in literature. It examined the objective and subjective research paradigms and justification for the position adopted in this study. It also examined the mixed research method and justified the selection of the embedded design approach for the qualitative and quantitative aspects of the research study. A conceptual model was proposed for the integration of SSCM in the Nigerian downstream oil sector.

The rest of the chapter focused on data collection from the refining, transportation and storage supply chain links of the Nigerian downstream oil industry in order to evaluate the adoption and practice of SSCM and the influence of the country's level of development, political stability and culture on the industry's SSCM performance. A mixed method data collection strategy was adopted in this chapter for data collection and this involved the use of both quantitative (survey administration) and qualitative techniques (interview). The use of qualitatively obtained data guides this research study to identify the factors acting a drivers or barriers to the adoption of a high performance SSCM in the supply chain links understudy. Data collected from administered surveys will reveal the how the supply chain links understudy affect its stakeholders as well as capture stakeholder expectations and perception with regards to sustainable practice in the downstream oil sector supply chain.

5 Data Analysis

5.1 Introduction

The chapter is categorised into two sections with one section covering quantitative data and another section for the qualitative aspect of this work.

Quantitatively collected data was analysed using the SPSS software. Nvivo 10 software package was adopted for data coding and for developing themes from the collected interview data. Emanating themes were further categorised and matched together where applicable to provide answers to the research questions.

5.2 Qualitative Data Analysis

Qualitative data analysis is the process of metamorphosing data into useful outcomes (Patton 2002). It refers to the "… nonmathematical process of interpretation, carried out for the purpose of discovering concepts and relationships in raw data and then organizing these into a theoretical explanatory scheme" (Strauss and Corbin 1990: 11). It is defined by the description of an event or a phenomenon being studied, understanding and classifying the characteristics of the phenomenon and the eventual connection of emerging concepts (Dey 1993).

Analytical categories are usually employed in qualitative data analysis in order to clearly describe a social phenomenon (Kaplan and Maxwell 1994). Such categories can be inductively developed; where answers to research questions are systematically derived from the data or deductively developed; in which obtained data is employed to test an assumption, a theory or a hypothesis (Brocki and Wearden 2006). Inductive qualitative analysis according to Thomas (2006: 238) describes a method that "… primarily use detailed readings of raw data to derive concepts, themes, or a model through interpretations made from the raw data by an evaluator or a researcher". A theme according to Boyatzis (1998:4) can be defined as "… a pattern found in the information that at a minimum describes and organizes the possible observations and at a maximum interprets aspects of the phenomenon. Thus, a theme is a useful textual information derived from raw data in form of meaningful chunks of information obtained by breaking down the data being analysed or relevant interpretive segments of data obtained by linking and documenting similar or related patterns that can be observed in the analysed data.

Research by Thorne (2000) showcased four prevalent analytic strategies. The strategies highlighted are the use of constant comparative analysis, phenomenological strategies, ethnographic approach and

narrative and discourse analysis. Grounded theory and ethnographic strategies are already discussed in the methodology chapter.

The constant comparative analysis approach is characterised by the evaluation and comparison of a fragment of data with another data which is defined by a similar or different experience with the purpose of deducing the relationship and associated theory between the compared data experiences. This comparison is conducted all through the entire data set to evolve patterns and themes that represent respondent experiences on the phenomenon. The use of the constant comparative analysis technique is often adopted in the grounded theory qualitative method (Boeije 2002, Starks 2007 and Thorne 2000) where events in collected data are catalogued into categories whilst continuously comparing to evolve defined properties of the categories until a characteristic event can be conceptually described in terms of the developed properties of the categories which are then linked based on the findings from the data (Tesch 1995).

A narrative and discourse analytical strategy focuses on how human experiences are depicted via the tool of language. They however differ on their basis for analysing language (Thorne 1998). Narrative analysis differs from discourse analysis in the manner in which meaning is derived through semantic representation. Narrative analysis is a strategy that acquires understanding about human experiences from the narration of such experiences communicated "… verbally, in writing or in thought…" (Thorne 1998). Discourse analysis on the other hand interprets or understands a lived experience based on the manner in which the experience is depicted using language tools (Starks 2007). In contrast to narrative analysis where speech forms are not the experience in itself but rather a medium for conveying the experience, discourse analysis digs in-depth into the language used and in what context it is used to draw meaning from the communicated experience.

Phenomenological research aims at realizing in-depth understanding and interpretation of an event or phenomenon (Creswell 1998, Patton 2002, Starks 2007) under study. It is characterised by the meaning of experiences and centres "… upon the emphatic understanding rather than statistical explanatory procedures" (Osborne 1990: 80). In phenomenology, the emphasis is on understanding human experiences from the perspective of the respondent (Tesch 1990).

This distinctive characteristic of phenomenological strategy makes it especially suitable for this research work as it provides a platform for capturing how SSCM works and to what extent it is being

influenced by political and social factors such as culture, political stability and country's level of development. A detailed justification for selecting the phenomenological approach for this research study can be found in the methodology chapter. When adopting this approach, it is crucial that all forms of prejudice is set-aside and a neutral perspective is imbibed. This stance is essential in interpreting and understanding the phenomenon being studied in a way that allows original descriptions and concepts to emanate from the data (Creswell 1998, Thomas 2006 and Thorne 1998).

The school of thought of phenomenology advocates that unlike other methodologies, data analysis in phenomenology does not follow a specific traditional set of instructions. Instead, a researcher should undertake the process by adopting an inquisitive disposition with the aim of providing answers to set research aims and objectives (Hycner 1985, Osborne 1990 and Creswell 1998). Method selection for analysing data in phenomenological studies depends on the goal of the researcher (Osborne 1990) and the phenomenon being studied (Hycner 1985). Thus, in analysing phenomenological data from interviews as obtainable in this research, Creswell (1998: 52) advices that the analytical approach "… proceeds through the methodology of reduction, the analysis of specific statements and themes, and a search for all possible meanings". Works of authors, Hycner (1985) and Osborne (1990) also seem to be in agreement with Creswell (1998) analytical guidelines.

The use of the inductive approach for analysis is particularly useful when the outcome of a research includes the development and design of a framework based on the findings from the research data (Thomas 2006) as it allows theory to emanate from collected raw data (Strauss and Corbin 1998). According to Boyatzis (1998), the inductive method is especially beneficial for generating themes and codes. In order to ensure that crucial data is not lost whilst analysing data collected from conducted interviews as well as to visualise SSCM practice in the case study countries in a manner that embraced an unbiased approach towards the subject, the inductive qualitative approach adopted in the works of Graneheim and Lundman (2003), Pope, Ziebald and Mays (2000) and Thomas (2006) was followed in the data analysis stage of this research work.

Thomas (2006) proposed a general inductive method for qualitative data analysis that is useful in developing themes and categories from complex data via a set of procedures in order to create meaningful responses to research questions and fulfil research objectives. A summary of the procedure as proposed by Thomas (2006) are: a) Cleaning and preparing the data; (b) thoroughly reading through the text to gain familiarity and understanding of the events and evolving themes; c) creating categories and themes from coded data (coding can be done with the use of qualitative software); d) possibility

of coding into more than one category and not coding some parts of the text at all due to its irrelevance to the subject matter; and e) continuously revising and clarifying sub-topics under each category to ensure they fall in line with the definition or message conveyed by the category.

Table 5.1 Comparison of Qualitative Analytical Techniques (Source: Thomas 2007:241)

	General Inductive Approach	Grounded Theory	Discourse Analysis	Phenomenology
Analytic strategies and questions	What are the core meanings evident in the text, relevant to evaluation or research objectives?	To generate or discover theory using open and axial coding and theoretical sampling	Concerned with talk and texts as social practices and their rhetorical or argumentative organization	Seeks to uncover the meaning that lives within experience and to convey felt understanding in words
Outcome of analysis	Themes or categories most relevant to research objectives identified	A theory that includes themes or categories	Multiple meanings of language and text identified and described	A description of lived experiences
Presentation of findings	Description of most important themes	Description of theory that includes core themes	Descriptive account of multiple meanings in text	A coherent story or narrative about the experience

Irrespective of the analytical method adopted by a researcher (see table 5.1), the availability of a comprehensive set of textual data which includes but not limited to notes collected on the field, interview transcriptions or audio/visual recorded materials, documents specific to the line of inquiry, photographs and diagrams is assumed (Kaplan and Maxwell 1994). In line with this assumption, the data analysis for the qualitative aspect of this work was started off with the transcription of all audio recorded interviews into textual information. Transcribing the audiotaped data provided an initial opportunity to read through the text whilst also becoming familiar with its content (Aronson 1995). Each interview was transcribed into a Word document and then saved in three different locations for easy retrieval; and to avoid loss of data as a result of any unforeseen or unprecedented circumstance that may lead to data loss.

Whilst transcribing, conscious effort was made to ensure that quiet moments, and other expressions and emotions expressed by respondents were captured to accentuate the hidden and overall meaning of their verbal response. This is in line with recommendations by Graneheim and Lundman (2003) where it was rightly stated that it is important for a researcher to capture non-verbally conveyed expressions such as sighs, laughter, silence, posture and gestures, when writing out interviews and observations into texts, in order to avoid missing out the overall fundamental meaning. Also as stated by Osborne (1990), gestures, motion, activity, moving to music and miming can also be regarded as forms of non-verbal data in phenomenological studies.

As stated in previous chapter, phenomenological study which is an aspect of interpretive research (Boland 1986) aims at understanding an event through the meanings ascribed to it in order to understand and make sense of the information being passed across (Myers 1997) as the situation emerges, as it is assumed that the researcher does not have enough information on the phenomena in advance to already formulate a hypothesis, but rather becomes armed with facts during the data collection and analysis stage to do this (Kaplan and Maxwell 1994). Thus, the researcher gains detailed knowledge on the phenomenon understudy as the study progresses and assumes an unbiased stance all through the analysis process. To this effect, an important first step taken during the data analysis was reading and getting acquainted with the data. Prior and detailed reading of the data is a good way for researchers to have a first-hand knowledge of emerging themes and meanings of statements and expressions and their relationship with other statements regarding a phenomena in question (Kaplan and Maxwell 1994). Thus, after completing the transcription process, the text was read and re-read many times to identify possible themes and categories emanating from the text as recommended by Pope, Ziebland and Mays (2000).

A major challenge in handling qualitative data is the difficult task of drawing reasonable findings from the very large amount of data that characterises it (Patton 2002). Also, researchers are faced with the dilemma of deciding in what context, depth, and level of abstraction the analysis should focus on. That is, either the *manifest content* which deals with the analysis of what the text says and focuses on the conspicuous elements of the text, or the *latent content* which is primarily concerned with understanding the concealed meaning of the text and thus focuses on what the text talks about (Boyatzis 1998 and Graneheim and Lundman 2003). An important step towards overcoming the first challenge mentioned above during data analysis, is to systematically reduce the data in a way that averts loss of essential facts crucial to arriving at accurate analytical deductions (Creswell 1998, Miles and Huberman 1994 and Patton 2002). Data reduction can be achieved by identifying patterns and themes in collected data. Kaplan and Maxwell (1994) highlighted four key techniques for exploring similarities, differences and identifying themes and categories in qualitative data analysis. The techniques identified for achieving these tasks are; coding, analytical memos, displays and contextual/narrative analysis. (Kaplan and Maxwell 1994). These techniques can be used as standalones or in combinations for emergent theories that lead the way to fulfilment of research objectives.

In developing themes and codes alike, it is important that a researcher sees evolving patterns in the data being analysed (Strauss and Corbin 1999). In developing themes for this research work, the thematic analysis approach was adopted. Thematic analysis is a method for developing themes from

qualitative data via pattern identification (Attride-Stirling 2001, Braun and Clarke 2006 and Fereday 2006). Thematic analysis is advantageous as an analytical method due to its flexibility as a stand-alone as well as its adaptive nature to other qualitative analytical methods (Braun and Clark 1998 and Boyatzis 1998). It also has the advantage of communicating collected data in a manner that is easy to understand by a wide array of scholars and researchers. This is because; it facilitates the presentation and organization of collected data in ways that allow philosophical abstraction (Boyatzis 1998).

Despite the strongpoints of the thematic methodology as a useful research tool for analysis, there seem to be some setbacks with regards to its use. The challenges with the use of this analytical tool have to do with sampling, projection, mood and style (Boyatzis 1998). Apart from the general research issues with sampling, the thematic approach requires a clear demarcation between units of analysis and units of coding. Unit of analysis is the actual entity that is being evaluated in a study and on which the interpretation of the study will be based while the unit of coding is the least element of the raw data that yields substantial insight into the phenomenon under study. The unit of coding can be a word or a short phrase from the data that represent aspects of the phenomenon. In this work the unit of analysis is the Nigerian downstream oil industry. Projection as a challenge arises when the researcher knows little about the phenomenon and hence become overwhelmed by the newness of the phenomenon. Analogously, projection emanates when a researcher is overly familiar with the phenomenon being studied that he can almost fill in the missing links or words in the collected data. Also, the subjective characteristic of qualitative research can become an issue when a researcher allows his ability to sense themes and develop codes to become corrupted by the source material making it difficult to keep an unbiased perspective and openness during the analysis.

In order to overcome the above highlighted challenges in this study, recommendations made by Boyatzis (1998) were taken to heart and implemented whilst adopting the thematic analysis. Some of the preventive measures adopted were:

- Establishing a clear protocol for collecting data in the data collection stage
- Representing respondent's statements and impressions on the subject with definitive codes.
- Constantly reviewing the collected data all through the theme and code development process.
- Adequately identifying the unit of analysis and the unit of coding.

In analysing the transcribed data for this work, both the latent content and the manifest content were considered in order to obtain a comprehensive view of the meanings behind respondent's responses.

In order to avoid missing out emerging themes in respondents' responses as well as emanating patterns across responses while analysing the data, competencies recommended by Boyatzis (1998) for the use of thematic analysis were taken into consideration all through the code generation and theme development process. According to the author, a researcher making use of the thematic approach for analysis, must in addition to being able to see variations, similarities and system of relationships in textual data, also already possess or learn how to recognise patterns, plan and think systematically, intuitively adapt social objectivity and acquire knowledge in the area of study.

While making use of thematic analysis, "… there is need for conceptual tools to classify and understand the phenomenon under study" (Joffe and Yardley 2004: 58). This is achieved via code creation which can be simply referred to as coding.

Coding is essentially used in sorting and making sense of collected data (Basit 2003 and Fereday 2006) by arranging the data in a manner that allows additional inquiry and evaluation (Catterall and Maclaran 1997 and Strauss and Corbin 1999). It is an essentially important approach to qualitative data reduction in a manner that allows necessary textual data to be retained and classified accordingly (Creswell 1998) to form theory (Strauss and Corbin 1990). The term reduction in this context refers to data categorization or grouping such that a segment of data is used to represent similar segments or segments of the same nature. Thus not necessarily reducing the data, but rather, classifying the data in a manner that allows sieving out important portions of data that speak of similar issues or simply fall under the same category (Tesch 1990). Coding can be defined as "… the process of categorizing and combing the data for themes and ideas and categories and then making similar passages of text (fragments) with a code label" (Blumberg, Cooper and Schindler 2011: 295).

According to Boyatzis (1998), good codes are able to richly capture experiences depicted in a qualitative study. Codes can emerge from previously conducted literature review, whereby a researcher identifies themes from pre-existing theories or ideas. It can also simply emerge as the researcher sieves through the data to understand what is being talked about and in what context and under what theme the respondent's contribution can be classified. This form of coding that require the emergence of themes and captions from the source material as analysis progresses is referred to as *open analysis* while the former coding technique is regarded as *prescriptive analysis* (Blumberg, Cooper and Schindler 2011). Codes can also emanate from research questions, interview questions and a researcher's knowledge about the data or study setting (Taylor and Gibbs 2015).

In addition to the open analysis approach of coding as described by Blumberg, Cooper and Schindler (2011), the template approach as defined by Crabtree and Miller (1999) was adopted. The template approach involves the development of "… a template in the form of codes from a codebook to be applied as a means of organizing text for subsequent interpretation" (Fereday 2006: 83). The template which is also referred to as codebook is developed prior to detailed evaluation of the data from theory, research questions or initial exploration of the data (Crabtree and Miller 1999, Fereday 2006, Miles and Huberman 1994 and Taylor and Gibbs 2010). The adoption of both approaches is made possible by the flexibility that characterises them (King, Cassell and Symon 2004). The reason for this selection is based on the additional reliability that the template approach introduces into the study in the context of code selection (King 2012). The use of template analysis is a good option in organizational studies where the perspectives of different members of staff is being sought to provide insight to a specific phenomenon (King 2004). Template analysis adapts particularly well with phenomenological approach with the only difference being the use of a priori codes. However, the adoption of these approaches in the analysis stage was done with caution so as to ensure that emerging codes are primarily data-driven, thus, derived from the raw data and thereby, increasing the validity of the developed codes (Boyatzis 1998). The use of a style analysis within a thematic approach in analytical studies that focus on broad patterns of discourse and emerging themes from raw data is not new, as authors such as Fereday (2006), King (2012) and King, Cassell and Symon (2004) have adopted and recommended its use.

The codebook for this work was developed by scanning through the raw data and also from the research questions. Also, due to the comparative nature of this research work; that is, comparing SSCM in the Nigerian downstream oil industry with their UK counterpart, it was imperative to also select codes from literature. These codes were entered into the QSR NVivo 10 software management package. More codes were added to the code book as in-depth examination of the text continued. This involved reading and re-reading the data as well as listening to the audio-recorded responses all through the analysis process. Also, following the example of Fereday (2006) iterative and reflexive analytical process, prior to commencing coding, the data collection documents including the protocol were reread thoroughly to ensure that the analytical process was well synchronized with previous stages of the study and grounded in the raw data.

5.2.1 Software Assisted Qualitative Data Analysis

There has been a growing trend in the adoption of software tools in qualitative research (Weitzman 2000). In recent times, the use of software packages such as NVivo, Atlas.ti, Comparative Qualitative

Analysis (QCA), NUD*IST, TextSmart, winMAX, C-I-SAID and HyperRESEARCH to mention a few have become prominent in qualitative data analysis (Myers 1997, Patton 2002 and Weitzman and Miles 1995). The use of software packages as a tool for analysis in the qualitative domain is a way of "… aiding the researcher in her or his search for an accurate and transparent picture of the data whilst also providing an audit of the data analysis process as a whole…" (Welsh 2002).

The use of software packages by researchers in qualitative research also referred to as Computer Assisted Qualitative Data Analysis Software (CAQDAS) is anchored on various advantages. Some of these advantages are the various additional possibilities of easy data sorting, fast data searches, identifying co-occurring codes and on-screen display of links and patterns to arrive at theory that are easily achievable with the data sets compared with when the data is manually treated (Basit 2003, Dey 1993, Pope, Ziebland and Mays 2000 and Weitzman 2000).

Despite these benefits, the use of software packages for qualitative research has to be done with caution as the package in itself is not designed to *carry out the data analysis or build theory*, but rather it is meant to serve as a support tool whose usefulness depend largely on the researcher's analytical expertise (Dey 1993, Pope, Ziebland and Mays 2000 and Weitzman 2000). Also, issues such as quantising qualitative studies, a researcher becoming distant from his data and the exchange of creative thinking to a mechanical approach to analysis are some other points that have been raised against the use of CAQDAS (Dey 1993, Weitzman 2000, and Welsh 2002). Possible solution for these set-backs however lies with the researcher and not the technology itself (Dey 1993). In the course of this work, precautionary measures were taken while making use of the CAQDAS. Some of the measures embraced were; sticking close to the raw data as much as possible, recognising the limitation of the software package and focussing on the analysis itself, the research questions to be answered and the goal of the study (Dey 1993).

The decision on what software to adopt for qualitative analysis is somewhat not straightforward as this depends on but not restricted to the type of project, type of analysis to be conducted, the time frame for the analysis, cost, need for closeness to the data and a researcher's level of computer competency (Weitzman and Miles 1995). In choosing a software package for analysing the qualitative data in this work, all the above listed factors were evaluated and were taken into consideration in the software package selection process.

As stated in previous chapters, this study is exploratory in nature as it seeks to find factors acting as barriers as well as driving SSCM adoption in the downstream sector of a developing country like Nigeria as well as evaluate the impact the country's level of development on SSCM adoption in the sector. Thus, for this work, a software package with tools for handling texts, audio-recordings and with facilities to explore keywords as well as detect complex patterns was deemed favourable and selected (Blumberg, Cooper and Schindler 2011, Tesch 2002 and Weitzman 2000), and for these reasons, QSR NVivo 10 software programme was selected for this work.

5.2.2 Nvivo 10

Nvivo 10 is a useful software tool for organizing and analysing qualitative data. Amongst its many functions, it allows the importation and analysis of textual, audio recorded data, images, videos, web pages and even social media data. The NVivo software package comes with the added benefit of flexibility as it is designed to adapt to whatever qualitative methodology is being adopted by a researcher.

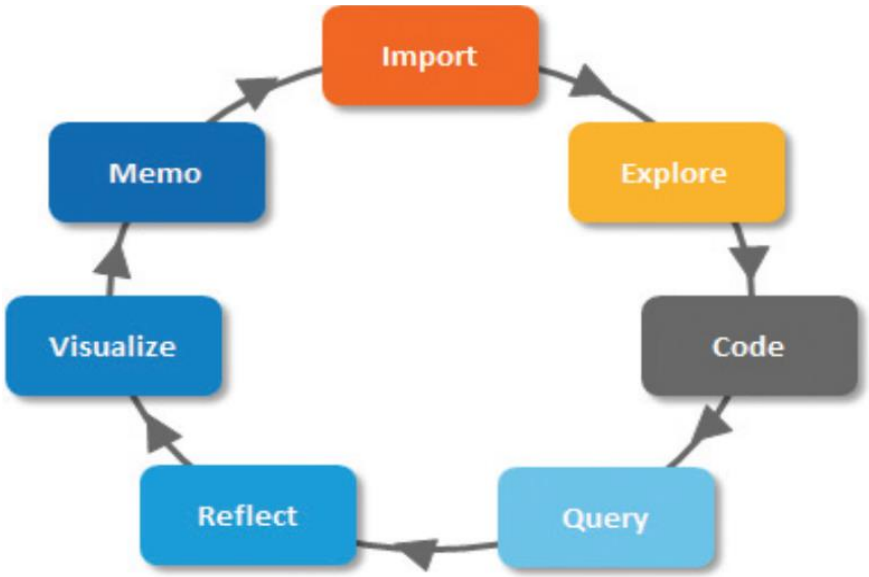


Figure 5.1 Theme Exploration Using NVivo 10 (QSR 2015).
Figure shows a possible pathway for exploring a theme using the NVivo 10 software package. NVivo 10 is especially beneficial for the management, exploration and pattern finding in qualitative data.

The software is particularly applicable for this research work which is characterised by 'how' and 'why' questions; a strongpoint for Nvivo 10 (QSR 2015). The basic steps in the Nvivo software application as shown in figure 5.1 allows for the direct coding of imported and saved audio interview as well as transcribed interview scripts whilst listening and reading respectively.

To make use of the NVivo 10 software package, interview documents which were in form of transcribed textual data from audio recordings and the audio recordings itself were uploaded onto the software package. This gave the added benefit of being able to listen to the audio tape even as the textual data was being read for verification while coding and sometimes to pick moments of salient expressions during the interview as stated earlier. This was followed by a detailed exploration of the imported data for further familiarity (Thomas 2006). In order to thoroughly explore the data and facilitate data coding and theme identification, the audio tapes were systematically listened to one after the other whilst reading the textual form of it (Fereday 2006).

The prepared codebook was also imported into the NVivo software and new codes emanating from the exploration process were added on. Nodes were created for codes in the codebook. A node is a storage place for codes so that related materials can be examined for emerging themes and patterns (QSR 2015). It allows the assembling of similar remarks in a specific location. The code book was revised even as new insights were being added along the way. Similar highlighted points and references were collected and coded in nodes, after which a '*text search query'* was run to check if other respondents made the same remark or statements. Query results were collected reviewed and displayed using visual representations such as tree maps, cluster analysis and charts. This provided a picture representation of relationships, patterns and themes emerging from the raw data. It should be noted that, these discussed steps as shown in figure 6.1 were adopted in an iterative and interconnected manner rather than a step-wise fashion through the course of adopting the NVivo package for this study.

5.3 Qualitative Data Analysis Results (Nigeria)

An initial step taken during the analysis was to summarize each interview transcript (see appendix). This was a good way of deliberately assimilating the data, processing the audiotape and highlighting key points remarked upon by the respondent. This was captured in generating a summary of the information in it. (Boyatzis 1998). Also, summarizing the read transcript was a good way of perceiving likely and emerging themes from the raw information (Fereday 2006).

As stated in previous section, a codebook was prepared before detailed coding of the raw data commenced. The codes generated from literature, research questions and interview questions covered five broad categories. These categories are captured in figure 5.2 shown below.

Thematic codes from the raw-data were generated based on Boyatzis (1998: 31) elements of a good code. Hence the codes were developed and identified based on; the code name, definition of what the theme is about and indicators on how to identify the theme when it occurs.

Initial codes developed from the raw data were first tested for reliability. In order to test the reliability of the developed codes, after fully coding two of the interview transcripts, two research colleagues and an academician were invited to code the document as well. Results from this exercise were compared and feedback was given. There was a high degree of agreement in the developed codes as only minor modifications were made to the coding syntax and no major modification was necessary in this regard.

1. SSCM Driver a. Internal Drivers b. External Drivers
2. SSCM Barriers a. Stakeholder issues b. Logistic Issues c. Fluctuating Oil Price
3. SSCM Measures a. Safety Standards b. CSR c. Optimised Operations d. Waste Reduction
4. SSCM Performance Measurement a. Quality Improvement b. Return-on –Investment c. Stakeholder Satisfaction
5. Country's Influence on SSCM a. Level of Development b. Cultures c. Government Policies

Figure 5.2 A Priori Coding Template for Analysis

These new codes were added to the already developed coding template and nodes were created for them in the NVivo software. The remaining eleven transcripts were coded and new codes were added on. At this juncture, some of the initial codes were refined and modified and unsuitable ones were

deleted. As the analysis progressed, segments of remarks were assigned to preliminary codes or designated to new codes as new themes emerged from the raw data.

The next step after all the transcripts had been coded was to merge and classify similar patterns into sub-themes. These sub-themes represent fragments of ideas and views that reside in the raw data. Hence, codes generated were examined for similarities and patterns relating to the research questions with the goal of identifying general themes across sub-themes.

5.3.1 Coded Responses from Interview (Nigeria)

From the coding process, coded responses that emanated from the coding exercise as well as some quotes from the interviewee prior to the merging and classification of similar codes into sub-themes and themes are identified below.

5.3.1.1 Sustainability Measures Deployed in the Nigerian Downstream Oil Industry

The sustainability measures identified by respondents as currently in place in the Nigerian downstream sector being covered and coded for this study are identified below:

- **Familiarity with SSCM**: Respondents seemed to be familiar with the term SSCM although, the term sustainability was more or less linked to HSE (Health, Safety and Environment) during the interview. Eight of the respondents regarded their acts of CSR as being directed towards social sustainability. One of the respondents said:

  "*In terms of social development, this has been in existence before SSCM came into being because we have CSR as a corporate body to our host communities and neighbouring communities*"

  In general, the term SCM was well understood by the respondents as all of the respondents interviewed had at one point or the other had undergone training on how to efficiently manage their supply chain.

  Some of the sustainability measures identified by respondents as already being in place and practiced as well as some of the more regularly recurring measures are listed below:

- **Adoption of TQM (Total Quality Management) System**: The adoption of TQM in supply chain processes and this involves superior delivery and elimination of mistakes and all forms of error.

- **Host Community Consideration**: Six respondents expressed that keeping host communities satisfied is an important part of NNPC activities as this is necessary to foster a cordial relationship between NNPC and its host community as well as neighbouring communities. One of the respondents said:

  "*Our stakeholders are the communities surrounding us*"

  "*We are really concerned about the communities around us. I do not think there has been any day that our operation was stopped because of community agitation*".

  "*We keep our stakeholders satisfied through CSR. We engage in numerous CSR projects. We assist host communities by providing infrastructures and social amenities*".

- **Good Procedures Geared Towards SSCM:** Respondents stated that the NNPC already had in place good practices geared towards SSCM. Many of these procedures were put in place to reduce the negative impact of refining, storage and distribution activities on the environment and socioeconomic development. Some good procedures identified include; periodic medical impact check-up for NNPC staff and members of neighbouring community, regular impact assessment, periodic community inspection to ascertain levels of emission and toxicity levels in neighbouring communities and writing of incidence reports to capture near misses and accidents on the plant.

- **Goal Zero Policy (zero accident, zero emissions, etc.):** NNPC has in place a goal-zero policy. This is captured under the ISO quality management system. This policy is designed to ensure zero or the most minimal emission possible as well as zero accident occurrence in the day-to day NNPC activities. A senior NNPC manager who took part in this research said:

  "… We are trying to achieve a goal zero incident for the corporation, because whatever you do, if you do it wrong, the image of the organization is at stake; there are litigation issues, there are reputational issues and so many other issues…."

  "We have an ISO quality management system in place. That policy demands that in the course of our operations, we should always aim at zero accident".

- **Compliance with International and National Standards**: Interview responses showed a clear admittance of NNPC's allegiance to international, regional and national regulations. Nationally, NNPC is regulated by DPR, a government organisation responsible for monitoring

and regulating activities of both the upstream and downstream sectors of the Nigerian oil industry. The need to comply with international regulations is driven by NNPC's bid to be a top ranking environmentally safe organisation whilst contributing to socio-economic development like other developed oil producing countries as well as their technologically advanced international peers.

- **HSE Management System:** There is currently a fully operational HSE system in the NNPC. The culture in NNPC is geared towards ensuring safe operations by taking into consideration personnel, societal and environmental safety. A senior NNPC manager who took part in this research said:

  "*… In NNPC we are deploying what we call the HSE management system…which is geared towards building a culture which is top-driven, everybody is involved, you know exactly what you need to do and when you do it right, it has positive impacts".*

- **Dedicated, Trained and Efficient SCM Personnel Responsible for Managing the NNPC Supply Chain:** SCM in NNPC has in recent years undergone a transformation to make the system efficient. To this effect, there has been a move towards staff training personnel development.

- **Installation of Modern Electronic System:** There has been a recent upgrade of NNPC supply chain facilities. This includes the installation of new and modern electronic systems across NNPC facilities for efficient management of the supply chain and this involves the use of automated systems for managing stock and purchases.

- **Purchasing from High-Quality Suppliers and Manufacturers:** Statements made by respondents showed that equipment, spare-parts and raw materials were sourced from reputable international suppliers and manufacturers.

- **Emission Level Inspection**: There is a system in place for emission level inspection (water and air). This is to ensure that operational emissions are monitored to avoid harmful impacts and to keep the environment pollution free. Readings are taken regularly and timely intervals and these readings are also monitored by NNPC regulatory body.

- **Host Community Inspection**: Regular host community inspection via periodic regular check-ups of the community to ascertain levels of emission and pollution.

- **Local Community Engagement**: This relates to NNPC's engagement and regular discussions with host community on how NNPC operations affect them.

- **Emergency Mitigation System**: Respondents emphasized that there are emergency mitigation measures in place in the event of unforeseen accidental discharge or emissions.

- **Employee Skills Acquisition**: Investment in employee skills acquisition is top priority in NNPC according to respondents.

"*There are opportunities in NNPC… I knew what it took to get me to this level…the amount of money spent on me on training; the amount of money spent on me on skill acquisition… honestly the investment is capital intensive and it is excellent*"

- **Trainings and Workshops**: There seem to be a lot of emphasis on training in NNPC. All respondents spoken to, stated that they have at one point or the other undergone some form of training in HSE, SCM, regulations and compliance and ISO requirements. However with regards to SSCM, respondents stated that more needed to be done in the area of training and creating awareness to sustainability issues.

- **Annual Budget for the Management of the Environment and Mitigation Plans**: There is an annual budget for the management of the environment and pollution control. This budget however is insufficient and is not comparable to the required funds to see to the efficient management of the environment and reduce or mitigate pollution.

"*I will say investment in pollution control is fair. Fair in the sense that pollution prevention still has to do with the infrastructures being in place and the basic amenities being there*"

- **Investments in CSR Projects**: Respondents categorically emphasised the existence of various CSR programmes in local communities where they are operational. Many of these programmes are geared towards skill acquisition for the local people, youth empowerment, school improvements via provision of classes and learning materials, and the allocation of scholarships to educationally sound students.

"*For the past three years, we have been training the youth on skill acquisition, sunk boreholes and built schools. Of recent, we just installed traffic lights and built a 6km road for the community as there was no road prior to this and other things that make the life of the local people better. In terms of social responsibility, I believe we are doing very well*".

"*I will rate our CSR programmes as being very good. I will say that we have had a positive impact on communities close to us. We provide portable water, electricity by buying them transformers and many times provide learning materials and other educational materials. Also twice a year, we run a skills acquisition programme for all the youths in the community where they are trained and given a take-off token to start off their own business*".

- **Regular Impact Assessment**: The NNPC safety policy also makes provision for regular impact assessment with respect to refinery operations and other downstream processes to evaluate the primary and cumulative effects these activities may have on surrounding communities.

"*We have a very good system that monitors day-to day activities. In the process areas, we have a very good waste management system with incinerators to make sure that effluent and other wastes do not get to neighbouring communities*".

"*We are being regulated, so we have to ensure that our activities do not negatively impact neighbouring communities. Regulatory bodies come every now and then to examine and evaluate our activities. We also have a whole unit to take care of the environment. The HSE department is responsible for the environment to ensure that our activities and emissions do not lead to any negative effect*".

- **Use of Safety Checklists**: The NNPC management makes use of safety checklist as a form of safety measure in the refineries and distribution terminals. This is to ensure that before an activity is allowed on the plant, necessary safety requirements are met.

"*Checks are carried out and for all those checks, there is a thorough checklist that is used before these tankers are allowed into the refinery*".

"*The parts that come into the production and refining process is also looked into and there is a checklist… so these are some of the safety measures in place to ensure compliance*".

- **Fully Certified ISO Quality Management System**: An ISO quality management policy is in place in NNPC. This has been in place for some time and is therefore inscribed into procedures and processes in the organization.

- **Capturing Near-Misses and Incidence Reporting**: The capturing of near misses and keeping an up to date incidence report are some forms of sustainability measures adopted in NNPC downstream operations. This is still aimed at the achievement of the goal zero policy that is in force in the NNPC.

"*Near misses are important because once you are able to capture a near miss that means some people are vigilant... when there is an incident, the root-cause analysis of the accident must be done to ensure that it does not happen again*".

- **Best Practice**: The downstream sector of the NNPC is striving towards best practice. This can be observed in the efforts being put into ensuring that operations are conducted in a safe manner.

"*Every operation carries its own risk, but best practice is adopted in NNPC…we are in the right direction, but we can do bet*ter…"

- **Environmental Pollution Control**: Respondents admitted that there is still a long way to go with regards to pollution control, but there was however a consensus that all effort was being put into the reduction of damage being done to the environment by the NNPC administration. There are procedures and policies in place for controlling pollution and managing its occurrence.

"*Asking my opinion, I say fair. Fair on a scale of 1 to 10, fair will be 5*"

"*The policy of NNPC is anchored on prevention, containment and remediation*"

> "*…One interesting thing about remediation is as you know; our land environmental standards are not that tough, in use and in practice*"

- **Improvements in SCM**: New SCM processes and operations are being introduced in NNPC refineries and other units. This has being embraced by all units and the organisation is currently benefitting from it. The organization is however still plagued by various SCM challenges. These challenges are captured in a later section.

"*… Now we have a department that is the supply chain department. Before now we did not have a department that is making sure that all the activities of the refinery are all streamlined….and now materials and finance are being checked and provided for as at when due… supply chain department is really helping the system*"

"*…in Nigeria, if you want a gasket or a valve, you need to travel abroad to buy that gasket. So you are subjected to all sorts of uncertainties and risks ….because you do not have in-country manufacturing capability for simple things like bearing, and other simple items and equipment parts that you can easily get in developed nations*"

- **Regulation Adherence**: Activities are regulated and monitored. Periodic checks are conducted and adherence measured. NNPC works toward compliance to regulations and standards.

"*We are regulated by both local and foreign laws that govern the downstream oil industry*".

- **Adherence to Safety Standards**: Safety is a key value in NNPC operation and this is covered under the goal zero and HSE policies.

  "*… Here in the refinery, safety is our number one core value. Nothing is done when it is adjudged unsafe to do so*".

  "*We operate a well-articulated safety policy that puts care for the environment ahead of profits and spells out what to do in any given operational situation*".

- **SSCM Performance/Implementation of SSCM**: There is a positive attitude towards new processes in the NNPC and this has translated into improved SCM performance. SSCM performance however has been described as fairly good compared to other developed countries. The reason for the underperformance of the NNPC with regards to SSCM has been attributed to the problems with equipment procurement and effects of pipeline vandalization.

  "*The oil and gas business is profit-driven, and I would want to imagine that without being told, you will not want to have in place control and measures that will make your supply chain unsustainable…The area of challenge is more on the environmental side*".

  "*… The planning and business management department is saddled with the responsibility of knowing how much comes into the refinery and how much goes out*"

- **Stakeholder Consideration**: This code was also captured under SSCM measures put in place by downstream NNPC. It was reiterated as one of the key performance area of the NNPC.

- **Improved Supply Chain Processes**: Also captured under SSCM measures. This signifies recent improvements in SCM to bring about processes geared towards SSCM.

- **Added Value to Economic and Social Development**: All respondents affirmed that the downstream oil sector is crucial to the survival of the Nigerian economy and its contribution is instrumental to the current economic and social state of the country. However, there were also indications the downstream sector was being incapacitated and under performing in the context of economic and social development as a result of the current regulation and control of the sector by the government.

"*More than ninety percent of the incoming revenue in Nigeria is from oil and gas. I can confidently attribute ninety percent of our operation to the growth and development of the nation*".

"*Like I said earlier, this sector is owned by the government and in the civilised society, government establishments perform. …In relation to SSCM, I think it has impacted positively*".

"*I would describe the contribution to the economy and development as very significant*".

"*Look at this scenario, fuel is sold at N120/litre in the oil market and you sell at the pump at N50/Litre. The differential goes to the middlemen. This disturbs the supply chain. Subsidy should be removed, it is not good for the economy*".

- **Efficient Waste Management Processes**: The NNPC has in place waste management processes to ensure that the environment is shielded from the harmful effects of organisation's processes and activities. The robustness of these waste management facilities however still hinges on the level of development in the country and factors such as the availability of infrastructures.

"*Right now, if you talk of the environment, we have a good system that monitors day-to day activities… we have a very good waste management system to ensure that the environment at all times is not being polluted… we ensure that our effluent and other waste does not go and pollute communities*".

"*I will describe the investment in pollution prevention and ensuring stakeholder safety as fair… I say fair considering the level of development in the country and the fact that basic amenities are not available*".

5.3.1.2 Challenges/Barriers to SSCM

This covers the challenges to SSCM as identified by respondents. These were coded under two headings; Primary and Secondary Challenges. For the purpose of this study and for ease of coding, Primary Challenges can be described as direct or first-hand challenges or barriers to the adoption and practice of a high performing SSCM in the Nigerian downstream oil industry while Secondary Challenges can be described as off-shoots of primary challenges and country's societal norm.

5.3.1.2.1 Primary Challenges/Barriers

Pipeline and Infrastructure Vandalism by Criminals and Local Communities: This is a major problem being faced by the NNPC. Vandalisation of pipeline infrastructures in an attempt to steal crude and refined products or to seek compensation in some instances were identified by respondents as a great challenge in the adoption of a sustainable supply chain.

"*It involves so much loss of product. All these pipelines have been vandalised; affecting agriculture, polluting the environment, soil, and so on. Sometimes the pipelines are on the surface, thus causing more havoc when vandalised. In some cases, communities have been wiped out due to fire caused by pipeline vandalism*".

"*Outright vandalism is the key supply chain risk. A lot of product is lost, coupled with a huge magnitude of damage done to the environment and surrounding areas from the leaking pipe*".

"*The greatest headache for us is this pipeline vandalisation*".

Currency Exchange Fluctuation: The persistent fluctuations and the weakness of the Nigerian currency were identified as barriers to SSCM especially in the area of equipment and material purchase from foreign suppliers.

"*Our primary responsibility is to ensure that whatever we require comes to our warehouses without interruption so if there is fluctuation of currency exchange like naira to dollar, it affects the purchasing process*".

Lack of Technical Understanding and Knowledge on the Importance of SSCM: There is insufficient understanding of and training on SSCM. The concept is relatively new and is only becoming popular in NNPC. Foreign suppliers are more knowledgeable and have a firm understanding of the concept. However, SCM is well known and this has been incorporated into the processes and operations of the sector.

Suppliers' Lack of Confidence in the System: The reasons for this was attributed to;

- **Government Bureaucracy and Delays**: As a result of the low and almost non-existent in-country manufacturing, foreign manufacturers tend to be the sole distributors and manufacturers of equipment used in the downstream sector. However, respondents stated that there is generally a lack of confidence in the system on the part of these companies and this can be attributed to bureaucracy and delays in the system.

"*Because of the bureaucracy and delays in the system, you can get a formal invoice and for six months, no order is placed*".

- **Lack of finance**: This is surprisingly a big problem in the sector according to respondents. Incidences of suppliers making equipment supplies and not getting paid on time were cited by four respondents.

"… *There is the issue of lack of finance; supply is made and the supplier is not paid for months, whatever the profit margin made in the supply is lost over a period of time to bank interests, hence suppliers do not trust us and have no confidence in the organisation"*.

Government Policy: All respondents pointed out that current government policy was a hindrance to the achievement of SSCM and the survival of the downstream sector

"*Government policies are absolutely negative except when the Petroleum Bill is passed and organizations are allowed to run the way they are supposed to run and people are punished for doing things that are wrong*".

Information Exchange: This was cited as a barrier to the adoption of SSCM and as a culture in the organization. According to respondents, information is restricted to executives and upper cadre managers and many at times does not get to the lower cadre staff of the organization.

"*One of the major problems we are having in NNPC is that information is not passed to the shop floor level, it only stops at the top…. Making it difficult for people to key into the organizational goal*"

Government Ownership and Control of the Downstream Sector: This is a limiting factor in the achievement of SSCM according to respondents.

"*The regulatory agencies that are statutorily mandated to enforce the law are government agencies…for a government agency to lampoon another government agency is like attacking the government at the centre… for political reasons the department of DPR cannot shut down NNPC refineries because that will cause economic damage….so you do your things with impunity knowing fully well that the person that is mandated to sanction you cannot do so*".

Delay in Procurement Cycle: Procurement cycle takes a long time sometimes due to financial constraint, or it cannot be prioritised because it was not included in the yearly budget.

"*…for instance, you need to buy an equipment that you know will help in reducing emission to the atmosphere, sometimes it takes 3-4 years to get the approval… and as a refinery that is ageing as it were, you have equipment that need to be replaced as at when due… when this is not done, at the end of the day, when the problem begins to arise, there is nothing anyone can do*".

Contamination Issues: Contamination of surrounding environs is a challenge especially due to the nature of refinery processes and products. It is also a challenge with regards to local communities and other associated effects this often has on operations and relationship with stakeholders as they make their demand.

"*Dealing with fluid can sometimes be problematic as we sometimes have contamination issues*".

Lack of Basic Infrastructures and Amenities: The lack of basic amenities and infrastructure was highlighted by all respondents as a problem with the adoption of SSCM. The effect is multi-dimensional as it covers a part of the problem with stakeholders, depending solely on international manufacturers,

"… In Nigeria, provision of basic utilities is still a problem and what are these basic utilities; water, and electricity supply. Now these are the things that raises concerns for manufacturing in-country".

"…To have a high performance SSCM system, owe need very good internet and intranet system…we are not there yet…the government need to put in place necessary developmental infrastructures in place".

CSR Projects not Effective: Many of the current CSR projects being undertaken by the downstream sector are not geared towards development and does not directly impact local communities. Over the years, there has been issues with CSR projects not fashioned to have long lasting developmental effect on stakeholders resulting in negative relationship with host communities.

"*They all have programmes to ensure that their communities are well taken care of, However when you look at the books and what is actually on ground, there is usually a disconnect. … Because yes indeed a lot of money is being put into CSR but how sustainable are these programmes…because the communities, their needs are not as much as what cannot be provided… if you build a school and there is no constant electricity supply, how then can they make use of the facilities you have provided*".

Corruption and Product Pilfering: The issue of corruption was highlighted from various angles; incorrectly calibrated tankers, corrupt security officials, false claims by host communities, corrupt government officials benefiting from product subsidization and importation.

"*The culture of the people believes it is right to make false claims, that will result in a community to collect oil benefits for something they did to themselves… and when you are collecting this peculiar false benefits, everyone will rally round to collect such false benefits and claims*".

"*It is corruption…in fact; some of these truck owners have 2, 3, 4 or 5 different types of calibration they use on the truck… you take a look at the gauging level, you load and end up with product shortage*".

Low In-Country Manufacturing: This is seen as a problem that can be ascribed to the low level of development in the country. Thus, the sector depends heavily on foreign manufacturers and suppliers. This is also a contributing factor to uncertainty in product availability.

"*… In Nigeria, the provision of basic utilities is still a problem, and what are these utilities; water and electricity supply. Now, these are things that raise concerns for manufacturing in-country*".

Stakeholder Issues: This was discussed in the context of land use, management and remediation problems with host communities. This is another key challenge to NNPC SC. According to respondents, unrealistic demands by host communities even where CSR is concerned are a limiting factor to the achievement of SSCM.

Country's Low Level of Development: lack of basic infrastructures and amenities, inadequate government policy, difficulty in making equipment and low in-country manufacturing

Rejection of Innovation/Change Management: People find it difficult to adopt new methods and ways of doing things.

"*Most times when there are new innovations, there is usually this reluctance to change*".

Product Subsidization and Regulation of the Downstream Sector: This is also captured under government control and deregulation. The current subsidisation of domestic products is done by the government and prices are also regulated by the government. This is currently a challenge to the sustainability of the downstream sector due to the lack of transparency and corruption.

"*…the ruling power, that is those who are currently ruling Nigeria and those who are aspiring to rule, they feed from that and because they feed from that illegally, they do not want to deregulate the sector; they do not want to make it open*".

"*The way we are now, NNPC is monopolising but if you open up the sector, there will be competition and the price will be determined by the market forces*".

NNPC Wrongly Accused of Environmental Pollution: Exaggeration by local communities of wrongdoing by NNPC especially in the area of pollution was cited under stakeholder issues. Instances of host communities deliberately polluting their environment by damaging pipelines in order to make claims and seek compensation from NNPC was also cited in the discussion.

Cost of SSCM: Cost of clean-up, suppliers cost of SSCM (cost of hiring experts, initial cost of training and recruitment cost) all add-up and pose as a challenge to SSCM practice.

5.3.1.2.2 Secondary Challenges/Barriers

Oil Industry not Playing Government: The lack of basic amenities that ordinarily should be provided by the Nigerian state but is not the case has caused many host communities where the NNPC is operational or have infrastructures in to depend on the NNPC to make these amenities available. Many at times, the NNPC is unable to meet some of these high expectations and demands and this has caused the NNPC severe reputation loss as well as product losses and facility damage.

Inadequate Laws and Inefficient Judicial System: The judicial system in Nigeria was also highlighted as a contributing factor to the challenges in adopting SSCM. The long trial times and inadequate laws regarding pollution and pipeline vandalism were cited as offshoots from this problem.

"*The laws are not even adequate… when you talk about the pollution-pay principle, you are ready to pollute the environment and they take you to court and the case remains in court for years and nothing comes out of it*".

"*People need to be punished for doing things that are wrong*".

Erratic Power Supply: The lingering epileptic power supply in Nigeria is a major challenge in the area of energy provision.

"*Even when you talk about energy, there is epileptic power supply*".

Low Channel Draft: This emanates as an offshoot from the pipeline vandalisation problem as the NNPC most often times resort to the use of smaller vessel and jetties for transportation of products. Due to the low channel draft, only small volumes can be transported at a particular time.

"… also the draft of the channel is low. This also affects and causes a reduction in the volume that we can transport".

"Use of pipelines for conveying crude and refined products is much cheaper than delivering by ship. However, we are incapacitated by the pipeline vandalism problem …products are therefore at risk when conveyed through pipelines and so we have to make use of sea transport".

"…we use sanudraft vessels. This has a low volume, thus smaller volume going into the jetty".

Poor Maintenance Culture: Many of the infrastructures are not adequately maintained either due to issues with funds or delay in the procurement cycle. This has been attributed to the culture in Nigeria as a country, thus causing the somehow inadequate maintenance given to some of the downstream infrastructures and equipment.

Minimum Regulatory Requirement Aimed At: Minimum rather than maximum requirement is aimed at by downstream operators. Some downstream operators lack the technical background to appreciate set regulations. Thus there is the tendency that the benefit of adopting SSCM may be lost to them.

"… Many downstream operators are potentially business people not having a lot of technical back-ground, so sometimes it is very difficult for them to appreciate why these regulations are there to start with"

"…they do not have the level of technical understanding why you have to do things in a certain way to bring about sustainability of operation …the upstream are usually more proactive, sometimes they go beyond the standard because they have a parent company who usually have in place standards that go beyond what we have"

Information Exchange: This is still challenging as lower cadre staff are often left out of the organisational communication chart.

Corruption Culture: The corruption that characterises the country directly and indirectly influences operational and management practice in the Nigerian downstream sector. The corruption culture cuts across all sectors and institutions ranging from corrupt security agents, inequality in social structure and influence of society in general.

Complete Dependence of the Nigerian Economy on the Oil Industry: This is also referred to as the resource curse problem and causes the marginalization of other industries, thus discouraging industrialization and growth of other industry sector. The focus on the oil sector as the national source of funds as witnessed in many developing oil producing countries is also a source of challenge to SSCM.

Product Theft and Losses: This is described as the key supply chain risk in the NNPC. Deliberate acts of vandalism and destruction of pipeline infrastructures in order to steal crude and refined products have been described as leading SC problems in NNPC.

"*People deliberately vandalise pipelines to steal crude oil and refined products…*"

Poorly Structured SSCM Programmes: There is still inadequate awareness and knowledge on SSCM, thus the organization is still not familiar with the term and is instead understood in the context of HSE. Hence programmes regarding sustainability are structured not adequately structured.

Slow Momentum towards Change: Multinationals in Nigeria seem to have adopted and perfected the change towards a more sustainable terrain unlike its state-owned counterpart.

"*… The multinationals in Nigeria have adopted these policies long, long ago and they have perfected them, but the NNPC being a state-owned company, thus changes come gradually being a state owned organisation, so definitely changes come gradually….*"

5.3.1.3 Drivers of SSCM

Conformance to International, Regional and National Standards: This code was also captured under SSCM measures and performance. It was also cited as a high performance area in the NNPC by some respondents. Compliance to both international and national standards as required in the sector of the industry was identified as a goal focused area of NNPC operations. The aspiration of being a

top ranking oil organisation both at international and local levels stands as the motivation for the NNPC's efforts towards conformance to standards. Although there were also inclinations that sometimes minimum requirements were achieved by the organisation.

"*…I would say achieving profitable operations on a sustainable basis and full conformance to environmental standards*".

Building an Efficient Supply Chain: The need to have an efficiently coordinated system of purchasing raw materials and equipment up onto the delivery of refined products to the end users is a driver of SSCM in the NNPC.

"… If a proper supply chain is not properly set up, we have a situation where things are either bought low quality and that would impact operations or highly expensive, at the end of the day loss is incurred… on time procurement to ensure on-time delivery for operations is also a key area covered".

"*Our supply chain is such that there are people who will alert you when you are getting to the minimum stock level even before you are aware of it so that whatever is tenable out there is also tenable within*".

Achieving Profitable Operations on a Sustainable Basis: Similar to many oil organisations, NNPC is profit-driven.

Supplier Benefits for Adopting SSCM: Benefits accrued from improved quality of service, on-time delivery and savings are factors driving the adoption of SSCM.

"*…comparing what was before now, I mean before the adoption of SSCM, as a supplier, a lot of benefits has been accrued in this regard…things are much more structured now, better documentation, and so on…You cannot compare what is on ground now to what was obtainable before SSCM started*".

Value System of NNPC: NNPC is also being motivated towards SSCM as a result of its value system and policies which aims towards positive innovation and development

"*The value system of NNPC is towards positive innovation and policies. Once we see one, we adopt… to move the organisation towards better performance*".

5.3.1.4 Influence of Nigeria's Developmental Level on SSCM

Low In-Country Manufacturing: All the respondents were of the opinion that Nigeria is still lagging behind in the area of manufacturing and this problem is evident in the high level of importation of equipment required in the downstream sector. The non-availability of basic infrastructures necessary for the efficient functioning of the manufacturing industry was cited as a cause of the high dependence on international suppliers and manufacturers in the sector.

"*... yes, these are barriers specific to Nigeria being a developing country. Some of the issues I have mentioned, someone in a developed country like the United Kingdom or other developed countries in Europe will find it really impossible or unlikely*".

Downstream Infrastructure Vandalism by Local Communities: Social problems such as unemployment, lack of amenities, etc. associated with the low level of development in Nigeria were highlighted as a leading cause of pipeline vandalism which is a key challenge to SSCM in the downstream sector.

Product Pilfering by Criminals: This was also captured under challenges to SSCM adoption. The low level of development in the context of the prevailing high level of unemployment and social inequality in Nigeria was attributed as the primary cause of product theft issues experienced in the downstream oil industry.

"*...also, I do not think it has anything to do with the culture of the people. Instead, I would say very high unemployment rate*".

Difficulty in Adopting Global Standard of Practice: Efforts towards compliance and adoption of global standards even by foreign suppliers and the NNPC is limited often proves challenging as result of the low level of development.

"*Even though we operate in a developing country, we operate global standards. Even though adopting global standards in a developing country is challenging due to locality dysfunction...*"

Lack of Resources/Financial Capability: Inadequate resources towards the purchase of necessary equipment and materials and to also marshal credible programmes towards stakeholder engagement was attributed to the level of development and the social problem of corruption in the country.

Infrastructures and Basic Amenities Lacking: The level of development in Nigeria was identified as the reason for the lack of basic amenities despite it being an oil producing country.

Agencies Lack Maintenance Culture: Respondents also highlighted the culture of delayed or no maintenance of infrastructures as a problem that is rooted in the low developmental level in the country.

Widespread Corruption: This was also highlighted as a key SSCM challenge. This is not restricted to the NNPC management (high, middle and low Cadre management) as it extends across social parastatals, security outfits, marketers and the entire country as a whole.

Inequality in Social Structure: The current level of development was identified as a reason for the wide gap in social status of the country's citizens and the large disparity between the rich and the poor. These were pinpointed by three respondents as one of the reasons for the vandalisation and corruption problems being experienced by the NNPC.

Monopoly of the Downstream Oil Sector by NNPC: Calls for the deregulation of the downstream sector constantly emerged in the interview discussions. Deregulating the downstream sector is strongly perceived as the way to revive the downstream oil sector and to make it sustainable in the long term.

"*Whether we like it or not, we have to deregulate. If we must survive as an organisation, we must deregulate…. the way we are now, NNPC is monopolizing, but when we deregulate what will happen, you open up the sector for other players to come in, there will be competition and there will be choices….. And also the price will be determined by the market forces*".

"*Deregulation is the only answer, if we must survive*"

"*I think the deregulation of the downstream oil industry will be a welcome change… this is because deregulation will make the process more transparent. It will open up the market as well as give government more revenue. It will go a long way in removing the monopoly and eliminate the cartel system*".

"*… deregulating is a development that is very much welcome and very much required… if today you deregulate, it means initially the prices may be high, but it will encourage entrepreneurs … It will make it more lucrative, and if it is lucrative, entrepreneurs will go into the business and also set up or take protection to guard their pipelines*"

Poor Economic Growth: Economic growth in Nigeria is dependent on the oil sector. Inadequate government policies and dominant control of the oil sector especially the downstream sector is a limiting factor with regards to economic growth in the sector as innovative initiatives and expansion that would otherwise have created a positive change by privately owned companies are currently lacking. Also price fixing and the regulation of the sector by the government is a hindrance to product availability and efficient processes according to respondents

Newly generated themes were further added on to the coding template in figure 6.2 as shown in table 5.2. These are the themes that evolved from the analysed interview responses.

5.3.2 Summary of Analysed Qualitative Data

As indicated in the previous chapter, 13 individual respondents were interviewed across the NNPC refineries, distribution centres, regulatory bodies and suppliers. Twelve main themes evolved from

the analysed data. These themes are SSCM measures, drivers and barriers, impact of barriers, country's influence on SSCM, culture, deregulation, problems peculiar to Nigeria, SSCM performance, performance measurement, regulatory, and ways of improving the current process.
A total of seven measures were identified and these represent current practices in place in the supply chain links for addressing and safe-guarding the environment, social and economic dimensions of sustainability.

In comparison to SSCM drivers in literature, only three drivers were identified in the supply chain links. These key drivers for the adoption of a positively impacting supply chain were the need for the industry sector to remain economically viable via profit making, conformance to standards, and the value system of the organisation.

Twelve SSCM challenges emanated from the qualitative study and these act as barriers to the implementation of a positively impacting supply chain. The cumulative effect of these challenges has resulted in operational and economic losses, product scarcity, production downtime and interruption, transportation problems and loss of consumer confidence.

The analysis also emanated nine factors influencing the adoption and practice of SSCM in the industry sector as a result of country's level of development (country's influence on SSCM). These stem across social and economic contributory factors to SSCM practice. The level of a country's development plays a key role in this contest as all the mentioned factors hinged heavily on Nigeria's development level. In the same vein, under the culture theme, three key factors were identified; the corruption problem in the country, influence of the larger society on policy creation and adoption in the NNPC and the reluctance to embrace change. Also, pipeline vandalism, change management and host communities not benefitting from resources emanated as problems peculiar to Nigeria. These surfaced in all interviews conducted and was mentioned by all respondents.

Deregulation of refined product pricing was a prominent part in the interview discussion and five key factors evolved, these were; dependence of the Nigerian refined product market on importation, market monopoly by the government owned NNPC, product price subsidies and the ambiguity in deregulation system pricing and balance of payment.
Four sub-themes evolved under the regulatory theme. Analysed data shows that the NNPC are routinely monitored for compliance and the organization itself also has in place a system for checking and ascertaining adherence to regulatory and health and safety requirements. These are aimed towards

impact reduction and a positively impacting supply chain. The need for education on regulatory requirements was also highlighted as an important aspect of adherence.

Four key metrics are adopted for performance measurement in the supply chain links. These metrics are centred on economic returns on investment and supply chain efficiency. This study has identified that with regards to SSCM performance, the supply chain link is currently underperforming but however, there is a positive attitude towards the practice of a well-developed and structured SSCM.

Based on the analysed data, this study has identified that there are complexities in the refining and storage supply chain links of the Nigerian downstream oil industry. While all the respondents interviewed were familiar with sustainability and supply chain management, the term SSCM was however not very known. SSCM measures adopted by the supply chain links were practised under the guise of HSE, TQM and ISO standards and not necessarily towards the goal of sustainability which is "the responsible use of resources such that the needs for the present generation are met without jeopardizing the same for future generation".

The motivation for the adoption of a positively impacting supply chain is mainly three fold. The first is the need to comply with stipulated industry standards and regulatory requirements in order to avoid negative publicity and fines. The other drivers are derivation of economic benefits from supply chain activities in the form of profit and the value system of the organization. These are the main motivation for SSCM activities across the supply chain.

SSCM barriers in the Nigerian downstream oil industry stem across all dimensions of sustainability. Apart from the lack of detailed knowledge on SSCM, which can be traced to inadequate education and awareness on the concept, and change management problems which characterises organisations introducing new processes and innovations, there were other barriers to the adoption and practice of SSCM that extended beyond the influence and capacity of the organisation. Barriers such as, outrageous stakeholder demands, foreign exchange rate, ageing infrastructure, pipeline and infrastructure vandalisation, transportation difficulties, lack of social amenities in surrounding communities, and loss of confidence in the system by suppliers extended beyond the influence of the organization. It rather depended also on foreign exchange market modalities, the Nigerian government and other stakeholders; local communities, suppliers, and the larger Nigerian society. In a similar vein, these barriers impacts on all dimensions of sustainability by causing operational losses, environmental pollution, product scarcity, financial losses and loss of consumer confidence.

The level of development in Nigeria also plays a pivotal role in the SSCM challenges faced by the storage and refining supply chain links especially in the social and economic dimensions and by extension, the environmental dimension. This is because social factors such as, lack of basic amenities, government policy, lack of transparency, infrastructure vandalism as a result of high unemployment and poverty rate and low literacy level impacts on the organization's effort at sustainable supply chain practices. The low level of in-country manufacturing which causes the sourcing of equipment outside the country has led to production downtime and low refinery output. Also government policies on refined product pricing and its ownership of the sector has impacted on the economic stance and profitability of the sector.

Culture of the country with regards to corruption, which is also observed in both private and government parastatals influences the profitability and efficiency of the supply chain and is a challenge in the industry sector. Also, the organisational culture in the adoption of new concepts and innovations such as SSCM takes time and requires effort and encouragement from the management. This in itself influences the level of adoption of sustainable practices and its integration across supply chain processes. The influence of the larger society in relation to stakeholder expectations and sometimes unrealistic demands plays a pivotal role in the way the organisation reacts to sustainability issues and this sometimes undermines the efforts and image of the NNPC.

Pipeline vandalism is common practice and is responsible for many of the environmental oil spills and fires ascribed to the supply chain links. Social problems in the country are a factor that plays an important role in this regard. Local communities around oil infrastructures expect more from the oil industry than they are currently able to provide due to the low level of development in the country.
The supply chain links understudy are currently underperforming in SSCM practices but there is a positive outlook towards improved adoption evidenced by positively impacting processes and operations. Currently, performance measurement is based on capacity utilization, ease of procurement, delivery time and revenue yields.

Meeting the market demand for refined product is still heavily dependent on importation even as there is still market monopoly as the industry sector is still majorly controlled by the NNPC under the ownership of the Nigerian government. The current system is ambiguous as the Nigerian government still plays a key role in the market mechanism and is responsible for the poor quality of service and supply chain activities.

Table 5.2 Themes Generated by Abstracting Themes from Codes (Nigeria)

SSCM Measures	• CSR • Conformance to Standards • Best Practice • HSE Policies • Stakeholder Engagement • Added Value to Development • Prioritising Local Communities
SSCM Drivers	• Conformance to Standards • Sustainable Profit • NNPC Value System
SSCM Barriers/Challenges	• Lack of Personnel Training • Change Management • Foreign Exchange • Lack of Confidence in the System • Ageing Infrastructure • Lack of Maintenance Culture • Outrageous Stakeholder Demands • Basic Social Amenities Lacking • Sustainability Awareness and Education Lacking • Minimum Requirement Aimed at by Downstream Operators • Difficulty in Transporting Products • Infrastructure Vandalisation
Impact of Barriers	• Transportation Problems • Product Scarcity • Production Interruption • Environmental Contamination • Revenue Loss • Operational Losses • Loss of Consumer Confidence
Country's Influence on SSCM	• Low In-country Manufacturing • Basic Social Amenities Lacking • Peculiar Social Issues in Nigeria • Slow Momentum Towards Change • Social Problems (Pipeline Vandalism, poverty, high unemployment) • Minimum Standard Requirement aimed at by Operators • Differing Literacy Level • Government Policy not Beneficial • Lack of Transparency
Culture	• Corruption • Reluctance to embrace change • Influence of Larger Society
Peculiar Problems in Nigeria	• Pipeline Vandalism • Change Management • Host Communities not benefitting from Oil Resources
Deregulation	• Importation Dependent • Market Monopoly • Subsidy Removal • Quality not Profiteering • System Currently Ambiguous
SSCM Performance	• Currently Underperforming • Positive Attitude
Performance Measurement	• Capacity Utilization • Ease of Procurement • Short Delivery Time • Revenue Yields
Regulatory	• Compliance Monitoring • Education • Impact Reduction • Operations Monitoring
Way Forward	• Education a core part of CSR • Awareness and Training on SSCM

5.4 Quantitative Data from Stakeholders (Local Communities around NNPC Storage & Distribution Terminals).

As stated in the data collection chapter, stakeholder perception of the downstream oil industry activities in the context of sustainability was assessed with the use of survey questionnaires. Data collected was afterwards processed and analysed using a statistical software package. The inclusion of the survey by questionnaire is aimed at corroborating the results of the interviews. As discussed in chapter 4, the use of the mixed-method (Qual-Quan) was adopted based on its numerous advantages. For the purpose of obtaining a detailed picture of current effort towards a safe and positively impacting supply chain in the Nigerian downstream oil industry, it is pertinent that the perception of stakeholders especially, local communities across NNPC infrastructures understudy is obtained. The inclusion of this data to the qualitatively collected data is aimed at obtaining an overall picture of current SSCM practice and or supply chain activities in this regard by the industry sector and how these activities are perceived by stakeholders who are direct recipients of such supply chain activities and are capable of impacting on its achievement.

A number of statistical software packages have evolved over the years for the analysis of quantitatively collected data. SAS, STATA and SPSS are some of the well-known packages often employed in quantitative data analysis (see table 5.3).

5.4.1 Justification for Use of SPSS for Quantitative Analysis

The SPSS software package was adopted for the analysis of quantitative data collected from the downstream oil industry stakeholders. The reason for this selection was based on the ease of adaptability and usage. Also, the package is freely accessible and downloadable from the university website and there were introductory training sessions on how to make use of the software for statistical analysis purposes. Thus eliminating the need for purchase and allowing easy accessibility to guidance and help with the use of the package from the statistic department in the university.

Table 5.3 Pros and Cons of SAS, STATA and SPSS Statistical Packages (Source: Konasani and Kadre 2015, Rabe-Hesketh and Everitt 2004 and University Library 2015)

SAS (Statistical Analysis System)	**STATA**	**SPSS (Statistical Package for the Social Science)**
PROS		
Widely used package for analysis in the business world	Used for data analysis, management, graphical representation and visualization	Widely used computer package for performing complex quantitative data manipulation and analysis
Suitable for very rigorous data handling and analysis	Interactive and makes use of line commands	Capable of handling large data sets and easy to use for first time users
Capable of processing extremely large data sets	Graph syntax in Stata are easily created and edited just like in the SPSS package	Able to perform a wide number of statistical analysis including regression, logistic regression, survival analysis, analysis of variance and multivariate analysis.
Perform functions ranging from report writing, business planning, forecasting and graphical representations	Allows data analysis for generalized bio-statistical equation estimation and the econometrics selection model	Gives clear graphic syntax and tubular outputs which can be copied into other packages and documents like Microsoft Word and PowerPoint.
	Allows both simple and complex manipulation of data with ease	Flexible and adaptable with other packages like SAS, Stata and Excel.
CONS		
SAS software package is expensive	Weak in the analysis of discriminant function and variance	It is expensive
Package runs largely by programming syntax and requires some level of programming competency to assess the tool for analytical purpose	Data management capabilities are not however as extensive as that of SAS.	Not as robust as some of its counterpart especially in performing robust regression and standard error estimation.

5.4.2 Quantitative Results and Analysis

Collected quantitative data was analysed using both descriptive and inferential statistical methods. Reliability, normality and validity tests were conducted on the data to test the internal consistency and the generalizability of the data. The correlation analysis of the data was also determined by employing the chi-square test of independence.

5.4.2.1 Non-Response Bias, Normality, Reliability and Validity Tests

Non-response bias has the potential of affecting the overall interpretation of survey variables and limit the conclusions from an analysed data set (Johnson and Wislar 2012). Different from response bias which occurs as a result of dissimilarity in obtained results and the true opinion of respondents participating in a survey; Non-response bias which can be "*total*", "*unit*" or "*item*" non-response bias is the error introduced into a study when respondents in a study sample do not participate or provide answers to the survey questions (Bryman 2008, Halbesleben and Whitman 2013 and Sax, Gilmartin and Bryant 2003). This may be due to the non-availability or refusal of respondents from partaking in the study (*total*) or sometimes caused by sensitivity of the questions resulting in some respondents participating in the survey not completing the questionnaire (*unit*) or responding by providing an invalid answer to a question (*item*). To eliminate unit non-response bias, careful consideration was

given to the research instrument (questionnaire) in the design phase to prevent respondents from not answering the asked questions. See questionnaire in Appendix D.

In analysing the quantitative data for this study, non-response bias was assessed using the t-test. Based on responses on the benefits of the NNPC facility, a t-test was conducted in order to find out the differences between respondents and non-respondents. Difference in mean values was calculated using three variables (Questions 8,10 and 13); view on the effects of NNPC activities (Q8), increase in occurrence of negative effects (Q10) and reasons for the negative effect of NNPC activities (Q13).

Table 5.4 Independent Samples T-Test Results

Variable		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	*Sig.*	*t*	*df*	Sig. (2-tailed)	Mean Difference	*SE*	95% *CI*	
									Lower	Upper
View on the effects of NNPC activities	Equal variances assumed	.23	.63	.39	77	.698	.35	.91	-1.46	2.17
	Equal variances not assumed			.36	8.31	.731	.35	1.00	-1.93	2.63
Increase in Occurrence of Negative Effects	Equal variances assumed	.40	.53	-1.17	77	.246	-2.81	2.40	-7.59	1.98
	Equal variances not assumed			-1.04	8.21	.330	-2.81	2.71	-9.03	3.42
Reasons for Negative Effect	Equal variances assumed	.51	.48	-1.51	77	.136	-1.97	1.31	-4.57	.63
	Equal variances not assumed			-1.25	8.02	.246	-1.97	1.57	-5.60	1.66

The t-test results (table 5.4) showed that there was no significant difference between respondents and non-respondents. As shown in the table, respondents and non-respondents were found to be statistically equal as there is no significant difference in the three considered variables; view on the effects of NNPC activities (t = .39, p = .698), Occurrence (t = -1.17, p = .246) and influence (t = -1.51, p = .136). Hence, non-response bias has no significant impact on the sample.

Assessing the **normality** of a data set is important for drawing statistical inferences as many statistical procedures depend on the normality assumption (Yap and Sim 2011). Normality can be assessed via visual inspection (graphically) or other tests such as skewness test, kurtosis test, Kolmogorov-Smirnov test and Sharpiro-Wilk test (Ghasemi and Zahadiasl 2012). The normality of the distribution for this

study was assessed using skewness and kurtosis tests (Pallant 2013). The values of the variables tested for normality (see table 5.17) using the tests fall within the acceptable range (between +2 and -2) of normality (George and Mallery 2010). Thus, the data sets satisfy the assumption of normality.

Table 5.5 Skewness and Kurtosis Test of Normality for Research Variables

Variables	Skewness	Kurtosis
Effort Towards Impact Reduction	-.710	.208
Increase in oil spills	-.180	-.753
Increase in gaseous emissions	.079	.211
Increase in environmental pollution	-.276	-.722
Increase in traffic problems	-.165	-1.096
dIncrease in criminal activities	.026	-.756
Increase in fire incidences	.260	-.130
Increase in poor health	.228	.223
Increase in bad roads	-.203	.614
Increase in no of social miscreants	-.134	.296
Increase in poor power supply	.075	.357
Increase in no of school dropouts	.139	-.051
Efforts towards safety	-.680	.324
Influence of developmental level on SSCM	-.254	-.941
Influence of government policies on SSCM	-.514	-.527
Influence of poor staff training on SSCM	.028	-.869
Influence of non-privatization on SSCM	.527	.246
Influence of government participation on SSCM	.163	-.413
Influence of culture on SSCM	-.581	.287
NNPC facility beneficial	-.764	.579
Effect on environment	-.106	-.800
Effect on social development	-.026	-.327
Effect on economic development	-.808	.410

Reliability is the extent of consistency and stability of a particular measure (Tavakol and Dennick 2011). It is the degree to which a test measuring a particular attribute or behaviour when repeated under different conditions can produce the same result over time. Internal consistency is a good way of measuring the reliability of a test construct (Drost 2011). This is because it measures to what extent a question set measure a particular attribute within the test. Cronbach's Alpha provides a measure of the inter-relatedness of a set of test items (Tavakol and Dennick 2011). It measures the internal consistency of items within a test. In order to test the scale, reliability for individual constructs in the study sample, the reliability test was performed. This was done separately for the dependent and

independent variables in order to test the internal consistency of the scale. Cronbach's Alpha was used in measuring the reliability of the scales.

- **Dependent Variable (Perception of Stakeholders)**

Questions 9, 11 and 14 from the survey questionnaire (see appendix D) were selected as the dependent variables. These evaluated the perception of respondents on the positive role of NNPC in their area. The dependent variable which explores the positive role of NNPC addresses the "*Benefits*" of NNPC to local communities around them is a five item scale with a five-point likert scale option for each item. As shown in table 5.6, the dependent variable has a Cronbach's Alpha of 0.651 which is indicative of a moderately high reliability in item scale (Gliem and Gliem 2003 and Ringim, Razalli and Hasnan 2012).

Table 5.6 Reliability Test Output for Dependent Variable

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.651	.663	3

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Effort Towards Impact Reduction	7.09	3.800	.396	.172	.636
Efforts towards Safety	6.80	3.523	.550	.304	.458
NNPC Facility Beneficial	7.08	2.712	.472	.254	.564

- **Independent Variable**

Positive contributions or benefits of NNPC activities were evaluated with regards to stakeholder view on the effect of NNPC activities on the three sustainability dimensions (Q8), responses of stakeholders on negative occurrence (Q10) and reasons for negative influence (Q13). Effect on the environment, society and economy is termed as "*Effect on Sus. Dimension*" afterwards for easy understanding and clarity. Cronbach's Alpha values of 0.810, 0.798 and 0.671 were obtained for "*Effect on Sus. Dimension*, "*Negative Occurrence*" and "*Reasons for Negative Occurrence*" respectively (table 5.7). For all three variables, deleting any item would not result in higher alpha values than 0.810, 0.798 and 0.671. Thus, every item is kept for further analysis (see tables 5.8, 5.9 and 5.10)

Table 5.7 ***Reliability Test Output for Independent Variable***

Cronbach's Alpha - Every variable		
Variables	***Number of Items (Number of Questions).***	***Cronbach's Alpha (Actual Population) (79 samples)***
Effect on Sus. Dimension	***3***	***0.810***
Negative Occurrence	***11***	***0.798***
Reasons for Negative Influence	***11***	***0.671***

Table 5.8 Cronbach's Alpha of Negative Occurrence

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Increase in oil spills	30.86	35.455	.361	.524	.794
Increase in gaseous emissions	30.90	35.579	.430	.574	.785
Increase in environmental pollution	30.73	32.813	.608	.643	.765
Increase in Traffic problems	30.38	35.521	.376	.354	.791
Increase in criminal activities	30.91	34.518	.522	.518	.775
Increase in fire incidences	31.03	36.230	.384	.529	.789
Increase in poor health	30.96	34.088	.627	.565	.766
Increase in bad roads	30.66	34.741	.496	.491	.778
Increase in no of social miscreants	30.65	35.488	.486	.422	.780
Increase in poor power supply	30.82	36.660	.329	.235	.795
Increase in no of school dropouts	31.09	35.723	.432	.501	.785

According to Flynn, Schroeder and Sakakibara (1994) and Ringim, Razalli and Hasnan (2012), Cronbach's Alpha values between 0.60 and 0.99 are acceptable and these indicates that the scale is reliable. Hence, the variables employed for examination shows that the scale is reliable. Also, the Cronbach's Alpha for the variables indicate high reliability, signifying that the data has astounding dependability as far as internal consistency is concerned.

Table 5.9 Cronbach's Alpha for Reasons for Negative Influence

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Influence of developmental level on SSCM	17.08	9.686	.320	.124	.656
Influence of government policies on SSCM	16.94	8.675	.476	.300	.601
Influence of poor staff training on SSCM	17.08	8.969	.460	.270	.609
Influence of non-privatisation on SSCM	17.48	9.766	.357	.171	.644
Influence of government participation on SSCM	17.27	9.300	.407	.218	.627
Influence of culture on SSCM	16.76	8.929	.385	.190	.636

Table 5.10 Cronbach's Alpha of View on the Effect of NNPC on Sus. Dimension

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Effect on Environment	6.42	2.759	.697	.492	.699
Effect on Social Development	6.54	2.969	.612	.376	.787
Effect on Economic Development	6.15	2.874	.668	.461	.729

5.4.2.2 Descriptive Statistical Results

Descriptive statistics summarizes data numerically and graphically in order to give a concise summary and representation of a data set to allow for easy identification of emerging patterns from the distribution (Lærd Statistics 2016). It is also useful for addressing specific research questions (Pallant 2013). For the purpose of this study, descriptive statistics was employed in analytically describing stakeholders' perception of NNPC activities on the dimensions of sustainability and the benefits accrued from having NNPC facilities in their locality.

5.4.2.2.1 Profile of Respondent

The profile of respondents that participated in the survey were described based on their occupation and NNPC infrastructure located close to the respondent as shown in table 5.11. Of the 79 respondents from which data was collected, 76% were traders, professionals, civil servants and self-employed

while 6% were manual workers and 18% of the respondents were students. The diversity in the occupational status of respondents indicates a wide coverage and well distributed respondent's views.

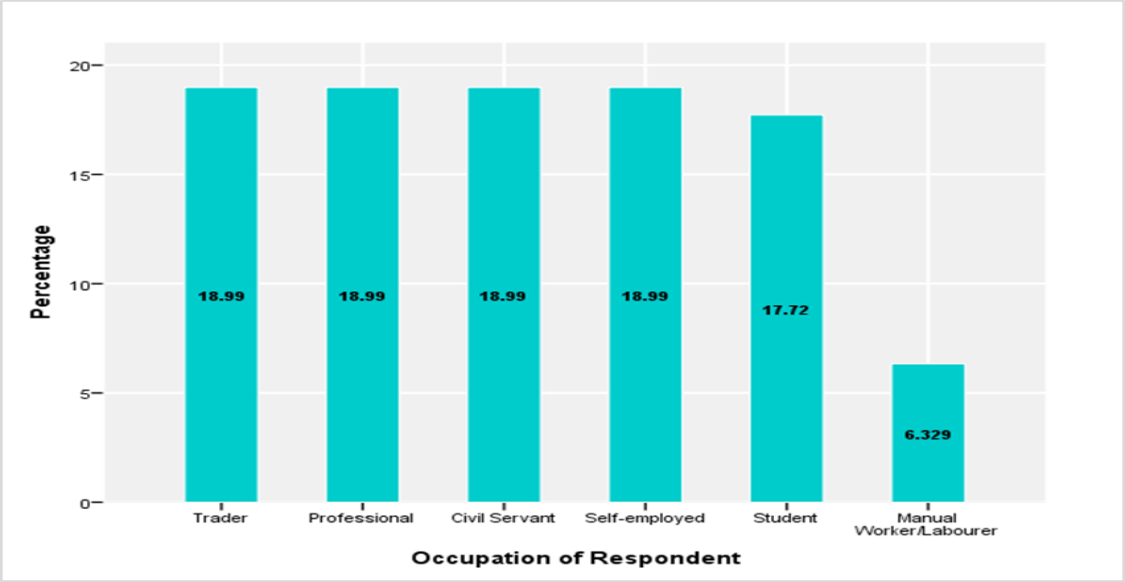


Figure 5.3 Occupation of Respondents

With respect to the NNPC infrastructure located close to the respondent, 35% of the respondent were located close to NNPC pipelines while 27% resided near NNPC storage tanks. The rest of the respondent (38%), were located near NNPC offices and storage terminals. The highest response rate from respondents based on their closeness to NNPC infrastructure was obtained from those near NNPC pipelines.

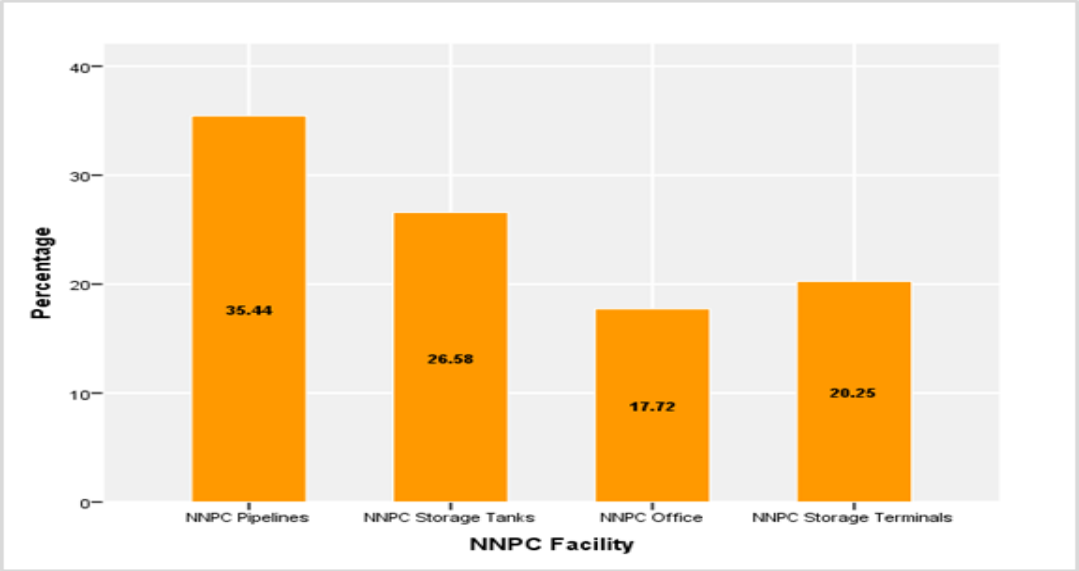


Figure 5.4 NNPC Infrastructure near Respondent

The distribution of responses from respondents residing close to NNPC infrastructure with regards to their location is well dispersed across existing NNPC infrastructure for the supply chain links under-study.

Table 5.11 Profile of Respondents

Criteria			
Occupation	Frequency	Percent	Cumulative Percent
Trader	15	19	19
Professional	15	19	38
Civil Servant	15	19	57
Self-employed	15	19	75
Student	14	17	93
Manual Worker/Labourer	5	6	100
Total	79	100	
NNPC Infrastructure close to Respondent	Frequency	Percent	Cumulative Percent
NNPC Pipelines	28	35	35
NNPC Storage Tanks	21	27	62
NNPC Office	14	18	80
NNPC Storage Terminals	16	20	100
Total	79	100	

5.4.2.2.2 Stakeholders' Perception of NNPC activities

In terms of the stakeholders' perception of NNPC activities, data set from 79 respondents/stakeholders was explored to understand benefit they derive from NNPC activities in their locality, the effect of such activities, and contribution of NNPC to their respective areas.

- **Benefits of NNPC Activities**

Descriptive analysis was conducted to study whether the respondents consider the presence of NNPC facility in their area beneficial at all. If the initial analysis indicate that they are accruing any benefit, the number of such benefits was also explored, as well as specific nature of the different advantages the respondents believe they are getting from the NNPC.

Results, as shown in Table 5.12, indicate that majority of the respondents/stakeholders believe that they are accruing benefits from the presence of NNPC facilities in their localities (i.e., 63.3% agree or

strongly agree that they are benefiting from NNPC activities, as compared with 24.1% having opposing views). Figure 5.5 also depicts the same variable – Benefits of NNPC facility – in a graphical format.

Table 5.12 Benefits of NNPC Facility

NNPC activities Beneficial	Frequency	Percentage (%)
Strongly Disagree	12	15.2
Disagree	7	8.9
Neither Agree nor Disagree	10	12.7
Agree	37	46.8
Strongly agree	13	16.5
Total	**79**	**100.0**

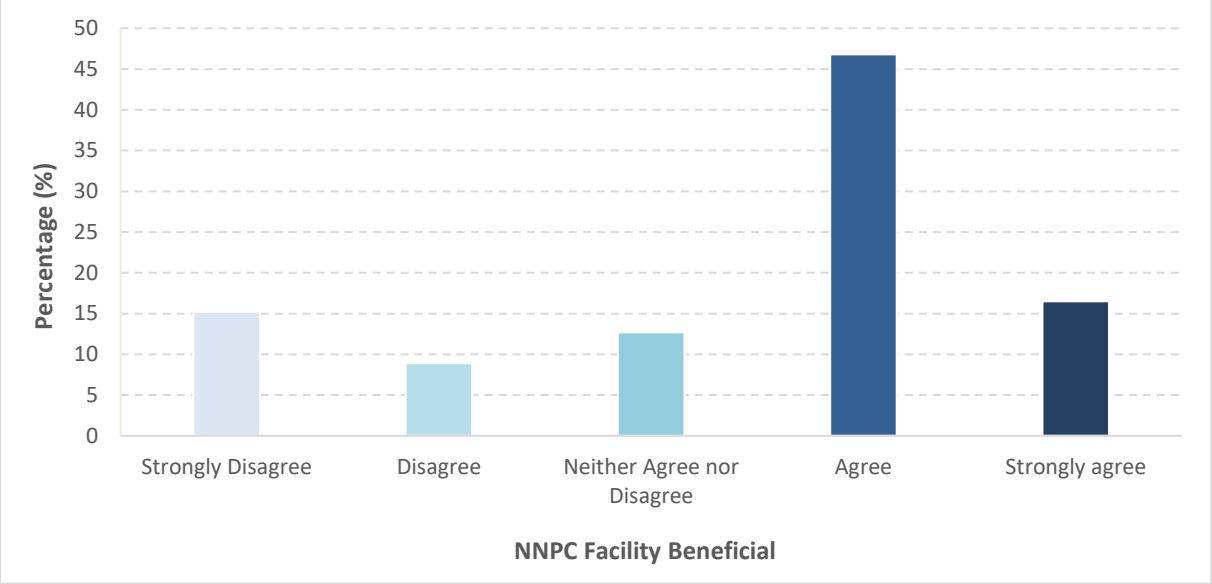


Figure 5.5 Graphical Representation of Respondents Perception on Benefit of NNPC facilities

- **Effect of NNPC Activities on Sustainability Dimensions and Local Communities**

Descriptive analysis was conducted to evaluate the effect of NNPC facilities and operations on the stakeholders. This was analysed under two headings; General Effect of NNPC Activities which gives a general perception of NNPC activities as depicted by stakeholders and Specific Effect of NNPC Activities which evaluates the effects on the separate dimensions of sustainability.

General Effect of NNPC Activities

In general, the results of the descriptive statistical analysis conducted indicate that majority of the stakeholders/respondents have a positive view of the NNPC Activities in their various localities. As shown in Table 5.13, approximately 48% of Stakeholders generally believe that the activities of the

NNPC have positive or very positive impact on their various localities, as compared with just approximately 22% of respondents having opposing views (i.e., negative or very negative views of NNPC activities). Figure 5.6 provides further graphical representation of the general effect of NNPC activities as viewed by the stakeholders.

Table 5.13 General Effect of NNPC Activities

Effect of NNPC Facility	Frequency	Percentage (%)
Very Negative	4	5.1
Negative	13	16.5
Neither Positive nor Negative	24	30.4
Positive	28	35.4
Very Positive	10	12.7
Total	**79**	**100.0**

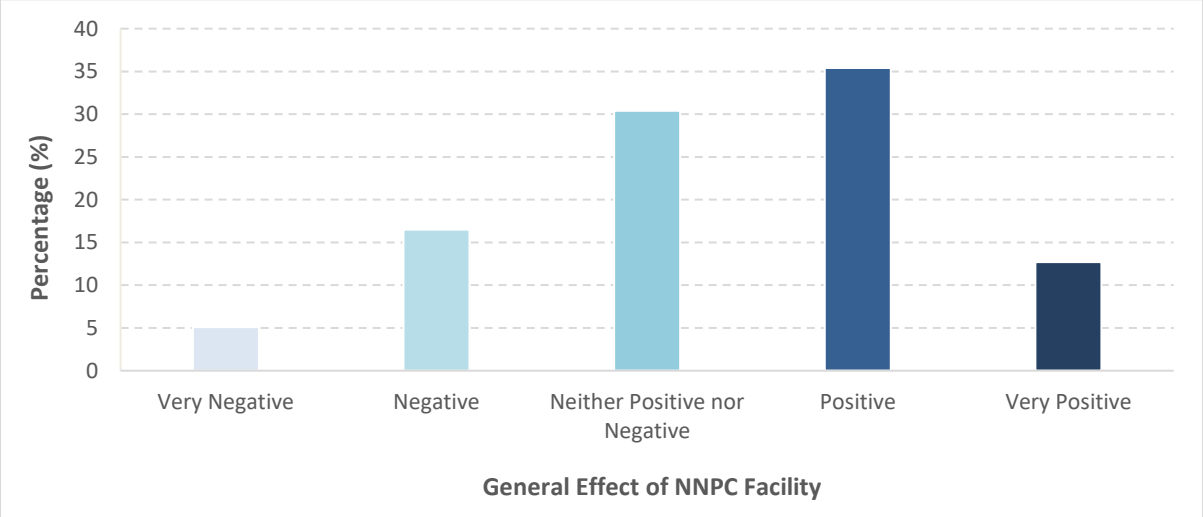


Figure 5.6 Distribution of the views of Respondents on the General Effect of NNPC Facilities

Specific Effect of NNPC Activities

Respondent's responses were analysed to evaluate the perceived effect of NNPC activities specifically on the environment, social development and economy.

- **Environment**

Specifically, majority of the relevant stakeholders are of the opinion that NNPC activities have a positive impact on their immediate environment, with approximately 41% of stakeholders expressing positive or strongly positive views on the Environmental impact of NNPC activities. Nonetheless, as shown in Table 5.14, approximately 29% of the stakeholders expressed negative or strongly negative views about the environmental impact of the activities, while 30% expressed on views at all (i.e., they

expressed neither positive nor negative views on the environmental impact). Figure 5.7 provides a pictorial representation of the stakeholders' views on environmental impact.

Table 5.14 Specific Effect of NNPC Activities on Environment

Effect of NNPC Facility on Environment	Frequency	Percentage (%)
Strongly Negative	2	2.5
Negative	21	26.6
Neither Positive nor Negative	24	30.4
Positive	28	35.4
Strongly Positive	4	5.1
Total	**79**	**100.0**

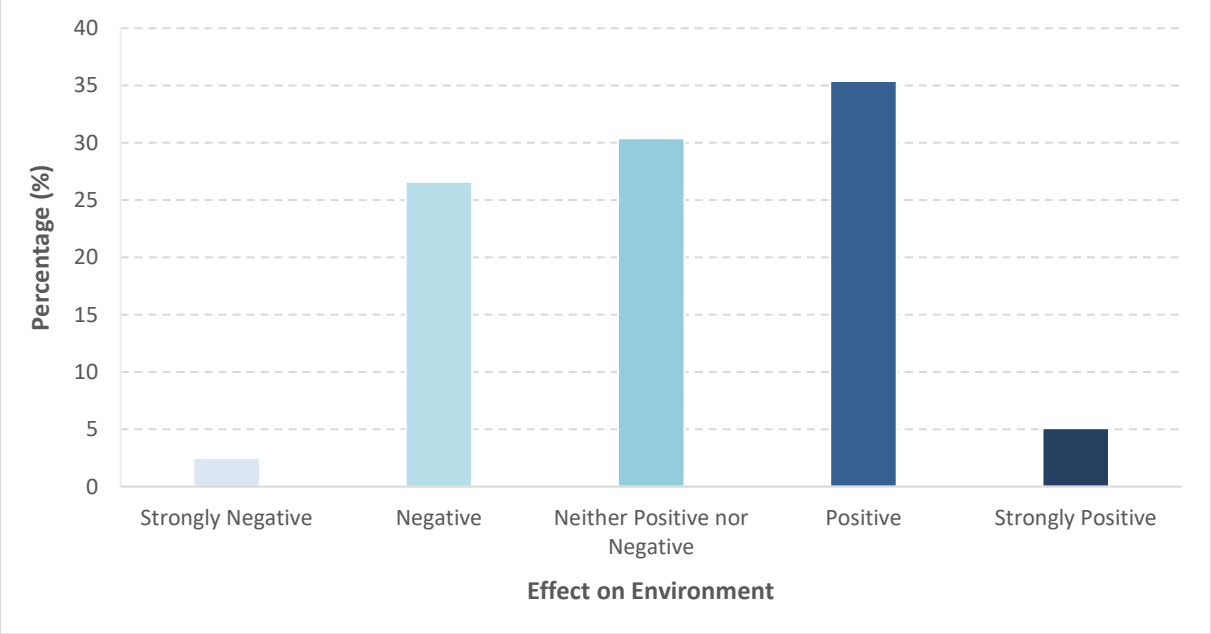


Figure 5.7 Distribution of the views of Respondents about the Effect of NNPC Facilities on the Environment

- **Social Development**

Furthermore, majority of the stakeholders expressed neither positive nor negative opinion about the specific impact of NNPC activities on social development. As shown in Table 5.15, approximately 41% of the relevant stakeholders expressed neither positive nor negative views, while approximately equal proportion of stakeholders stated negative/strongly negative (29%) and positive/strongly positive (30%) views of the socio-development impact of NNPC activities. Figure 5.8 provides a graphical representation of the stakeholders' views of the socio-development impact of NNPC activities.

Table 5.15 Specific Effect of NNPC Activities on Social Development

Effect of NNPC Facility on Social Development	Frequency	Percentage (%)
Strongly Negative	4	5.1
Negative	19	24.1
Neither Positive nor Negative	32	40.5
Positive	20	25.3
Strongly Positive	4	5.1
Total	**79**	**100.0**

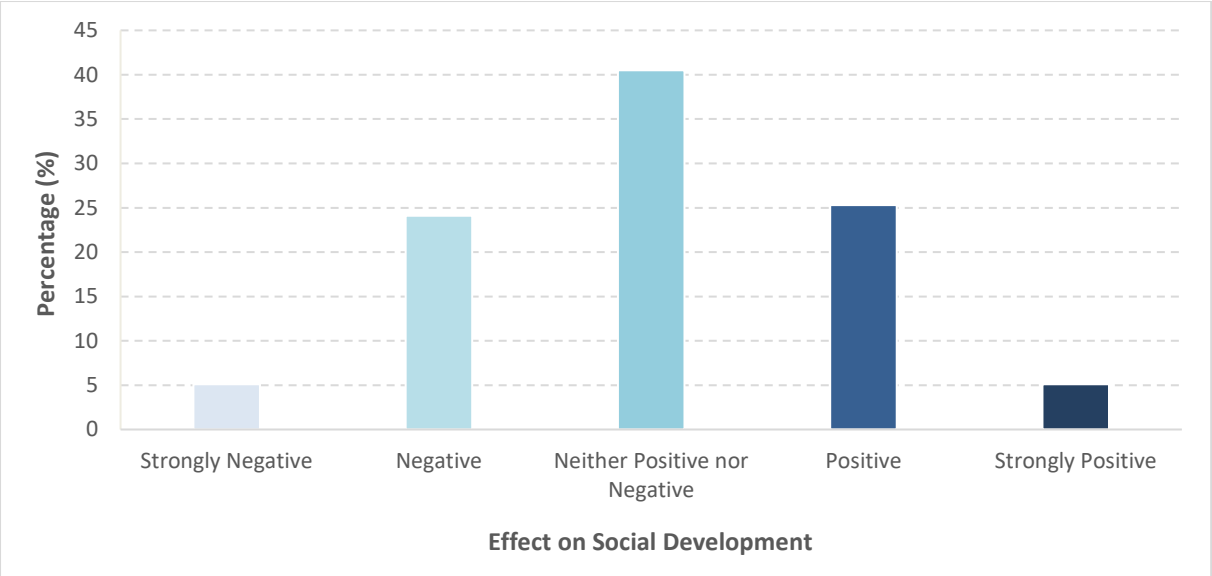


Figure 5.8 Distribution of the Views of Respondents about the Effect of NNPC Facilities on Social Development

- **Economic Development**

Moreover, in terms of Stakeholders' perception about the specific impact of NNPC activities on local economic development, the descriptive statistical analysis results show that majority of the stakeholders have positive or strongly positive views of such economic impact. As shown in Table 5.16, approximately 58% of the stakeholders expressed positive or strongly positive views regarding the impact on economic development, while only a meagre 19% expressed opposing views (i.e., negative or strongly negative opinion about the economic impact of NNPC activities). Figure 5.9 affords a pictorial representation of the distribution of stakeholders' views on the economic impact of NNPC activities.

Table 5.16 Specific Effect of NNPC Activities on Economic Development

Effect of NNPC Facility on Economic Development	Frequency	Percentage (%)
Strongly Negative	3	3.8
Negative	12	15.2
Neither Positive nor Negative	18	22.8
Positive	42	53.2
Strongly Positive	4	5.1
Total	**79**	**100.0**

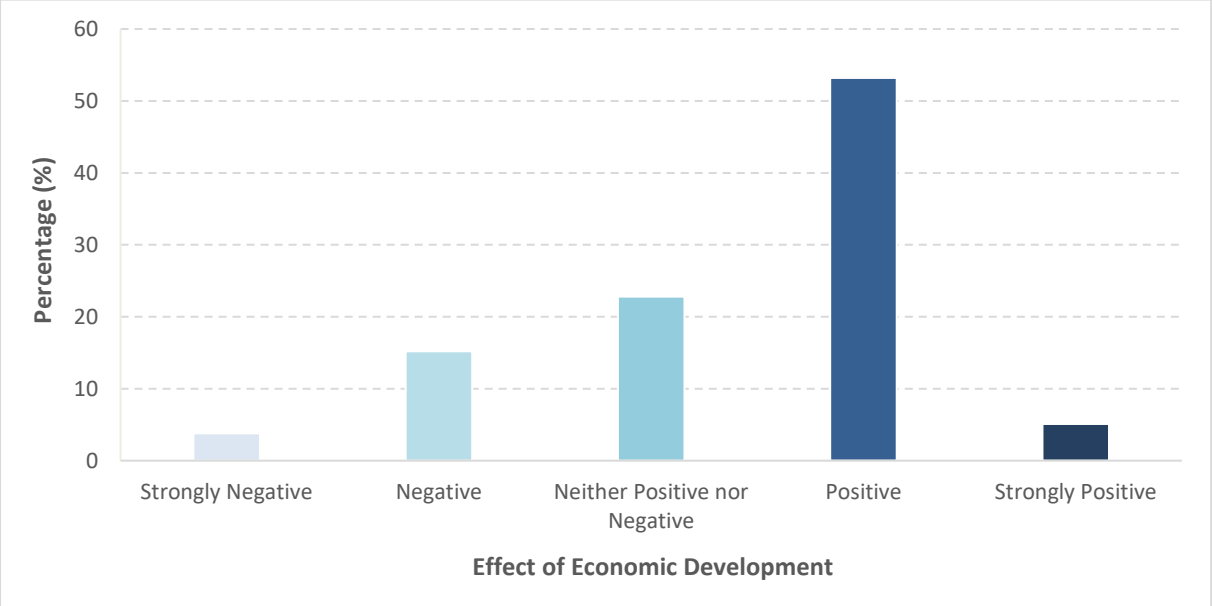


Figure 5.9 Distribution of the views of Respondents about the Effect of NNPC Facilities on Economic Development

- **Contributions of NNPC activities**

Majority of respondents/stakeholders expressed that NNPC have made some contributions to their locality (as shown in Table 5.17, 64.5% of stakeholders stating that NNPC contributions are satisfactory – i.e., okay, good or very good). Furthermore, Figure 5.10 shows the graphical distribution of the views of respondents/stakeholders in terms of NNPC contribution in their various localities, and it depicts a distribution that is highly tending towards normal; indicating a very balanced perception of the stakeholder as regards NNPC contribution. In other words, majority have an average appreciation of NNPC contribution.

Table 5.17 NNPC Contribution

View of Contribution	Frequency	Percentage (%)
Very Poor	12	15.2
Poor	16	20.3
Okay	25	31.6
Good	17	21.5
Very Good	9	11.4
Total	**79**	**100.0**

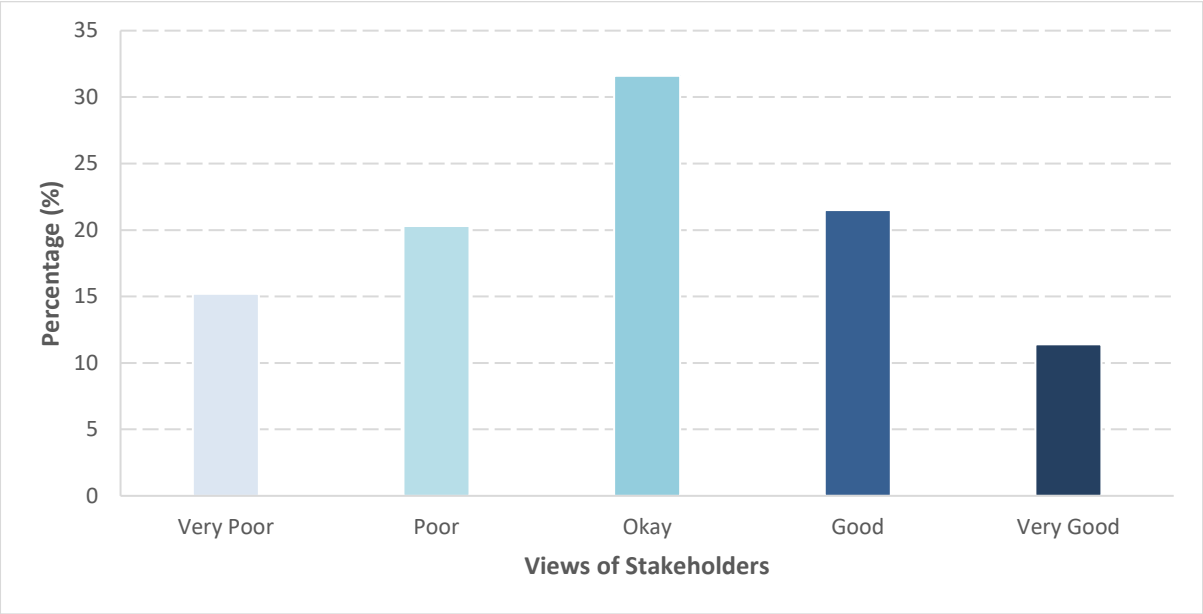


Figure 5.10 Distribution of Views of Stakeholders on NNPC Contribution

5.4.2.2.3 Benefits Accrued from Having NNPC Facilities in Locality

Further analysis indicates that amongst those that expressed advantages of NNPC facilities, majority have accrued very limited number of such benefits (i.e., as shown in Table 5.18, majority of those that expressed that they have accrued benefits (72%) were only able to specifically state/identify one particular advantage they have benefited from NNPC activities).

Table 5.18 Rank of Advantages of NNPC activities

Categorical Number of Benefits	Frequency	Percentage (%)
One benefit	36	72.0
Two benefits	10	20.0
Three benefits	8	16.0
Four benefits	6	12.0
Five Benefits	1	2.0
Six Benefits	2	4.0
All seven benefits	3	6.0

Note: benefits considered include better road network, better business opportunities, greater security, better access to domestic fuel, better community projects, regular power supply, and better social amenities.
*The reason the sum of percentages is greater than 100 is because value for each category is calculated as a proportion of total number of respondents that agree and strongly agree that they are benefiting from NNPC activities (i.e., 50 respondents).

As stated earlier, majority of those stakeholders that expressed some form of benefit from NNPC activities were only able to state just one of such benefits. Specifically, the categories of benefit mostly alluded to by these respondents/stakeholders are better business (30.5%) and access to fuel (30.5%). The least expressed categories were better security (3%) and benefit of social amenities (3%). Figure 5.11 provides a graphical representation of the distribution of the views of respondents as regards the benefits they have accrued.

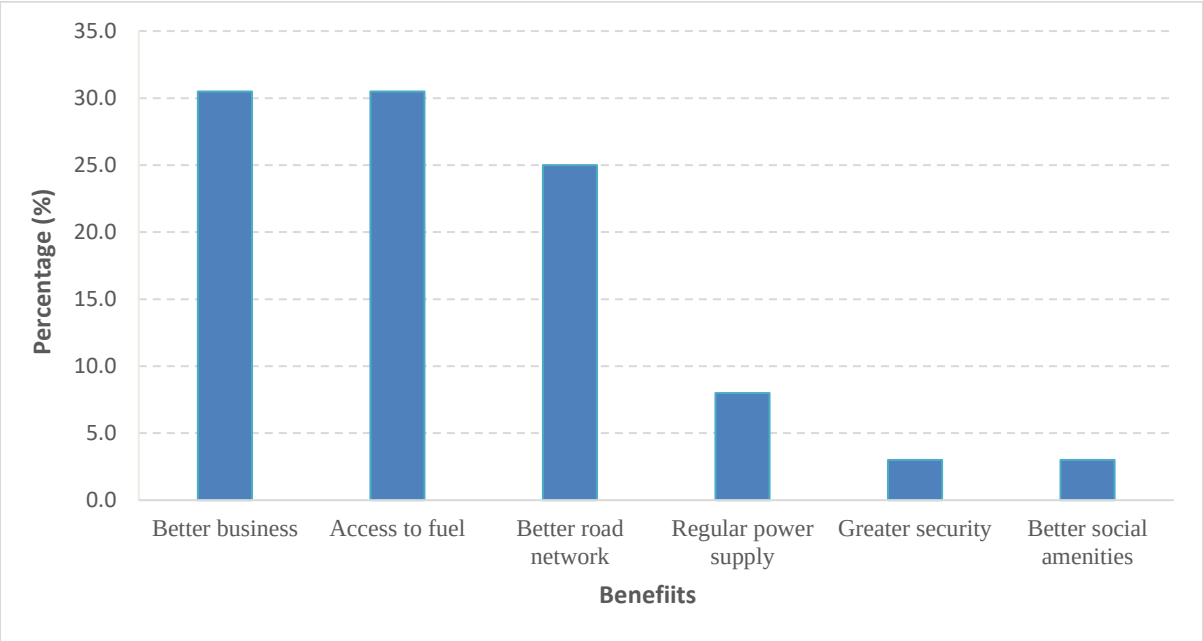


Figure 5.11 Distributions of views of stakeholders as regards Benefit of NNPC activities
(Note: the proportion calculation is based on the subset of respondents that categorically stated that they have accrued at least one benefit from the NNPC activities (i.e., 36 respondents/ Stakeholders)

5.4.2.2.4 Perception of Stakeholders on Improvement Areas

Further analysis indicates that despite current benefits accrued by stakeholders as shown in table 5.18, stakeholders expressed the possibility for the NNPC to do more to mitigate the negative impacts of their supply chain activities. Nearly half of the respondents (48.1%) agreed that there are still options to explore and another 31.6% strongly agreed that the NNPC should take other management options to mitigate the environmental, social and overall negative impacts of their activities (table 5.19). As a probable solution, 51.9% of stakeholders suggested that the NNPC invested more on infrastructure and social amenities (table 5.20).

Table 5.19 Stakeholders Response on the Necessity for Initiatives

Need for Improvement Initiatives	Frequency	Percentage (%)
Strongly Disagree	1	1.3
Disagree	3	3.8
Neither Agree nor Disagree	12	15.2
Agree	38	48.1
Strongly agree	25	31.6
Total	**79**	**100.0**

Table 5.20 Initiative Preferred by Stakeholders

Initiative	Frequency	Percentage (%)
Infrastructure & Amenities	41	51.9
No suggestion	34	43.0
Missing Data	4	5.1
Total	**79**	**100.0**

5.4.2.2.5 Factors Responsible for the Negative Impact of NNPC's Activities as Perceived by Stakeholders

While identifying reasons for the negative impact of NNPC's activities (table 5.21), more than 63% of stakeholders either agreed or strongly agreed that corruption and poor management is one of the core factors in this regard. Also, over 63% either agreed or strongly agreed that poor government policy is a major reason for the negative impact of NNPC activities. The percentage agreement (agree or strongly disagree) is slightly over 48% for negative impact attributed to insufficient training of NNPC officials on safe practice and well over 55% in the case of Nigeria's level of development.

On the other hand, 51.9% and 43% of the stakeholders adopted a neutral stance (neither agreed no disagreed) for negative impacts attributable to non-privatisation of the downstream oil sector and government participation in the oil sector respectively.

Table 5.21 Factors Responsible for Negative Impact

	Nigeria's Level of Development	Poor Government Policies	Insufficient Training of NNPC Officials on Safe Practice	Non-Privatisation of the Down-stream Oil Sector	Government Participation in the Oil Sector	Culture (Corruption, Poor Management, etc)
Strongly Dis-agree		1.3		1.3	1.3	2.5
Disagree	21.5	17.7	17.7	24.1	19.0	10.1
Neither Agree nor Disagree	22.8	17.7	34.2	51.9	43.0	24.1
Agree	45.6	48.1	34.2	15.2	26.6	35.4
Strongly Agree	10.1	15.2	13.9	7.6	10.1	27.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

5.4.2.3 Correlation Analysis Result

Correlation analysis indicates the relationship between variables. As a statistical measure, it depicts the strength of the relationship existing between variables in a data set. Ideally, a Pearson or Spearman correlation analysis would have been conducted to explore the relationship between the study variables, but since the level of measurement of data pertaining to the variables is at the nominal level, a Chi-square test of independence was deemed more suitable for the analysis (i.e. explanation of association between the variables).

A correlation analysis of the perceptions of stakeholders against the stakeholder types was performed on the data sets. This was deemed necessary to give an understanding of the strength and association between stakeholder types and their perception of NNPC's supply chain activities and their impact on sustainability dimensions.

Chi-square test of independence was performed on the data to test the association between the variables. This was done by analysing the perceptions of stakeholders based on the stakeholder types. The stakeholder types was categorized based on their location and proximity to NNPC facility/infrastructure (NNPC Pipeline and Storage Tank, NNPC Office and NNPC Storage Terminals). Table 5.21 presents a summary of the results of the Chi-square test ofindependence (χ^2, *p* and Cramer's V value). Where p is not significant for values greater than 0.05 (not significant - null hypothesis as $p > 0.05$)

Table 5.22 Result Summary of Chi-square Test of Independence between Stakeholder Perception and Stakeholder Type

Variables	P-Value	Cramer's V-Value	Significant (p<0.05)
Effort Towards Safety	**0.032**	**0.295**	**Yes**
Effect on the Environment	**0.043**	**0.304**	**Yes**
Effect on Social Development	**0.330**	**0.168**	**No**
Effect on Economic Development	**0.975**	**0.168**	**No**
Influence of Govt. Policies	**0.995**	**0.011**	**No**
Stakeholder Expectation	**0.074**	**0.257**	**No**
Effect of NNPC Facility	**0.039**	**0.302**	**Yes**
NNPC Facility Beneficial	**0.805**	**0.074**	**No**
Influence of Nigeria's level of Development	**0.775**	**0.080**	**No**
Influence of Culture	**0.114**	**0.234**	**No**
Increase in Negative Occurrence	**0.246**	**0.188**	**No**

- **NNPC Effort Towards Safety and Stakeholder Type**

The relationship between stakeholder types and their perception of NNPC's effort on safety was investigated using Chi-square test. The analysis revealed 75.5 percent **(75%)** of stakeholders living near a pipeline & Storage tank "agree" or "strongly agree" that NNPC officials in the different residential areas always conduct their business and operations in a safe way so as not to endanger the local people/residence. This result is more interesting especially in terms of those stakeholders living near Pipeline & Storage Tanks. The Adjusted Residual result for "Agree" being significantly larger than expected **(2.6),** and significantly lower for "Disagree" **(-2.6)**. Furthermore, the Pearson Chi-square results show that the proportion of stakeholders with the perception that NNPC officials always conduct their business and operations in a safe way so as not to endanger the local people/residence, is significantly different across the stakeholder types (p=0.032). In other words, it appears that there is an association between stakeholder type and their perception that NNPC officials always conduct their business and operations in a safe way so as not to endanger the local people/residence. Additionally, taking into consideration the Cramer's V results (Cramer's V Value = 0.295), the size of association

appears to be of medium effect (Pallant 2013). Thus, a Chi-square test of independence on stakeholder types and their perception on NNPC's effort towards safety indicated a medium association and significant difference between stakeholder types and the view on the effect of NNPC activities, χ^2 (*1,* n=*79*) = *6.893, p = 0.032* (*p* < 0.05), Cramer's *V = 0.295*. Current NNPC's HSE, TQM and ISO standard requirement and practices might account for this response.

- **Environmental Effect of NNPC Supply Chain Activities and Stakeholder Type**

The Chi-square test of independence on stakeholder types and their perception on the environmental effect of NNPC activities indicated a significant difference and medium association between stakeholder types and the view on the effect of NNPC activities [(χ^2 *(1, n=79) = 6.408, p = 0.043 (p < 0.05*), Cramer's *V = 0.304*)]. Thus, the result indicates a significant difference between stakeholders with the view that NNPC's activities has a negative effect on the environment and those with the view that the effect is positive (p = 0.043). There is therefore an association between stakeholder types and their perception that NNPC supply chain activities have a negative impact on the environment.

The relationship between stakeholder types and their perception on the effect of NNPC activities on the environment shows that 59% of stakeholders living close to NNPC pipelines and storage tank view the effect of NNPC's activities on the environment as negative or strongly negative. The Adjusted Residual for stakeholder's perception of NNPC's activities for "Negative" is significantly larger (1.4) and significantly lower for "Positive" (-1.4) as expected. The proximity of these stakeholders to pipelines and storage tanks which are often characterized as sources of leakages and subsequent pollution could be responsible for this outcome.

- **Social Effect of NNPC Supply Chain Activities and Stakeholder Type**

The association between stakeholder types and their perception on the effect of NNPC's activities on social development was investigated using a Chi-square test. The analysis revealed an associated significant value larger than the alpha value of 0.05 (*p = 0.330, p > 0.05*). Thus, it can be concluded that the result is insignificant (Pallant 2013) indicating that there is no statistical association between stakeholder types and their view on the effect of NNPC's activities on social development. This is expected, as the effect of NNPC's activities on social development is generic to NNPC's supply chain infrastructures and facilities. This, coupled with the existent social problems that is a characteristic feature of the country, it is not surprising to see that there is a lack of statistical significance across stakeholder types on effect.

- **Economic Effect of NNPC Supply Chain Activities and Stakeholder Type**

A Chi-square test for independence across stakeholder types and their perception on the economic effect of NNPC's activities, indicated no significant association ($p = 0.975$, $p > 0.05$). Thus, the proportion of stakeholders who viewed the effect of NNPC activities as being positive or negative is not statistically different across stakeholder types.

The reason for this may well be that the presence of NNPC facilities and infrastructures can act as a business catalyst in some areas and may not be perceived as such in others. While the former is expected in this case, as the presence of a business infrastructure has been known to boost economic activity. Thus boosting economic development activities. Similarly this also has its effect on the purchasing power of local people who tend to somehow share in the back fall of increasing cost of goods and services in the area due to high demand, increased business activities and influx of people to the area (Vivian, Blamah and Ezemokwe 2012).

- **Effect of Government Policies and Stakeholder Type**

The relationship between stakeholder type and their perception on the negative influence of government policies on NNPC's supply chain activities was investigated using the Chi-square test. The outcome revealed no statistical association across stakeholder types and their perception of the negative effects of poor government policies on SSCM ($p = 0.995$, $p > 0.05$). This indicates that the proportion of stakeholders across the surveyed NNPC facilities who indicated that poor government policies has negatively affected NNPC's SSCM practice is not significantly different from the proportion that think otherwise across the different stakeholder types. Although poor government policy has been identified as a factor associated with the current state of the downstream oil supply chain, it is not significantly associated with stakeholder types in this research. The reason being that, there are mixed feelings with regrads to government policies. Where a percentage of the population prefer the subsidies to remain and support government participation in the sector, some are of the opinion that government policies on the sector is one of the problems in the sector.

Where there has been calls for the Nigerian government to remove oil subsidies and reduce the price of refined products, especially gasoline and kerosene, many are still of the opinion that subsidies should remain so as not to further lower the currently low standard of living in the country. Policies around price drops and subsidies alongside product availability remain attractive to the population. The Nigerian government however has on many occasions indicated that achieving this is work-in-progress as a large proportion of domestically needed refined products are currently being imported pending the repair of the country's refineries.

- **Stakeholder Expectation and Stakeholder Type**

Similarly, results of Chi-square test for independence on stakeholder types and stakeholder expectation of NNPC management in reducing the negative impact of their activities showed no statistical association ($p = 0.074$, $p > 0.05$). Indicating that the proportion of stakeholders across stakeholder types with a view that more should be done by NNPC management to reduce the negative impact of their activities was not statistically different from those with an opposite view. This outcome is surprising as one would expect that high stakeholder expectations will be observed across stakeholder types. It may well be that some respondents do not perceive NNPC's supply chain activities as negatively impacting and are satisfied with the current effort.

- **Influence of Culture and Stakeholder Type**

Similarly, the Chi-square test for independence across stakeholder types and their perception of the influence of culture on NNPC's activities indicated no association ($p = 0.114$, $p > 0.05$). Thus, stakeholders who perceive that NNPC's activities are negatively influenced by culture are not statistically different from those that think otherwise across stakeholder types. Where culture can be a pervasive factor within an organisation, in the country context, it is a way of life and its influence on business activities may be difficult to identify.

- **Effect of NNPC Facility and Stakeholder Types**

A Chi-square test of independence of stakeholder types and their perception of the effect of the NNPC's facility in their area shows that 68.8 percent (69%) of stakeholders living near storage terminals are of the opinion that the NNPC facility has a negative or strongly negative effect on them and their household. This percentage is higher than that observed in stakeholders living close to storage tanks and terminals with 49 percent (49%). The adjusted residual for "Negative" is significantly larger (1.5) and significantly lower for positive (-1.5). Also, the Pearson Chi-square result shows that the proportion of stakeholders with the perception that NNPC facilities near their residence has negative effect, is significantly different across the stakeholder types (p = 0.039). Hence, it appears that there is an association between stakeholder types and their perception that NNPC activities in their area has a negative effect on them and their household. Furthermore, based on the Cramer's V results, the size of the association appears to be of medium effect (Cramer's V value = 0.302).). [χ^2 *(1, n=79) = 6.588, p = 0.039, Cramer's V = 0.302*)].

- **Nigeria's Level of Development and Stakeholder Type**

The relationship between stakeholder type and their perception of Nigeria's level of development as a contributory influence to the negative effects of NNPC activities was investigated using the Chi-square test. Results show that there is no statistical association between the two variables ($p = 0.775$, $p > 0.05$). Thus, the proportion of stakeholders who perceive that Nigeria's level of development is a contributory factor to the negative effects of NNPC's activities is not different from those who have an opposing view across stakeholder types. The social problems in the country which stems in part from the high level of corruption in the country might account for this response. As many people view the current level of development on corruption and other problems as offshoot from it.

- **Benefit of NNPC Facility and Stakeholder Type**

The association between stakeholder type and their perception of benefits of NNPC facility was investigated using a Chi-square test. The analysis revealed no statistical association ($p = 0.805$, $p > 0.05$). There is no statistical difference between respondents who view NNPC facility as beneficial and those who do not across the analysed stakeholder types. The social problems in the country coupled with the incessant scarcity of refined products which is a common feature of the downstream oil sector may be responsible for this outcome.

- **Increase in Negative Occurrence and Stakeholder Type**

Chi-square test of independence for stakeholder types and their perception on increased occurrence of incidences of oil spills, emission, environmental pollution, traffic problems, criminal activities, fire incidence, poor healthy, bad roads, social miscreants and poor power supply showed no statistical association ($p > 0.05$). Indicating no statistical difference between stakeholder types and their perception of these factors as contributing to the negative effects of NNPC's activities.

5.4.2.4 Relationship between Qualitative and Quantitative Data (Nigeria)

The use of the mixed method; qualitative and quantitative data collection methods in this study is primarily to ensure that an in-depth understanding of industry practice of SSCM via discussion with industry personnel alongside the collection of data providing insight into how NNPC's supply chain activities are viewed by local communities living around NNPC downstream infrastructures. In other words, "*giving a voice*" to communities around NNPC infrastructures whilst understanding SSCM practice from the industry point of view. (Morse 2017). This was deemed necessary to provide answers to the research questions of this study (Creswell and Plano Clark 2011).

In order to derive the full benefit of making use of the mixed method of choice, it is imperative that the qualitatively collected data and the supplementary data from the quantitative exercise are combined tactfully to elucidate cogent points that provide answers to the research questions. The quantitative result is basically intended to corroborate findings from the interview. Based on recommendations by Creswell and Plano Clark (2011) and Morse (2017), on the use of the embedded mixed method (Qual – quan mixed method), the relationship of the two research techniques was done based on the research questions and the mixing is conducted to evolve a result narrative.

Addressing the question on what sustainability measures are deployed by the downstream oil industry, analysed qualitative data showed that measures such as CSR, conformance to standards, best practice, adherence to HSE policies, stakeholder engagenment, prioritizing local communitites and added value to development are already being embarked upon by the industry sector. The implementation of these measures is in concordance with the qualitatitavely analysed data where majority of stakeholders have a positive view on NNPC activities and asserted that benefits were being accrued from the NNPC facility in their area. This indicates that the NNPC's claim of having in place measures to ensure safe practice and well being across sustainability dimensions is consistent with the qualitatively analysed data. The extent of adoption however varies across the sustainability dimensions as indicated for example by the high proportion of stakeholders (41%) that were uncertain (neither positive nor negative) when asked about the specific impact of NNPC activities on social development and effect on the environment. Also, the qualitative result shows that majority of stakeholders have accrued very limited number of benefits from the NNPC facility close to them with 72% indicating one benefit from a total of seven benefits.

The integrated data also gave an important insight into the influence of Nigeria's level of development on SSCM practice. Corroborating views emerged from the data types as qualitative data indicated that many other issues (low-in-country manufacturing, lack of social amenities, social problems, literacy level, unbenefitting government policies, lack of transparency and minimum standard requirement) all hinge on the developmental status of the country. Majority of the stakeholders (56%) also had a similar view on the influence of the country's level of development as a contributory factor to the negative effects of NNPC's supply chain activities. It was interesting to note that there was no statistical difference across stakeholder types in views indicated on the influence of the country's level of development. Quantitative data indicates that the country's level of development is a contributing factor to the negative impact of NNPC's activities and the magnitude of this influence on the industry sector's supply chain is reflected in the qualitatively analysed data. Suggesting that the industry faces

challenges as a result of the current developmental level of the country in the local and global market place.

Other influences on SSCM practice that emanated from the qualitative data and which was corroborated by the quantitative data are; poor government policies, corruption and poor government policies. The non-privatisation of the industry sector which emerged from the qualitative result as a contributory factor in the current poor state of the industry sector was not viewed as a negative influence by stakeholders as only 22% "agreed" and "strongly agreed" while 77% accounted for an opposing view as well as the indecisive population.

The qualitative data revealed a number of drivers and barriers to SSCM in the industry sector as highlighted in section 5.3.2. These barriers have an extended effect on the operational efficiency and has resulted in loss of consumer confidence. This result was corroborated by the quantitative data where correlation analysis revealed that stakeholders expectation across the surveyed NNPC location indicated a view that more should be done by the NNPC management to reduce the negative impact of their activities. This view was not statistically different across stakeholder types, indicating that it is important that the NNPC improve on current practice in the context of positively impacting on sustainability dimensions in order to boost consumer confidence in the organization and the sector as a whole.

Another important point that emerged from the integrated data is the influence of NNPC facilities on the dimensions of sustainability. The qualitative data showed that the SSCM in the organization is driven by three core factors (conformance to standards, sustainable profit and the organisation's value system) and the organisation does have in place structures in form of industry standards and policies for ensuring that supply chain activities are not negatively impacting on social development and other sustainability dimensions. The quantitative data helped elucidate this qualitative result as a high percentage of stakeholders did not view the presence of the NNPC facility in their area as a factor for the increase of negative occurrences in their locality. However, nearly half of quantitatitively surveyed respondents indicated that further investment by NNPC in infrastructure and social amenities alongside improved management options for sustainability dimensions is required to mitigate the negative impacts of their supply chain activities.

5.5 Data from the UK Downstream Oil Industry

As stated in the data collection chapter, secondary data was employed for the UK downstream oil industry. The justification for the use of secondary data was also discussed in this section.

The use of secondary data for research comes with some set-backs and advantages as highlighted in previous chapter. Most often than not, researchers tend to source for primary data with as much tenacity as possible to avoid pitfalls or bias that may ensue from the use of secondary data (Andersen, Prause and Silver 2011, Cowton 1998, Sørensen, Sabroe and Olsen 1996). To avoid these bias, Blumberg, Schindler and Cooper (2011) data-mining process and Harris (2001) secondary data analysis steps were adopted in this section of the study. The data-mining process recommended by Blumberg, Schindler and Cooper (2011) for secondary data analysis is a 5-step process which covers; determining the type of secondary data to employ, exploration of the data to examine relationships, data modification or revision, analysis of data relationship using a model and testing the model's precision. Harris (2001) in an empirical study on business ethics, examined the place of courage as a virtue in managerial decisions by analysing organisational documents and newspaper publications. The author analysed the data by employing the eight-step content analysis technique. Some of the reasons for the use of the technique according to the author was to ensure that the bias of validity and reliability of results can be put to rest.

Secondary data analysis recommendations made by Harris (2001) and Blumberg, Schindler and Cooper (2011) were explored for the UK data analysis. Data employed for this aspect of analysis was retrieved from reliable information sources and the sources employed were; government and regulatory agencies, internal documents and reports from UK downstream oil sector. Also data was sought from the UK downstream representative agency; UKPIA. This is in-line with recommendations by (Blumberg 2011, Cowton 1998 and Harris 2001).

Similar to the Nigerian data analysis, after identifying the secondary data sources required for the UK data based on the research questions and goals (Harris 2001), the unit of analysis was also specified. Unlike the Nigerian downstream oil sector, which is majorly controlled by the government owned organisation, NNPC, the UK downstream oil industry comprises of six independent oil companies. Hence the unit of analysis also centred on SSCM practice in these companies. Secondary data sources can be selected based on the research questions to be answered and available resources in form of available finance, time and expertise (Boslaugh 2007). In light of this, data from UKPIA which is a representative of the six UK downstream oil industry member companies was sought as it served to give a characteristic overview of the UK downstream oil sector as well as information on the member companies which make up the organisation and SSCM practice in the sector as a whole. Secondary data sources can be selected based on the research questions to be answered and available resources in form of available finance, time and expertise (Boslaugh 2007). Also documented information from

DECC (Department of Energy and Climate Change) was also employed as a reliable source of information. Other sources adopted for acquiring secondary data for the UK downstream oil industry included reputable journals, company reports and available information on news media and company websites.

Also secondary data sourced was not restricted to a specific timeline, but rather a mix of both longitudinal and cross-sectional secondary data was adopted. The use of secondary data from both timelines in research designs offer benefits of being able to follow trends in data as well as explore specific characteristics in data sets (Anderson, Prause and Silver 2011).

Caution was exercised while selecting documents, reports, publications and websites for the analysis. This was to avoid bias resulting from data misuse and drawing of baseless conclusions from the data (Andersen, Prause and Silver 2011, Boslaugh 2007, Cowton 1998 and Sørensen, Sabroe and Olsen 1996). A step taken in this regard was to evaluate the data based on questions and recommendations proposed by Boslaugh (2007), Andersen, Prause and Silver (2011) and Harris (2001) in order to confirm the relevance of the data to the research. Questions posed in this regard included; the purpose of the data, where, when and how it was collected and cleaning procedures which have been applied to the data.

5.5.1 Coding of Secondary Data (UK)

Initial documents containing data on the UK downstream companies were identified and recorded in order to keep record of what and where the information is located. Also, a summary of what is contained in the document was outlined after a first reading of the documents. This was to allow assimilation of the key contents of the documents, recognize emanating themes and also to explore relationships within and across the data sets (Blumberg, Schindler and Cooper 2011).

After the completion of the preliminary document study, information gaps were identified and another round of sourcing for information to follow these gaps was embarked upon. At this stage, common themes relating to SSCM in the UK were already emerging. Caution was however applied even as more data sources were identified to avoid over-extending the search and to know the point where data saturation is reached.

Prior to coding the data, a coding scheme was developed and this contained the coding rules and code categories. Similar to the coding template developed for the Nigerian data analysis, the coding categories were based on the research questions and a similar template was adopted for the UK code categories. The justification for this is based on the comparative nature of this research work, and the quest for deeper insight into similarities and differences and factors influencing SSCM adoption in these countries (Carrigan, Marinov and Szmigin 2005, Gurău and Ranchhod 2005 and Kimaro, and Nhampossa 2007).

Thus, a similar coding template as adopted for the Nigerian section was employed as a starting point for the UK coding. Following recommendations by King (2012), extensive reading was conducted for each of the selected sources of data and this involved a three-times reading of the documents. New codes were afterwards added as detailed studying of the secondary data progressed.

In order to ascertain the reliability of coding, after coding two documents, two research colleagues were invited to code the same document and emerging codes were compared (Harris 2001). There was very little semantic dissimilarity, and a perfect match was achieved with one of the invited coders. Thus, coding reliability was verified.

Similar to the coding of the Nigerian qualitative data, the data was intensely analysed in a manner that allowed the data to talk for itself. Harris (2001) in his work employed the use of a data collection form which contained specific questions to be answered by the analysed data in order to critically examine each data document. The Nigerian interview questions and the research questions were useful tools in this regard as it allowed definitive questions to be posed to the analysed data in order to evolve answers in the context of the asked questions.

On completion of the coding exercise, emergent codes were afterward abstracted into sub-themes in a manner analogous to the qualitatively analysed data.

5.5.2 Coded Data from Secondary Sources (UK)

Based on the research questions, patterns across sub-themes were sought and themes were generated as shown in table5.23. Codes, sub-themes and themes developed in the coding process are identified below.

5.5.2.1 Sustainability Measures Deployed in the UK Downstream Oil Industry

Sustainability measures as identified from secondary data sources currently in currently in place in the UK downstream sector coded for this study are identified below:

Health and Safety Policies: Due to the hazardous nature of petroleum and its derivatives, health and safety measures are put in place to avoid any unforeseen accident or casualty (UKPIA 2016). Downstream member companies have in place well developed health and safety policies and procedures and these includes safety trainings and schemes by supply chain players in the sector. These policies are regularly evaluated based on operational trends, legislation and technological innovation.

The six major UK downstream companies under the umbrella of UKPIA have in place a strategy called "*Assuring Safety*" which is aimed at the protection of the environment and people by averting unsafe hazardous emission and exposure, minimise the impact of such if it inevitably happens and foster safe and reliable organisational leadership and culture. This strategy focuses on process safety and also aimed at operational excellence and cooperation amongst member companies.

"*Process safety focuses on the concerns of major hazards impacting safety, environmental damage and business losses*" (UKPIA 2016)

"*Process safety is a unique blend of engineering and management skills with a clear focus on preventing catastrophic accidents – particularly toxic levels, explosions and fires which are potential risks associated with the use of hazardous substances if these are not properly managed*" (UKPIA 2016).

Goal Zero Policy: The UK downstream sector has in place a goal zero policy. An initiative which is aimed at ensuring injuries, accidents and significant incidents that can affect the environment, operations, employees and the community are totally reduced to being non-existent. Thus, conducting business in a manner that considers dimensions of sustainability.

"*Goal zero captures the belief that we can operate without injuries or significant incidents despite the often conditions in which we operate*" (Essar Oil 2016)

"*We seek to drive incidents with environmental impact to zero, and to operate in a manner that is not harmful to the environment*" (Exxon Mobil 2016)

Best Practice: The adoption of best practice in operations and processes stands as top priority in all the six UK downstream oil companies. This is motivated by a drive for operational excellence coupled with safety commitment.

"*… To us, operational excellence encompasses personal safety, process safety, asset integrity, reliability, cost efficiency and environmental stewardship*" (Phillips 66 2016)

Added Value to Development: The UK downstream oil industry has been of tremendous benefit to the UK economy. Apart from the high number of employees (over 200,000) in the UK downstream workforce, the sector has also substantially enhanced the availability of energy supply even during periods of crude oil shortage. The sector also plays an active role in UK economy balance of payment via oil product import and export and is responsible for supplying feedstock to the country's petrochemical, construction and pharmaceutical industry. The sector has a turnover of £50 billion and a trade surplus of £5 billion (UKPIA 2011: 7).

"*UK refineries, as well as making a sizeable contribution to the national economy, form a substantial part of the surrounding economies where they are located*" (UKPIA 2011)

Corporate Social Responsibility: The industry sector has in place schemes and programmes to foster community engagement as well as address their interests and potential concerns they may have with regards to downstream operations and activities. This is seen as being critical to the economic growth of the sector and the sustainability of the sector.

"*We value our people and communities by promoting local volunteerism and investments, valuing open communication and trust relationships and by maintaining safe, healthy and inclusive workplaces*" (Phillips 66 2016)

Low Carbon Agenda: Following the Energy Acts 2010, the UK downstream companies are mandated to work towards reduced carbon emission and thus the UK downstream oil industry for some time now has been moving towards a low carbon economy. Seen as additional cost for many UK downstream oil companies as it adversely influences company's level of competitiveness, stringent requirements and standards imposed at the national (UK government) and regional level (EU Emissions requirement) has led to investments in greenhouse gas emission reduction in the UK downstream oil sector.

"*At ExxonMobil, we are dedicated to reducing emissions from our own operation*" (ExxonMobil 2016)

"*Worldwide, we are working with the scientific and business communities on leading research to identify economically viable technologies that can meet future energy demand while dramatically reducing global GHG emissions*" (Exxon Mobil 2016).

Adherence to International and National Environmental Standards: There is a widespread commitment of all the six major UK downstream oil industry players to meet international environmental standards. This is aimed at minimising negative effects of downstream processes and pollution prevention through continuous environmental improvements and adherence to the ISO14001 international standard.

"*We seek opportunities to reduce the air emissions associated with our operations and the products we deliver to increase shareholder value and meet regulatory requirements*" (ExxonMobil 2016)

"*It is company's policy to comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist*" (Essar Oil 2016)

"*UK oil refineries have a record of responding positively to Government policies aimed at early adoption of cleaner fuels in support of new vehicle exhaust clean-up technologies*" (UKPIA 2011)

Vapour Recovery & Bottom Loading: This is a practice adopted at storage and distribution terminals. It enables a closed loop process for petroleum product distribution, thus, reducing harmful effects on the environment and people.

Safety Improvement: Installation of infrastructures and upgrades to facilities and processes to ensure and improve safety within the downstream sector of the industry. These improvements in safety practice has drastically reduced accidents and near-misses in the sector (Fabiano and Curro 2012) and is seen as being critical to the sustainability of the sector (UKPIA 2012)

"*Safety management of risk and striving for operational excellence in process safety are key priorities for UKPIA members*" (UKPIA 2012)

Research & Development: The continuing environmental impact concerns and new regulations which have characterized the UK oil industry in general has played an important role in the downstream sector by driving innovation and development towards more sustainable operations and processes with reduced negative impact to sustainability dimensions.

"*ExxonMobil also makes use of in-house capabilities to conduct life-cycle assessments (LCAs). LCAs are useful in understanding whether a technology can result in environmental improvements across a broad range of factors (e.g., GHGs, water, solid waste) versus an existing or alternative process*" (ExxonMobil 2016)

"*In addition to selling petroleum products that include renewable fuels, we conduct research and development in the areas of renewable fuels and sustainability*" (Phillips 66 2016)

Personnel Training and Skill Acquisition: The industry has in place trainings and skill acquisition programmes for employees and contractors. This focuses on health, safety and sound work practices and is aimed at ensuring operations and processes are conducted in a safe hazard-free manner.

"*…the UK oil refining industry also fosters skills, knowledge and expertise in….refining, fuel technology, lubricants and environment*" (UKPIA 2011)

Improving Energy Efficiency: This measure extends beyond reducing the negative impact of downstream operations on the environment as it also reduces cost, improves organisational competitiveness and emission reduction. Energy efficiency is an important aspect of the UK downstream oil industry emission policy and cuts across all participating companies.

"*One measure of our success to use energy more wisely and responsibly is that despite an increase in the amount of energy required by some advanced technologies and processes in some parts of our business, our global focus on energy efficiency has allowed energy consumption to remain relatively flat over the past five years*" (ExxonMobil 2016)

Biofuels and Renewable Fuels: The industry sector has embraced the innovative addition of biofuels and renewables to conventional refined crude oil derivatives. The Renewable Transport Fuel Obligation (RTFO) allows the addition of biofuels to road fuels in specified percentages. This plays an important role in greenhouse gas emission reduction.

"*… Biodiesel can be blended at the refinery using current quality controls and the existing fuel distribution system*" (UKPIA 2012).

Collaboration with Suppliers: Maintaining partnership relationships as opposed to the adversary organisation-supplier has improved not just the quality of service, but also allowed the integration of HSE policies and programmes into supplier's processes. This is allows a more thorough and practical application of improved safety processes across the supply chain.

"*We engage with business partners and suppliers to manage HSE in line with company policy*" (Essar UK 2016)

5.5.2.2 SSCM Challenges

Sustainability challenges as identified from secondary data sources in the UK downstream sector coded for this study are identified below:

High Risk Business: In the last five years, there have been three refinery closures in the UK (Process Engineering 2015). A reason for this trend is attributed to the sensitive nature of refining in the UK and Europe in general which is regarded as high-risk enterprise with minimal profit.

"*The reasons that refineries are failing to be sold are numerous, but they boil down to one fact; refining crude oil in Europe is a high risk, low reward business*". (Process Engineering 2015).

"*Pressure on the profitability of UK refineries which in future periods of poor refinery margins may lead to UK refinery closure*" (UKPIA 2016)

Market Shift: The current shift of demand to diesel engines from petrol is a challenge to the overall survival of UK refineries as the further importation of diesel to meet up with demand due to the inadequate diesel manufacturing capacity of UK refineries stands to erase the already slim profit margin accrued from the refined products.

"*Most refineries in the UK were largely set up to produce light (e.g. petrol) and heavy distillates (e.g. fuel oil), meaning that there is now a supply-demand imbalance with refiners unable to produce enough diesel and aviation fuel to meet demand*" (DECC 2014: 5).

Excess Capacity: Refineries in the UK are largely designed to process sweet crude with less sulphur. This dates back to the years these refineries were built and the product demand then.

"*The UK has the fourth largest total refining capacity in the European Union and some of its nine refineries are among the largest in Europe. The refining business, however, has suffered from overcapacity and weak margins. As a result three refineries have been sold in 2011 to buyers from India, China and the US"* (Palmer and Culver 2011: 170).

Inconsistent Sustainability Standards: The UK downstream oil sector has been faced with more stringent laws compared to many of their global counterparts and despite its benefit, this also has its effect on the sector. The current development trend in emerging economies such as Asia and Middle East for example has witnessed huge investments in establishing and improving their refining capacity under less stringent laws as witnessed in the UK and its other European allies. This further puts pressure on the profit margin of UK refiners. (DECC 2014)

Significant Regulation Requirements: High regional and national standards and regulatory requirements set by regulatory bodies for the UK refining companies comes with the potential risk of limiting available investments in innovative programmes. Thus, hindering their ability to remain competitive (DECC 2014).

"*…in some cases the UK sets its own standards, or applies European standards more strictly than required elsewhere in Europe. This places UK refineries at a disadvantage in terms of operating costs and attractiveness as a place to invest*" (UKPIA 2006)

Equipment Failure and Malfunction: This has been identified as a major cause of accidents and near-misses in the UK downstream facility amongst other factors which include pipe loss, non-adherence to rules and regulations, maintenance failure, natural event and transport (Fabiano and Curro 2012). This statistics reflect process and safety data collected over a 9-year period in the sector.

Cost of Sustainability: The high cost of putting in place sustainability measures is an inhibiting factor to the adoption of SSCM. In the UK, stringent laws already apply with regards to emissions and climate change. The cost of compliance and putting in place infrastructures is also economically tasking for industry management.

"*…the compliance costs for companies associated with monitoring and verifying emissions are considerable*" (UKPIA 2012).

"*…refineries are impacted by multiple EU and UK legislation, which is placing incremental cost demands, in terms of operational and other requirements whilst severely disadvantaging them against EU and global competitors*" (Energy Global 2016)

Profit Loss: This is closely related to the previous challenge; that is cost of implementing sustainability measures. In a bid to adopt SSCM, resources required to competitively position the industry is diverted towards SSCM implementation, thus eroding the anticipated profit margins required to be competitively positioned.

5.5.2.3 SSCM Drivers

Strict Standards: In recent years, UK and EU legislation regarding emissions and quality of fuel has become more stringent (UKPIA 2015). These regulatory requirements require compliance from the industry sector and as such is a critical driver of SSCM. This adherence to regulations is evidenced by investments being made by the sector to meet stringent environmental standards, stricter fuel specifications and improved process safety (DECC 2014).

"*In the UK some local environmental standards are already tighter than elsewhere in Europe*" (UKPIA 2012)

"*… We strive to beyond compliance to demonstrate leadership and environmental management*" (ExxonMobil 2016)

Climate Change: Reports show that reducing the impact and effects of industry activities on the climate stands as a current and strategic priority in the UK downstream oil industry operations and processes. Following the Kyoto protocol where the UK alongside many other industrialized economies pledged their commitment to safe-guarding the environment by reducing greenhouse gas emissions (DTI 2003), the UK downstream sector is actively involved in fostering and working to ensure reduction in greenhouse gas emissions and play an active role within the "Low Carbon Vehicle Partnership" programme designed to allow a smooth sail to low carbon fuels and vehicles in the UK.

"*The recent focus of legislation in the EU and the UK has been on climate change and reducing greenhouse gas emissions*" (DECC 2014)

Image: The oil industry generally wants to be seen as a positive contributor to social development and the environment and the downstream sector is not left out. This drives the industry's adoption of SSCM and the promotion of policies and programmes in this regard.

"*Our goal is to have no harm to people, to maintain a sustainable environment and to institutionalise a culture of safety in the organisation*" (Essar Oil UK 2016).

Competitive Advantage: The potential to be competitively positioned as a result of being environmentally friendly, socially responsible and finding ways of reducing the impact of industry operations and process is a major driver towards SSCM adoption.

Cost: This is two folds; the cost of compliance as well as not being compliant with industry set-regulations. In the first case, despite the high cost of putting in place the required structure and facilities to remain compliant with continuously changing regulations and standards, this cost is accepted as a better option when compared with the cost incurred for not being compliant with set standards as this may cost the industry more financially and image-wise. Thus, cost can serve as a deterrent to unsustainable practise and on the downside be a barrier to the adoption of sustainable practices as it makes the sector competitively unfavourable to downstream companies.

"*…in response to the question of what factors posed the greatest challenges to the UK refining, refiners in particular cited legislative burdens and associated compliance costs as being the greatest challenges*" (DECC 2014)

Supply Chain Integration: The current trend of integrating supply chain activities and streamlining the number of suppliers in many industries has also caught up with the UK oil industry in general.

This in itself is not a direct driver of SSCM, but rather allows for cost reductions and the "burden of adopting and sustaining green traditions" (Yusuf *et al*. 2013: 505)

5.5.2.4 SSCM Performance

Cleaner Fuels: The UK has in place regulations to control vehicle emission and these has resulted in cleaner and less polluting domestic fuels.

"Since 1990, road fuels and vehicles have become significantly cleaner resulting in much lower exhaust emissions despite an increase in traffic levels of around 25%" (UKPIA 2015).

Community Investments: Available reports show that UK downstream oil companies invest in community development projects. These projects cut across education, health and safety and the environment.

"*We work with and support our local communities through educational, environmental, wellbeing, sporting and corporate initiatives in partnership working with appropriate agencies and charities*" (Essar Oil UK 2016)

Reduction in Carbon Emission: Reports show that this is an important topic in the UK downstream oil sector and progress has been made in this direction. The six major UK downstream companies have in place policies and programmes to reduce their operational emissions. This is evidenced by programmes and schemes characterising this goal, such as expanding cogeneration, energy efficiency improvements, investment in cleaner energy sources and reduction in flaring and venting.

"*In 2014, our net greenhouse gas emissions totalled 122 CO2-equivalent million metric tons, a decrease of 3million metric tons relative to our 2013 performance*" (ExxonMobil 2016)

5.5.2.5 Country's Influence on SSCM

Reduced Environmental Pollution: Despite the additional cost on downstream companies as a result of tighter product specification and stricter emission legislation in the UK, progress has been made in the downstream oil sector with regards to reduced environmental pollution. This can be attributed to the commitment of the government and set down policies regarding emission and environmental pollution which is not restricted to the oil industry alone but implemented across the country's manufacturing, pharmaceutical and petrochemical industry.

"*UK refiners and importers operate within the context of a regulatory framework designed to protect human health and the environment and refiners play their role in delivering reductions in carbon dioxide through participating in climate change policies*" (DECC 2014).

Table 5.23 Themes Generated by Abstracting Themes from Codes (UK)

SSCM Measures	• CSR • Conformance to Standards • Best Practice • HSE Policies • Stakeholder Engagement • Added Value to Development • Climate Change • Low Carbon Agenda • Cleaner Fuels • Safety Improvements • Collaboration with Suppliers
SSCM Drivers	• Conformance to Standards • Sustainable Profit • Competitive Edge • Image • Cost • Supply Chain Integration • Profit Loss • Cost of Sustainability
SSCM Challenges/Barriers	• Excess Capacity • Stringent laws • Trend in Emerging Economies • High Risk Business • Market Shift • Equipment Failure and Malfunction
Impact of Barriers	• Refinery Close-down • Loss of Profit margin • Loss of competitive edge • Further dependence on importation • Accidents
Country's Influence on SSCM	• Reduced Environmental Pollution • Stakeholder Satisfaction • Social development
SSCM Performance	• Currently performing • Positive Attitude • Low carbon Emissions • Cleaner Fuels
Performance Measurement	• Capacity Utilization • Ease of Procurement • Short Delivery Time • Revenue Yields
Regulatory	• Strict Regulations • Emission Reduction

Stakeholder Satisfaction: Safer operations, stakeholder engagement and economic contributions by the UK downstream oil industry can be traced in part to the open free market being operated in the UK downstream sector as well as government legislation in the sector. There has been considerable effort by downstream companies to see to stakeholder concerns as well as ensuring that their day-today economic business activities is conducted in a manner that takes into consideration initiatives that are beneficial to stakeholders whilst minimizing the negative effects of such business activities.

Social Development: The UK is a developed country, thus to some extent is economically stable and socially developed. This rubs off on the UK downstream oil sector as is evidenced in the level of investment in innovative and technological know-how as well as in the HSE initiatives and contribution to the UK economy.

"*The competitive nature of the industry and developed infrastructure ensures that consumers are able to benefit from relatively low cost fuels*" (DECC 2014).

5.6 Summary

This chapter focused on the analysis of secondary data and primary data collected in this research. The qualitatively collected data was analysed using the Nvivo 10 software and themes abstracted from the developed codes. The quantitatively collected data was analysed using SPSS to evolve stakeholder perception on the Nigerian downstream oil industry SSCM practice. Both qualitatively and quantitatively collected data were integrated using the mixed method. The integration of the quantitatively collected data from stakeholders residing around NNPC downstream infrastructures corroborated responses from the qualitative interview. This evolved a more comprehensive view of the current SSCM practice in the industry sector and the influence of NNPC's supply chain activities on local communities around them. Secondary data from the UK was also analysed by following a similar coding process as adopted for the Nigerian qualitative data. Codes were developed and themes abstracted based on the analysis.

6 Data Evaluation

6.1 Introduction

The previous chapter presented collected data on SSCM practice in the Nigerian and UK downstream oil industry. The methods of analysis were also described and themes developed to provide answers to the research questions in this work.

This chapter will look at the research questions identified in the earlier part of this thesis and provide answers based on findings from collected data. These will be compared with findings from literature and past work. This chapter begins by revisiting the concept of SSCM in the Nigerian context. It then goes on to critically make deductions based on the findings from the collected data by identifying and focusing on areas of disparity in SSCM between the UK and the Nigerian downstream oil industry and the subsequent development of a SSCM framework for the Nigerian downstream oil industry.

6.2 Research Questions

In order to address the aim of this research study, it is important that answers are provided to the research questions identified at the beginning of this study. Thus, to adequately assess SSCM of the in NNPC downstream as well as obtain a comprehensive overview of factors driving or inhibiting the adoption of SSCM, it is imperative that the research questions of this study are revisited. This is to allow a systematic examination of the analysed data vis-à-vis thoughtful examination so as to provide answers to the research questions and achieve the study aim. Thus, going back to the research questions for this study:

1. What sustainability measures are deployed by the downstream oil industry – Nigeria and UK?
2. What is the influence of Nigeria's level of development on achieving effective downstream SSCM
3. What are the drivers and barriers to SSCM in the Nigerian and UK oil industry and how do these impact SSCM in these countries?

The data was collected from respondents in the Nigerian downstream oil industry (NNPC). Evaluated findings from the analysed data are presented in sections below.

6.3 Overview of SSCM in the Nigerian Downstream Oil Industry from Analysed Data

As stated in the literature review chapter, SSCM is fast becoming an integral part of business processes and operations in many industries (Zailani *et. al* 2012). This development however is still in its infancy or stated more frankly almost out of reach in many indigenous organisations in developing countries. This latter description describes the current performance of the NNPC with regards to SSCM practice.

Based on the data collected and analysed in previous chapters, it can be deduced that the term SSCM is not new to senior and middle supply chain managers in the Nigerian downstream oil industry as many of them were not only conversant with the term, but had also at one point or the other attended various trainings and courses in this regard. This understanding of what SSCM stands for was stated in interview discussions and covered mainly CSR, HSE and SCM. Understanding SSCM in these context alone in itself may not be considered as an issue if going by Carter and Rogers (2008) where the authors acknowledged the fact that there are varying definitions of SSCM with many of these definitions integrating one or more combinations of environmental-economic concerns and social-environmental concerns under CSR. These variations in SSCM definition are not unusual especially in maturing academic fields with promising potential and usefulness (Kuhn 1996 cited in Carter and Roger: 364). Thus, the understanding of SSCM simply as the integration of CSR and HSE into supply chain activities and processes is in itself not an issue, but the translation and the areas covered by this interpretation in order to bring about a progressive journey into a more sustainable organisation evidenced by a high performing sustainable supply chain is a subject that requires in-depth examination (Sarkis 2001).

Despite the observed sustainability awareness in discussions with respondents, findings from this study revealed that there is still a knowledge gap in the adoption of SSCM. This observation was evident in remarks made on what SSCM is and how it was being practised in the organisation. NNPC respondents mentioned that the organisation had in place CSR and HSE policies geared towards the integration of sustainability into the supply chain. However, findings show that these are stand-alone policies that are implemented under the umbrella of compliance to standards and the QMS (Quality Management System) put in place to ensure continuous improvement in the delivery of products and services in a safe and accident free manner with reduced or nil negative impact on the environment. This stance though capturing some of the aspects covered by SSCM, does not however do justice to the practice of SSCM in the whole sense of it.

The integration of sustainability into SCM require that organisations do not only imbibe common operational safety, product quality and socio-economic practice, but rather, go beyond these measures to incorporate principles that take into cognizance the reengineering of supply chains to bring about a wholesome approach to ensuring environmentally, socially and economically sustainable supply chain activities (Font *et al*. 2008, Matos and Hall 2007 and Yusuf *et al*. 2013).

Table 6.1 Current SSCM Measures in NNPC (Source: Author 2017)

SSCM Measure	Mentioned	Not Mentioned
• Carbon footprint reduction		✓
• Reducing air emissions/pollution	✓	
• Efficient waste management	✓	
• Decreasing the consumption of hazardous materials		✓
• Development and use of renewable energy sources		✓
• Decreasing the frequency of environmental hazards and spills	✓	
• Safe working condition for employees	✓	
• Development of host community /area	✓	
• Stakeholder engagement	✓	
• Increased economic input to infrastructural development	✓	
• Reduction in energy use		✓
• Reduction in the number of workplace accidents	✓	
• Employee education and skills development	✓	
• Efforts towards reducing the number of pipeline accidents and fires	✓	
• Satisfying stakeholders	✓	
• Adoption of green purchasing		✓
• Use of eco-friendly products		✓
• Resource management		✓
• Supplier compliance auditing		✓
• Increased focus on customer satisfaction	✓	
• Recycling		✓
• Compliance to safety standards	✓	
• Reverse Logistics		✓
• Lean Management		✓

Some of the sustainability measures mentioned in the literature review chapter were also mentioned by interview respondents as already being in place in the downstream supply chain activities (see table 6.1). A quick look at Table 6.1 shows that SSCM in the NNPC is focused on practices that are majorly motivated by compliance to standards, avoiding stakeholder issues and achieving business benefits.

Organisations that are strategically inclined towards a positively impacting supply chain takes into cognizance the dimensions of sustainability in order to achieve both short and long-term benefits are shifting away from the inefficient traditional ad-hoc method of managing sustainability issues (Curkovic and Sroufe 2010).

Thus, a more proactive and collaborative position is encouraged, which goes beyond the primary goal of following set industry regulations and standards but rather, begins with defining and integrating sustainability goals into an organisation's business strategy and their entire supply chain (Dyllick and

Hockerts 2002 and Handfield, Sroufe, and Walton 2005). In this regard however, collected data shows that the NNPC's position can be described as more reactive inclined than proactive as measures put in place are tuned towards ISO and regulation compliance, TQM and CSR.

6.4 Standards in the Nigerian Downstream Oil Industry.

Existing literature has shown that one of the main external drivers towards the adoption of SSCM in the oil industry (Yusuf *et al*. 2012) and industries in general is the compliance to regulations and ISO certifications (Daibat and Govindan 2011, Mann *et al.* 2010, Walker *et al*. and 2008). The need to comply with government regulations regarding operational practice in order to avoid punitive measures is a deterring factor for many organisations to engage in unsustainable supply chain practices and activities. This trend is not native to the downstream NNPC as the sector is also governed by set industry regulations.

Findings from collected data show that with regards to environmental protection, downstream NNPC is not only governed by national environmental and petroleum laws and regulations, but they also adhere to regional regulations as well. This according to respondents can be attested to by the NNPC's position as a fore-runner in West Africa and the African continent as a whole with regards to compliance to standards and regulations. This claim was further corroborated by the recognition given to the organisation in 2012 for being the most HSE compliant organization in Africa (NNPC 2016). Ambituuni, Amezaga and Emeseh (2014: 49) however does not seem to share this opinion as the authors stated that the Nigerian downstream oil industry is a known culprit of environmental pollution and that "…all the refineries owned by the federal government, through the state owned NNPC, have been implicated in some of the major downstream pollution incidents".

This disparity in claims by the industry and literature findings can be argued in both ways. Firstly, it is no news that the Nigerian oil industry in general is no saint with regards to environmental pollution which over the years has given rise to various issues with stakeholders (Idemudia and Ite 2006, Omodanisi, Eludoyin and Salami 2014, O'Rouke and Connolly 2003 and Vivian, Blamah and Ezemokwe 2012). The downstream oil industry which is the focus of this research is a known source of pipeline explosions, oil spills and gaseous emissions. Processing of crude oil in the refinery and subsequent storage and distribution by the downstream NNPC has been associated with many fire incidents which may be attributed to product mishandling and many at times pipeline vandalization (Ehinomen and Adeleke 2012 and Fadeyibi *et al*. 2011). This latter cause, pipeline vandalisation, was

mentioned by all respondents during the interview as a key reason for many of the other problems facing the Nigerian downstream oil industry. This however is not covered within the scope of this section and will be discussed in subsequent section.

Thus, on one hand, evidence shows that the downstream oil industry still engages in environmentally unsustainable activities, but industry performance outcome with regards to compliance indicates a different outcome as shown in the NNPC's award for compliance to set industry regulations in the continent and even attested to by surveyed respondents. An argument for this, may be that compared to its peers in the African continent, the NNPC's effort towards compliance is remarkable even if this effort is not commensurate with the expected outcome of environmentally sustainable practice and is still surrounded by some negative unsafe outcomes. This argument may not be far from the truth as downstream NNPC respondents during the interview discussion iterated that the NNPC goal with regards to HSE compliance is to be at par with their developed counterparts. With this in mind, it may not be totally surprising that there is a reasonably high level of efforts in this regard.

This can further be explained using Vroom's expectancy theory of motivation. This proposes that a person's choice of behaviour or action over other possible alternatives is motivated by what the expected outcome of that selected behaviour will be (Vroom 1964). Thus, the motivation for a particular behaviour is a function of the person's desired outcome. Leonard *et al*. (1999: 971) identified three sources of motivation, and these are; "intrinsic process motivation, motivation based on goal internalization and extrinsic or instrumental motivational". A person is said to be intrinsically motivated when he performs a task or behaviour just because it is fun and he enjoys it. The reward in this regard is simply derived from performing the task. The motivation that is based on a person's value system or morals is referred to as goal internalization motivation (Kelman 1958). In this regard, an entity adopts a certain behaviour because the content of that behaviour is agreeable with the entity's value system (Becker 1992, Kelman 1958 and O'Reilly and Chatman 1986). Thus, the adoption of a behaviour is based solely on the individual's or organization's existing values and the reward is derived from the actions that govern the behaviour (Kelman 1958).

Compliance can be described as the adoption of a certain behaviour by an organization so as to achieve or obtain specific results or avoid certain punishment (O'Reilly and Chatman 1986 and Kelman 1958). This kind of motivation is externally induced and includes motivation brought about by legislation or legal requirements (Leonard *et al*. 1999). Many at times, organizations comply, not necessarily because they believe in the contents of the influence, but rather because there is an expected outcome

to be achieved from another person or institution. Thus, an organization or a person may adopt "…the induced behaviour not because he believes in its content but because he expects to gain specific rewards or approval and avoid specific punishments or disapproval by conforming" (Kelmar, 1958: 53).

From this foregoing, it may be that the high level of HSE compliance witnessed in the NNPC may be motivated by the organization's desire to be at a level playing ground with their developed counterparts and the outcome of this being measured in level of HSE compliance and evidenced in the organization's competitive achievement in Africa. It may also be that the NNPC is simply complying by set laws and legislations to avoid any negative stand-off with law enforcements regarding their adopted HSE policy. This may however be unlikely as the main oil regulatory body (DPR) in Nigeria is also owned by the Nigerian government which may make it difficult for any meaningful enforcement to take place in situations where the law has been breached. This possibility, also identified by one of the interview respondents who stated that it would be highly impossible for DPR to take very drastic actions against the NNPC because according to him, if the NNPC is chastised and in an extreme scenario, closed down for unsustainable practices, by the regulatory body DPR for non-compliance, then the Nigerian economy as well as the Nigerian populace will suffer and that even the federal government of Nigeria will have to call the regulatory body to order if that happened. This shows the possible dilemma that oil industry law enforcement agencies in Nigeria may face, such that the NNPC has to be maintained in the good books so as to avoid drawing unnecessary negative attention towards the organisation and outcry from the population especially those that may have or still being affected by the industry's value-adding supply chain activities.

6.5 Sustainability Measures Adopted in the Downstream Oil Sector of the Case Study Countries (Nigeria & UK)

There is a knowledge gap that this research work aims to fill with regards to the level of adoption of SSCM and the sustainability measures being integrated in the downstream oil industry supply chain of developing economies in the case study country; Nigeria. Findings from this study gives an insight into the practice of SSCM by identifying the current SSCM measures that have been adopted till date in the downstream oil industry of the state-owned oil parastatal in Nigeria, NNPC.

Findings from the analysed data show that a number of sustainability measures have been integrated in the refining and storage links of the NNPC supply chain and this was corroborated by findings from the quantitative survey. The sustainability measures empirically found in this research for the Nigerian downstream oil industry were: CSR, conformance to standards, best practice, HSE policies in place,

stakeholder management, added value to development and prioritising local communities. While in the UK downstream oil industry, findings showed that in addition to all the measures being adopted in the Nigerian downstream oil industry, measures such as; climate change, low carbon agenda, cleaner fuels, safety improvements and supplier collaborations were also being adopted as shown in Table 6.2.

This further emphasises the gap in SSCM adoption in both countries. Apart from the UK downstream oil industry being corporately driven to adopt a sustainability enhanced supply chain, an important factor characterising this adoption can be traced to government intervention with regards to strict legislations regarding emissions and safe practices in the sector (DECC 2011).

Table 6.2 Empirical Findings of SSCM Measures in the Downstream Oil Industry (UK and Nigeria)

Sustainability Measures	Nigeria	UK
• CSR	✓	✓
• Climate Change	X	✓
• Safety Improvements	X	✓
• HSE Policies	✓	✓
• Stakeholder Management	✓	✓
• Conformance to Standards	✓	✓
• Low Carbon Agenda	X	✓
• Cleaner Fuels	X	✓
• Best Practice	✓	✓
• Collaboration with Suppliers	X	✓

6.5.1 CSR

In SSCM, it is required that supply chain actors take into cognizance their stakeholders by meeting stipulated requirements and fostering partnerships with them (Teutscher *et al*. 2006).

Findings from the Nigerian data show that in the refining and storage supply chain links, CSR initiatives have been adopted and this seem to be the core of the organisation's social sustainability measures. It was common practise for the organisation to put in place CSR programmes such as provision of social amenities and infrastructures such as drilling boreholes for rural access to clean water, traffic lights and road maintenance, school construction, books and other learning materials for state owned schools. With regards to development, the focus according to respondents is centred on long term skill acquisition for rural youths via skill development programmes for unskilled youths and scholarship programmes for academically sound students in the community. These programmes are rolled out yearly and has been in existence for quite some time (over 15years).

Findings regarding the role of NNPC in providing basic amenities in rural or local communities where they are operational is not surprising as many communities where oil companies operate, see these oil companies as the government that should provide the amenities they need but do not have (Visser 2008). In a developed country like the UK, the provision of social amenities is the responsibility of the government. This is however far from being the same in a developing country like Nigeria as many at times, the oil industry is faced with the additional burden of playing the role of a "*messiah*" that should provide some of the social infrastructures that many rural communities have been denied by the appropriate social and governing structures (Amaewhule 1997, Eweje 2007 and Idemudia and Ite 2006) of the state either due to mismanagement, poor wealth distribution programmes or simply lack of resources to put the infrastructures in place. This is however not restricted to rural areas alone as it is a problem even in the urban centres as well.

This difference in expectation of stakeholders in developed countries compared to its developed counterpart is not new as "developing countries present a distinctive set of CSR agenda challenges which are collectively quite different to those faced in the developed world" (Visser 2008: 474) as mentioned in section 2.3.2.1.

In Nigeria, there are set laws governing downstream oil industry activities, however, these laws have not yielded some of the desired results as the industry is still plagued by issues with unsustainable practices. This can be partly attributed to the low level of priority assigned to legal and ethical obligations in the African region and by extension the Nigerian downstream oil industry. The sector is similarly plagued by incoherent laws, legislative overlap and coinciding regulatory functions (Ambituuni, Amezaga and Emeseh 2014) alongside strategic and ethical dilemmas faced by oil industry managers which occurs as a result of the detrimental consequences of business activities necessary to achieve a a profitable business case (Van den Hove, Le Menestrel and De Bettignies 2002) .

6.5.2 Climate Change Policies

The UK downstream oil industry similar to its upstream sector already have adopted various strategies to reduce CO_2 emissions and have made considerable investments in this regard. Measures such as energy efficiency scheme via improved energy management of refinery processes and construction of CHP (Combined Heat and Power) units, use of alternative fuels such as; bio-fuels and gaseous fuels, CO_2 emissions cap, improved fuel quality, and containment measures at large oil storage terminals. The UK oil industry is strictly regulated and thus the high level of compliance even in the face of profit

margin loss may be attributed to a compulsion to adhere in order to avoid punitive measures and the increasing need for positive public image by UK oil companies (Yusuf *et al*. 2012).

Studies have shown evidence of climate change in Nigeria which is manifested in the increasing damage caused by extreme weather conditions and changing patterns (Odjugo 2009). Responses from the interview identified various waste pollution and emission reduction practices in the downstream NNPC. Although, these were not discussed in the context of climate change but rather, pollution prevention, it is however worthy to note that these are some of the sector's contribution towards addressing the global climate challenge (NNPC 2016).

The NNPC has over the years developed policies to tackle climate change issues, although many of the targeted goals of these policies have failed to achieve the desired result as is evident in the still on-going gas flaring in the upstream sector despite various targets and deadlines set for its stoppage and considering its huge negative impact on the well-being of local communities near oil producing wells, the environment, and global climate (Ajugwo 2013, Edino, Nsofor and Bombom 2010 and Malumfashi 2007). An estimated volume of 17.2 billionm^3 of natural gas is flared in Nigeria which is approximately equal to a quarter of the total current power consumption in the African continent alone (Ajugwo 2013). Thus, apart from the social, health and environmental problems associated with the practice, there is also the economic benefit that is currently not being harnessed (Malumfashi 2007).

Despite these set-backs, the NNPC is still forging on with policies aimed at playing their part in reducing their contribution to the climate change dilemma. Some of the most recent discussions regarding combatting climate change is centred on putting in place a realistic road-map within an achievable time frame to put a stop to gas flaring. This is to be done in partnership with the World Bank Global Gas Flaring Reduction Partnership (NNPC 2016). Other measures towards reducing Nigeria's climate change footprints include the initiation of the CDM (Clean Development Mechanism) projects which is aimed at carbon emission reduction via international carbon trading, elimination of CFC (Chlorofluorocarbon) based materials in NNPC operations and the construction of various gas utilization infrastructures to put to adequate use, previously flared or vented associated gas from wells (NNPC 2016). In a developing country like Nigeria with an oil sector that has been plagued by complex challenges, these measures are good starting points. However, the emphasis here is majorly on the upstream sector and not many of the measures if any is directly associated with reducing climate change impact.

6.5.3 Other Measures

Other measures adopted as identified from findings are; compliance to standards, adopting best practice, HSE policies, stakeholder management and engagement, added value to development, ISO environmental Management System, supplier collaboration and prioritising local communities. As stated in the previous section, there is a huge emphasis on compliance and adherence to regulations in the Nigerian downstream oil industry. Findings showed that effort is being made to ensure that the industry was at par with their more developed country counterparts.

HSE Policies

Many oil spill incidents in the Nigerian downstream oil industry has been attributed to pipeline sabotage and theft by social miscreants and criminals (NNPC 2016). This was further corroborated from the data collected from interview respondents. Analysed data from the Nigerian downstream managers indicated that oil spill and pollution incidences in the industry are majorly caused by acts of deliberate sabotage, equipment failure, theft and human error. However with the adoption of good oil field practices and awareness programmes centred on HSE, these factors have been on the decrease with the exception of pipeline sabotage and theft which is still an ongoing problem and which does not only cause pollution related problems, but also threatens the availability of refined products and the economic sustainability of the industry (Punch 2016).

As stated in section 3.3.2.4, there are existing acts and regulations relating to HSE management in the Nigerian petroleum industry. The effectiveness of these existing decrees (see Table 3.9) is however marred by the rather poor implementation or enforcement of these statutes and decrees (Green, Nwankwo and Ikechukwu 1998).

Nigerian respondents affirmed that there is a functional and effective HSE department with the responsibility of formulating, administering and ensuring compliance to HSE policies and guidelines according to industry standards (NNPC 2016). This is aimed at continuous improvements even as the HSE management system in the corporation is still evolving but with the added benefit of corporate support and commitment which is required to effectively and continuously redefine strategies for improved HSE performance. Studies have shown that corporate commitment and good work environments can positively influence and motivate workers to adhere to safety rules and regulations and can positively influence performance (Ogbo, Lauretta and Ukpere 2013). However as stated earlier, the effectiveness of the HSE department and adherence to stated corporate practice on the other hand calls for further investigation as in some cases, practice deviates from observable results as

described in the Kaduna refinery example in section 2.3.7. There is thus an imbalance between specified guidelines, operational practice and visible results in the Nigerian downstream HSE practice as results do not show complete adherence to HSE policy and continuing negatively impacting practices in the sector.

The commitment of the UK downstream sector to improved HSE practice recognises the need for a more robust process safety performance as an integral part of ensuring that people and the environment are protected from negatively impacting activities of the sector. This was captured under the *commitment to process safety* initiative and solidified the engagement of the downstream players via the UKPIA body. Objectives set out in the commitment to process safety and process safety improvement make up the *Assuring Safety Initiative* and is designed to collectively recognise necessary improvements towards the advancement of tools and standards (UKPIA 2012). This covers three critical areas; *working together* across the sector to identify concern areas and addressing them, *encouraging excellence* by evaluating sector performance and identifying areas for further improvement *and sharing and learning* by communicating and exchanging process safety information as well as lessons learned across the industry sector.

UK downstream companies are responsible for the effective management of their individual process safety according to set COMAH standards and regulations. This is achieved via collaborations with sector peers, regulators and other industries.

Stakeholder Management and Engagement

Quantitative data collected from the Nigerian downstream oil industry stakeholders show that the NNPC has made some contributions to the locality where they operate as majority of stakeholders that participated in the survey have an average appreciation of NNPC contribution. This contribution however is limited to specifically one advantage as majority of stakeholders surveyed indicated *better business* as the main benefit derived from having the NNPC facility in their community. This is not surprising as a study conducted by Vivan, Blamah and Ezemokwe (2012) showed a similar trend with local communities affirming that locating the refinery in their community had economic advantage and has brought about improved commercial activities which is necessary for community growth and economic sustainability.

Interviewed NNPC respondents affirmed their commitment to stakeholder engagement and consideration. This is achieved by regular discussions with communities around them with regards to their activities in the community. Also the sector engages with local communities with the goal of understanding their expectations and anticipated benefits, in order to find a meeting point where both parties can work together to accomplish a long-lasting positive relationship and better improve the experiences of these communities.

In an ideal world, this would be the case, but in practice, there is usually a clash of interest between host communities and organizations especially in this case, the Nigerian downstream sector which like its upstream counterpart has been a source of unsustainable practices (Odeyemi and Ogunseitan 1985). This has led to numerous acts of sabotage by stakeholders towards the oil industry sometimes to show their grievances or simply a deliberate act of theft to take back some of the resources they believe is rightfully theirs but they are far from enjoying.

Analysed data shows that with regards to local communities around downstream infrastructures, the NNPC faces problems such as land use, remediation, unrealistic compensation demand and acts of sabotage. The needs of these local communities are also multifaceted alongside the fact that stakeholder demands can also be multifarious. A typical example of this scenario was a case cited by a respondent in the interview, where two adjoining villages to a refinery made conflicting demands on the NNPC management and could not come to a consensus on a mutually beneficial demand. As a result, putting the r management in an awkward position and resulting in an extended period of putting in place developmental projects in the villages. This kind of scenario according to respondents is not a one-off and happens often. These stakeholders are also positioned such that they are able to influence value-adding activities of the sector as highlighted by respondents. As afore mentioned, destructive activities such as pipeline vandalism and destruction of NNPC infrastructures by local communities to show grievances has resulted in disruptive production schedules, unplanned downtimes, refined product scarcity and environmental pollution to mention a few. This has caused the NNPC huge financial losses as well as dented the image of the industry. Respondents implied that many of the pipeline related pollution linked to the organisation were mostly caused by acts of vandalism.

This influential attribute of the downstream oil sector stakeholders similar to their upstream counterparts, positions them, such that they do not only have stakes in the sector, but also fit into the pluralistic unidirectional and bidirectional ability to influence or be influenced by the NNPC's activities as proposed in the work of Mitchell, Agle and Wood (1997). This contributory influence on

SCM practice and as an offshoot on sustainability dimensions requires that downstream sector stakeholders are effectively managed. Stakeholder management is a structured approach to managing the expectation of a person or a group of people with an interest in or can be influenced by an organization's activity. This requires identifying who the stakeholders are, analysing their power and interest, planning how to manage them and engaging such stakeholders. In managing stakeholders, stakeholder engagement requires that organizations involve and engage relevant stakeholders. This in itself goes beyond merely interacting with stakeholders, but rather encompasses inquiring into stakeholder needs, wants, wellbeing and taking into consideration how the action of one party may affect the other(Noland and Phillips 2010). Hence, to achieve real success in stakeholder engagement, it is important that it is encrypted into an organization's strategy.

Thus, for the downstream sector to thrive and make progress with regards to their stakeholders, a starting point will be to effectively identify the degree of power and interest of the sector's stakeholder. Also, a re-evaluation of the stakeholder management structure currently in place is necessary, as this will assist in the identification of areas for improvement, especially with regards to current practices and stakeholder engagement blueprints. Majority of stakeholders who participated in the survey indicated that they accrued benefits from having the NNPC in their community. Majority of the respondents also had a positive perception of the NNPC with regards to their activities and contributions to their locality. Reasons for this may be attributed to a number of measures described by NNPC respondents, such as; local community engagements, periodic community emission checks and improvements in stakeholder management practice. Engaging stakeholders however goes further to accommodate continuous improvements, outcome monitoring and putting in place corrective measures as a strategically proactive stance. Also, there has been calls for a dual stakeholder engagement perspective (strategic and moral) especially with regards to sustainability (Arthur, Price and Austin 2008 and Noland and Phillips 2010). Adopting this stance facilitates the ethical integration of stakeholders and their demands into an organization's business strategy. In this regard, stakeholder engagement encourages inclusive decision making, equity and building spin-off relationships necessary for a honest, open and engaging business-stakeholder relationship.

Added Value to Development

With an estimated contribution of about 7% into the UK national treasury accrued from around £36 billion in yearly VAT and fuel duty, the UK downstream sector is an integral contributor to the country's economic growth (UKPIA 2016). Also, despite the continuous importation of crude oil to supplement local production in the UK, the country remains a major exporter of refined products, thus

positioning the downstream sector as an integral contributor to the national treasury. That being said, recent changes in product demand and the reducing number of functional refineries in the UK has promoted dependence on imported refined products such as diesel and jet fuel and this has drastically influenced the sector's economic contribution from exportation and importation. The proportion of imported refined products in the UK currently supersedes the volume exported. A feat which has continuously persisted since 2013.

As mentioned earlier, increasing legislation on allowable emissions, product specifications and changing consumer needs has continuously affected the rates of return on investment compared to some other industries in the country such as manufacturing, services and even upstream oil sector (UKPIA 2016). The comparison shows a consistent negative return on investment for the UK downstream oil sector over a five-year period (2010-2014) when compared with the other industries which reported an average return of 14.8% altogether.

Despite the challenges being encountered by the sector, UK downstream companies still cater for a large percentage (about 85%) of inland refined product consumption ensuring product quality and availability at competitive market prices for the UK populace all year round (UKPIA 2016).

The UK downstream sector is defined by a reliable supply chain with an excellent track record for unanticipated emergencies and disruptions (UKPIA 2011). This is in sharp contrast to its Nigerian counterpart which has over the years been characterised by epileptic supply of refined products despite continuous importation to complement locally refined crude oil.

Similar to the UK, the Nigerian downstream oil sector plays an important role in the country's economy. The sector is responsible for the generation of about 20% of the country's GDP (Akpoghomeh and Badejo 2006) and for the availability and supply of refined products in the country. Despite numerous initiatives and programs put in place by various governments aimed at diversifying the Nigerian economy in order to nudge it off its heavy dependence on petroleum as the main source of revenue generation, petroleum still accounts for an estimated 95% of the country's revenue earning (Majekodunmi 2013). This dependence coupled with the country's persistent need to import refined petroleum products and recent fluctuations in global crude oil price has had significant effect on the country's balance of payments and the economy as a whole (Adelabu 2012).

Also, the aspect of making available refined products by the sector has over the years been challenging and has been described as underperforming evidenced by incessant fuel scarcity (Akinola and Wissink 2017, Akpogomeh and Badejo 2006 and Bazilian and Onyeji 2012). This insecurity of refined product availability has been blamed on non-functional and below-optimal refinery production, global crude oil price fluctuations, government domination of the sector, fuel subsidy practice and non-deregulation of the sector (Soile, Tsaku and Yar'Adua 2014).

Analysed interview responses and questionnaire showed that the Nigerian downstream sector currently plays an important role in the sustenance of the Nigerian economy despite its challenges. Also, all interviewed respondents indicated that the sector was still behind in comparison to its counterparts in developed economies. All respondents emphasised that the sector's underperformance can be attributed to the current regulation and control of the sector. Many scholars have blamed the numerous challenges being faced by the sector on continued government involvement and there has been calls for the deregulation of the sector in order to improve the current state of the sector (Akinola and Wissink 2017 and Okpaga, Ugwu and Eme 2012). This is because on one hand, the government claim that the cost of subsidisation is not only huge, but also not sustainable and its removal will ensure product availability and product price stability which will result in economic development (Bariki and Reza 2014). On the other hand, there is the perception that deregulating the downstream oil sector may cause increased product prices, job losses, increased production cost and a receding economy (Bariki and Reza 2014 and Owoeye and Adetoye 2016). Deliberation on the deregulation of the Nigerian downstream sector is often done within the context of petroleum product subsidy removal rather than with a fixed focus on the bigger picture which is the complete elimination of government control on the sector (Owoeye and Adetoye 2016).

In the context of the Nigerian downstream oil sector, deregulation is the withdrawal of oil subsidy and government control of the prices of refined products, thus institutionalising the legal framework for price determination by market forces (Kalejaiye, Adebayo and Lawal 2013). This encourages public participation and competition with the goal of an efficient and reliable sector evidenced by a secure supply mechanism and improved economy (Kalejaiye, Adebayo and Lawal 2013, Okpaga, Ugwu and Eme 2012 and Owoeye and Adetoye 2016).

In Latin American countries and the UK, deregulation and privatisation policies are motivated by the need for private sector funding of parastatals in order to alleviate government funded subsidies whereas in Nigeria, motivation for these policies are driven by "… demand for efficiency and effectiveness in

public enterprises (PEs), to the need for accountability, generation of employment, curb external borrowing, strengthen the capital market amongst others" (Kalejaiye, Adebayo and Lawal 2013: 2404). The UK downstream oil sector is owned and controlled by private sector companies (UKPIA 2016) and refined product pricing is dictated by market forces. The sector's activities and operations are however overseen to be responsibly conducted by the UK government via regulatory agencies and task force such as the Department of Energy and Climate Change (DECC). The responsibility of DECC includes amongst other things, ensuring the UK has access to affordable, and secure fuel supplies, regulating environmental emissions and promoting renewable energy policies (DECC 2016).

The UK downstream oil sector by virtue of its liberalised and non-government market influence, operates a competitive market and this has to a large extent driven prices and innovation in the sector. A similar development is achievable in the Nigerian downstream sector if deregulated (Hahn and Guasch 1999 and Owoeye and Adetoye 2016). However, care must be taken in the selection of regulatory frameworks and tools as well as the employment of economic expertise and monitoring (Abu 2016) in effectively managing the transition to a deregulated and privatised downstream oil sector so as not to further subject the country and the sector to further economic woes as predicted and currently being experienced by antagonists of the policy, scholars and the Nigerian populace respectively (Ibanga 2005, Kalejaiye, Adebayo and Lawal 2013, Okpaga, Ugwu and Eme 2012 and Sani and Kouhy 2014).

Prioritising Local Communities

In prioritizing stakeholders, it is important that organizations take into cognizance their stakeholders in the context of "… who and what really counts" (Hall, Millo and Barman 2015). Organizations tend to prioritize their stakeholders based on definitive criteria (Pederson 2006). This is an important organizational task as it is very unlikely that an organization will have the aptness to accord equal degree of dedication and resources to every stakeholder associated with the organisation. This is because some stakeholders have the capability of taking up various roles as well as be in manifold stakeholder groups (Breiger 1974 and Rowley and Moldoveanu 2003).

As aforementioned, local communities across NNPC's downstream infrastructures are oftentimes directly affected by many of the supply chain operations embarked on by the sector. They can be regarded as primary stakeholders and dependent stakeholders based on Clarkson (1995) and Mitchelle, Agle and Wood (1997) stakeholder classification respectively.

Analysed survey data showed that 48% of stakeholders who completed the questionnaire believed that activities of the NNPC had a positive impact on their localities while 22% disagreed with this view. Also, with regards to their perception on the impact of NNPC's activities on the three dimensions of sustainability, 41% viewed NNPC's activities as positively impacting while only 29% viewed it otherwise. Similar to the environment, more than half of stakeholders who participated in the survey believed NNPC's supply chain operations had a positive impact on economic activities in the area, while only 19% disagreed. These positive views regarding the NNPC can mean that the organization obviously takes into consideration their stakeholders as indicated in interview responses. Interviewed NNPC managers buttressed the fact that as part of the goal zero policy being imbibed by the organisation, the safety of local communities around them is considered an important aspect and this is put into practice in all supply chain processes and activities. These efforts however has been marred on various occasions by scrupulous acts of pipeline vandalism and theft that has many times cost the organization financially and imagewise.

The NNPC's effort towards ensuring that local communities around them are safe and not put in harm's way however seem to be overshadowed by incidences of pipeline accidents and other hazardous occurrences that seem to characterise the organisation (Ambituuni, Amezaga and Emeseh 2014, Ite *et al*. 2016, Nnadi *et al*. 2014 and Omodanisi, Eludoyin and Salami 2014) even as many works have showed that the Nigerian downstream oil sector supply chain in general have impacted negatively on the environment, social development and even to a certain extent on the economy (Ambituuni, Amezaga and Emeseh 2014, Ite *et al*. 2016, Sani and Kouhy 2014).

ISO Environmental Management System (EMS) Certifications

It is evident that the popularity of the ISO standard is not new to the Nigerian downstream oil industry as empirical findings showed that the ISO EMS standards are currently being adopted and this has been on for quite some time now. Respondents repeatedly emphasized the integration of the ISO 14000 series and the ISO 9000 standards into everyday downstream operations. The integration of the ISO 14001 standard according to respondents is aimed at best practice and also doubles as a tool for improving procedures and processes across the organization by reducing or better still eliminating negatively impacting environmental practices for example as captured in the *goal zero policy* which indicates zero accident and zero emission being adopted in the organization. The ISO 14001 which exists under the ISO14000 series was established in 1996 provides a framework aimed at enumerating specification for environmental management system (Curkovic and Sroufe 2010 MacDonald 2005 and Petros Sebhatu and Enquist 2007).

Improvements in environmental practice as indicated by NNPC respondents as a result of integrating ISO standards, specifically the ISO 14001 standard is quite understandable as literature has shown that the integration of ISO14001 in organizational processes (Petros Sebhatu and Enquist 2007) and specifically supply chain activities (Curkovic and Sroufe 2010) can lead to improvements in sustainable practices and value creation.

Collaboration with Suppliers

As a sustainability measure, supplier collaboration encompasses cooperative activities between a focal company and its suppliers aimed at improving logistic operations, information flow and material and component transfer across the supply chain (Vachon and Klassen 2008). The cumulative sustainability efforts of links in the supply chain network which includes suppliers contributes to the focal company's sustainability performance (Leppelt *et al*. 2011).

Analysed data shows that supplier collaboration is an integral part of the UK downstream companies with the goal amongst other things of enhancing their sustainability performance. This is not surprising as the sector strives to meet with stringent environmental requirements (DECC 2016 and UKPIA 2014) as well as improve their sustainability performance as well as (Luzzini and Brandon-Jones 2015).

In contrast to the UK data, the Nigerian downstream respondents did not mention supplier collaboration as a sustainability measure. Respondents however stated that many of the equipment used in the sector were sourced internationally. Lack of local supply capability was cited as a major challenge facing the sector as the country is still lacking in technological competence. Thus, leading to a heavy reliance on internationally sourced materials and equipment. The current lack of emphasis in supplier collaborations and characteristic on-the-shelf sourcing and purchase of materials and equipment in the sector is detrimental to sustainability performance as studies have shown that inter-organizational collaborations encourage the adoption of focal company sustainability measures that can lead to improved social, environmental and economic performance (Carter and Roger 2008, Luzzini and Brandon-Jones 2015 and Vachon and Klassen 2008).

6.6 SSCM Drivers in the Nigerian and UK Downstream Oil Industry

Empirical findings showed three main SSCM drivers in the Nigerian downstream oil industry; conformance to standards, sustainable profit and NNPC value system. While in the UK, six SSCM drivers were identified and these are; conformance to standards, sustainable profit, gaining a competitive edge, company image, cost reductions and supply chain integration. These drivers are

consistent with literature findings (Daibat and Govindan 2011, Walker *et al*. 2008, Yusuf *et al*. 2012 and Zhu, Sarkis and Lai 2013) and cuts across both internal and external classifications.

The drivers identified in both case study countries are as shown in figure 6.1. In the NNPC and the UK downstream oil industry, SSCM is internally driven by the organisation's goal towards achieving sustainable profits and thus economic sustainability. Profits and GDP are organisational and country-based economic sustainability measures respectively (ICAEW 2016) and in many organisations, operating goals are directly associated with profits (Epstein, 2014). For-profit organisations that continue to stay in business, are said to be economically successful when there is a measurable incremental growth in turnover, profits and market capitalisation. (Doane and Mac Gillivray 2001 and ICAEW 2016). That is, ensuring sustainable profit is a key motivator for the adoption of SSCM (Doane and Mac Gillivray 2001).

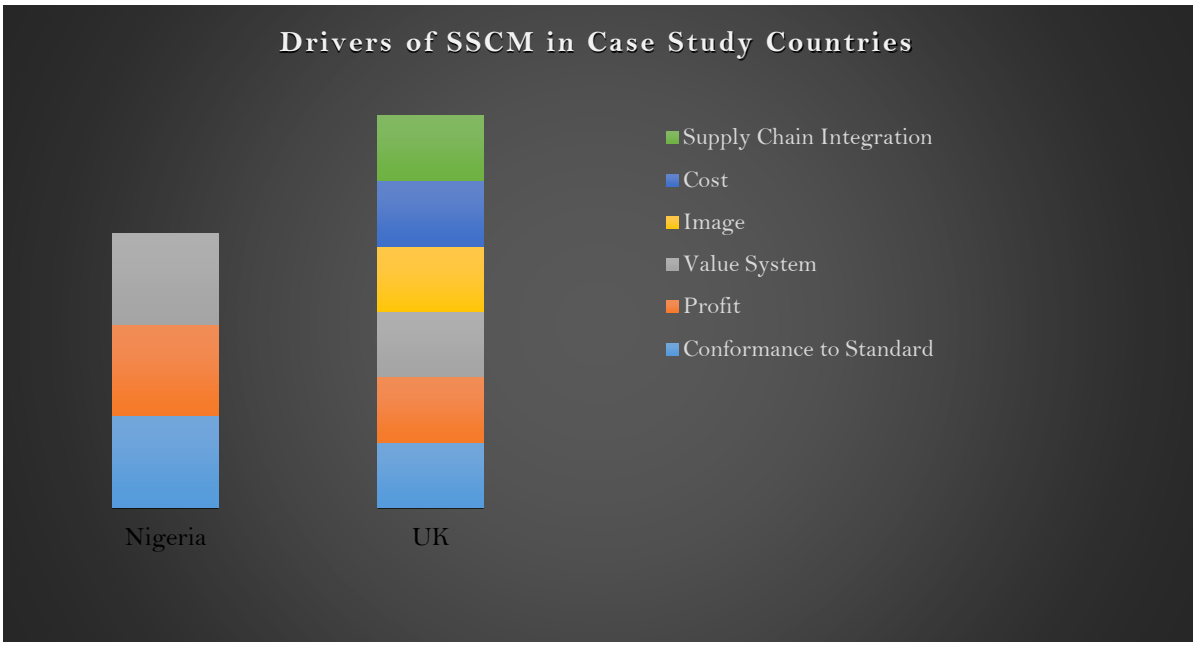


Figure 6.1 An Overview of SSCM Drivers in the Nigerian and UK Downstream Oil Sector
Figure shows empirical findings of drivers of SSCM in the Nigerian and UK downstream oil sector. SSCM in the Nigerian downstream oil sector is motivated by standard, profit and NNPC value system. This is the same in the UK which is also motivated by company's image, the need for supply chain integration and cost.

Findings also showed cost reduction is another internal driver of SSCM in the UK downstream oil industry. Organisations that integrate sustainability into their supply chain can potentially reduce long-term risks of fluctuating energy costs, product liabilities, and pollution management (Demirel and Kesidou 2011 and Shrivastava 1995). Also, according to Carter and Rogers (2008), organisations can make potential economic and cost savings by integrating sustainable practice into the social and environmental supply chain activities. Thus, cost savings can be made from reduced health and safety costs, reduced wastes from product packaging, lean logistics via safer warehousing and transporting,

reduced inventory, safer working environments and hence lower labour costs, shorter lead times and improved product quality.

Empirical findings showed that conformance to standards and regulations is a key important motivator for SSCM adoption in both case study countries. This type of driver according to Zhu, Sarkis and Lai (2013) are classified as coercive institutional pressure. These are influences exerted by governing authorities such as government and regulatory agencies (Sancha, Longoni and Gimenez 2015). Institutional pressures in form of government regulations and industry standards are influential factors in the pursuit of green and social sustainability practice and brings about performance in this regard (Zhu, Sarkis and Lai 2013).

Also, organisational values was identified as a key SSCM motivator. In the NNPC, respondents emphasized that concerns for the environment, and their stakeholders especially communities and customers and the continued need to provide high quality products in a safe and sustainable manner defined their organisational value system which in turn modelled their operations and supply chain activities. In order to make any progress with regards to safeguarding the planet and taking responsibility for the environment and its inhabitants, business leaders, and industries need to make value judgements that protect the global environment and other associated socioeconomic dimensions whilst ensuring organisational growth through market systems (Buchholz 1991). Organizational commitment in the context of top and middle management support which is often anchored on cost reduction is a key motivator for SSCM adoption (Yusuf *et al*. 2012).

Another external SSCM driver identified in the findings is conformance to standards. This also captures industry, regional and country set regulations. Regulations by governing authorities and industry standard of practice require that companies address and take up the sustainability challenge by introducing laws and codes of conducts that ensure that business operation and practices are within acceptable limits and do not further negatively impact the dimensions of sustainability (Epstein 2014). Failure on the part of organisations to follow set laws and codes of conduct may result in costly repercussions ranging from penalties and fines, closure of operations, legal cost, production down-time and negative public image. The short and sometimes long-term effects of non-compliance and its avoidance tends to deter organisations from non-sustainable practices along their supply chain, hence, adherence by organisations (Yusuf *et al*. 2012).

Other external drivers that emanated from the study are positive organisational image and supply chain integration. These drivers are specific to the UK downstream oil industry as these drivers were not observed in responses from the Nigerian downstream oil industry. In literature, supply chain integration has been linked to improved business performance and innovative quality products (Van der Vaart and Van Donk 2008). The integration of supply networks to facilitate inter-firm coordination between supplier tiers and the focal company are positive influences to improved operational performance (Kannan and Tan 2005). Strategic Partnerships with suppliers, strategic sourcing, and supplier involvement and development are all add-ons to a high performing supply chain. Hence, modern day organizations that are performance focused tend to tread the path of integrated supply chains characterized by strategic supplier alliances, improved information and knowledge flow and better coordinated supply chain activities in order to ensure improved business performance and thus profits and lowered costs (Seuring and Muller 2008).

Positive organisational image is an important factor motivating the current stance of UK downstream oil industry. Customer perception of an organisation as well as its product and the brand image of a product can competitively position an organisation in the market place (Qadri, Haleem and Arif 2011 and Zhu, Sarkis and Lai 2013). Hence, many organisations tend to adopt sustainability measures to address public concerns on sustainability dimensions and be seen as an environmentally and socially responsible organisation. Also, a proactive sustainability image is imbibed by organisations and organisations that take a proactive rather than a reactive stance are less likely to be scrutinized and attacked by pressure groups like NGOs (Bronn and Vidaver-Cohen 2009 and Christmann and Taylor 2002).

6.7 SSCM Barriers/Challenges in the Nigerian and UK Downstream Oil Industry

SSCM barriers are factors inhibiting an organisation's effort towards the adoption and implementation of sustainable practices. Empirical findings showed quite a number of challenges being faced by the case study countries to the adoption of SSCM. Twelve and six challenges were identified in the Nigerian and UK downstream oil industry respectively, and these are captured in Figure 6.2. Findings showed a wide difference in the types of challenges being experienced in the case study countries.

Identifying SSCM challenges in the downstream sector of a developing country like Nigeria is a new concept. In the Nigerian downstream oil industry, many of the challenges identified may be described as social-economic issues that are associated with the current low level of development in the country (Ambituuni, Amezaga and Emeseh 2014, Asif and Muneer 2007 and Dobers and Halme 2009).

Challenges that fall under this category include; lack of basic infrastructures, poor maintenance culture, ageing refineries, supplier confidence in the system, infrastructure vandalisation and stakeholder issues. Countries lacking in development growth evidenced by infrastructural investments and adequate sustainability governance are faced with non-sustainable practices and problems as can be observed in the Nigerian oil industry (Aminu and Olawore 2014 and Anifowoshe *et al*. 2011). Other SSCM challenges that characterise the downstream oil sector of the developing nation such as change management, sustainability awareness, lack of personnel training and minimum compliance are consistent with literature (Guinipero, Hooker and Denslow 2012, Haake and Seuring 2009, Tay *et al*. 2015, Walker and Jones 2012 and Yusuf *et al*. 2012). The barriers to SSCM identified in Nigeria can be described as country-specific and is attributable to the level of development in the country.

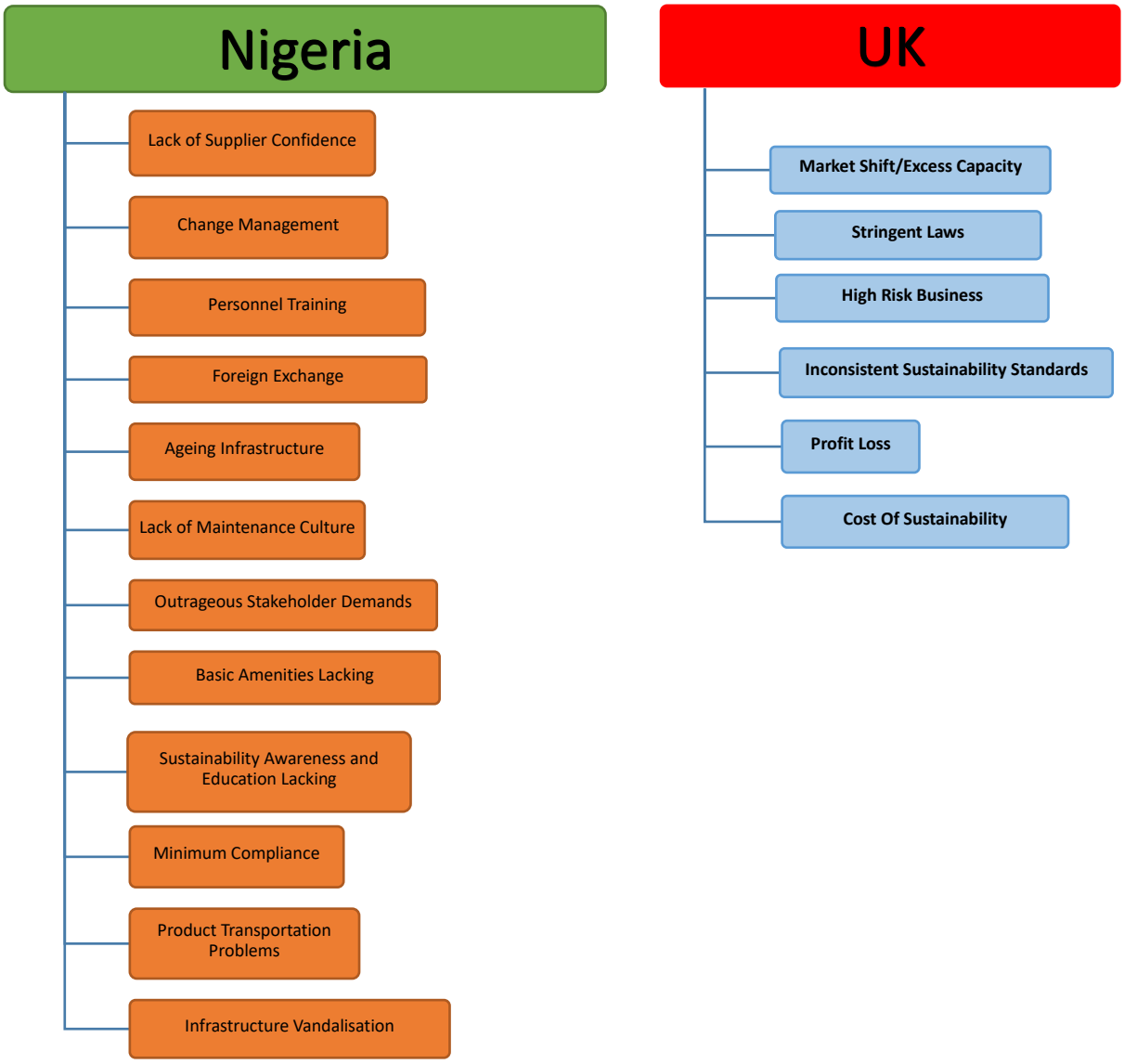


Figure 6.2 SSCM Challenges in the UK and Nigerian Downstream Oil Industry
Figure shows empirical findings of SSCM challenges in the Nigerian and UK downstream oil sector.

Findings showed that the UK downstream oil industry which is already an adopter of SSCM (Yusuf *et al*. 2012) is faced with challenges that are more inclined towards the economic sustainability of the industry. Factors identified in this regard are; excess capacity, market shift, high business risk, and cost of implementing sustainability. All the barriers identified in the UK are consistent with literature (Guinipero, Hooker and Denslow 2012, Haake and Seuring 2009, Tay *et al*. 2015 and Yusuf *et al*. 2012).

6.8 Impact of Barriers

This category describes the outcome of the SSCM challenges on the case study organisation. Findings showed that in the Nigerian downstream oil sector, seven impact factors were observable and these are; product transportation problems, product scarcity, production interruption, environmental contamination, revenue loss, operational losses and loss of consumer confidence. This is consistent with literature findings (Ambituuni, Amezaga and Emeseh 2014, Aminu and Olawore 2014, Anifowoshe *et al*. 2011 and Omodanisi, Eludoyin and Salami 2011). The problem of pipeline vandalism in the Nigerian downstream oil industry in addition to being a SSCM challenge, is also a facilitator of other environmental and socioeconomic problems such as environmental pollution, revenue loss and production interruption in the Nigerian oil industry in general and the country as a whole (Aminu and Olawore 2014 and Omodanisi, Eludoyin and Salami 2014). Alongside the pipeline vandalism challenge, ageing refineries and downstream infrastructures as well as other challenges identified in previous section have been attributed to the frequent production interruptions which often result in operational losses, non-availability of petroleum products and loss of consumer confidence (Onuoha 2008).

In the UK, four impact factors were identified and these are; refinery close down, loss of profit margin, loss of competitive edge and further dependence on importation. These impacts as observed in the UK oil industry and as an outcome of barriers to SSCM can be partly attributed to the cumulative effect of the stringent laws which are necessary to keep up with set environmental targets in the UK. As it is, negative consequences of environmental regulations cannot be completely avoided and in order to implement sustainability measures, it is imperative that additional costs often times are incurred by organisations (Managi *et al*. 2005). Thus, SSCM adopting organisations aiming to achieve goals of SSCM often bear take-off cost as well as additional costs for innovation. This cost however does not act as a deterrent to SSCM implementation for exemplar organisations as such organisations usually are way ahead of even set regulatory regulations (Wu and Pagell 2011).

6.9 Country's Influence on SSCM

Literature has shown that institutional environment play a key role in supply chain performance and can also act as a barrier to the actualisation of a high performance supply chain (Yaibuathet, Enkawa and Suzuki 2008). Findings from this study show that Nigeria's current level of development has a high influence on the adoption and practise of SSCM in the downstream oil industry. Areas of influence that emanated from the analysed data are; low in-country manufacturing, lack of social amenities, slow momentum towards change, pipeline vandalism, minimum standard requirement, differing literacy levels, government policies and lack of transparency.

Developing countries are many years behind in infrastructure availability and thus suffer from the lack of basic amenities such as constant electricity and good roads necessary to foster socio-economic development (Huang and Palvia 2001). Making available a good standard of living and life quality to the population in developing countries is way beyond the capability of the government of such countries as they are oftentimes faced with pressing economic problems (Wanderley *et al*. 2008). Thus, compared with its developed counterparts, many developing countries still remain unstructured societies where there is limited control and enforcements (Wanderley et al. 2008). This, alongside the lack of basic amenities and accountability cumulatively influences the adoption of new initiatives and programmes in such countries.

Identified SSCM setbacks, attributable to Nigeria's current developmental level are consistent with literature. These influences extend beyond local platforms of development but rather its cumulative effect also influences the industrialization of the country as local and Nigeria-based foreign organizations partake in the shortfalls (Isehunwa and Falade 2005 and Straub 2008). A major set-back mentioned by respondents is the low level of in-country manufacturing and complete reliance on foreign suppliers and thus importation for equipment purchase. This has socio-economic effects as foreign exchange earnings which otherwise would have remained in the country is used to nourish other economies whilst technological development remain in the background. This is expected as technological advancement can only thrive in an environment that encourages and foster research and development as well as scientific ingenuity that can amount to innovative technological capabilities over a period of time (Isehunwa and Falade 2005).

Also, the issue of pipeline vandalism which is a major problem in the Nigerian oil sector alongside many acts of violence that characterise the country can be traced to amongst other things, high unemployment rates, high level of poverty and other socio-economic problems in the country (Osabiya

2015). These are negative attributes of a developing country and its aftermath effect are social vices, crime, militancy and acts of vandalism (Adebayo 2013). Unemployment though a global problem, is more prevalent in developing countries like Nigeria (Nkechi, Emeh Ikechukwu and Okechukwu 2015). In contrast to the Nigerian aspect, findings revealed a positive country influence on the UK downstream oil industry. The influences identified are; reduced environmental pollution, stakeholder satisfaction and social development. These are expected and are consistent with literature (Yusuf *et al*. 2012).

6.10 Addressing Research Questions

Based on the evaluated data, answers can be provided to the research questions raised in this study. The first research question is answered in section 6.5. This section identifies the SSCM measures adopted in the case study countries.

Section 6.9 provides answers to the question on the influence of country's level of development on SSCM adoption in the downstream oil industry. It shows that a country's level of development does influence the industry's allegiance towards a sustainable path as can be observed in the UK case study country. In Nigeria however, the country's low level of development is a barrier to SSCM adoption in the industry sector.

Research question three on the drivers and barriers to SSCM in the case study countries is addressed in sections 6.6 and 6.7. While in Nigeria (NNPC), the drivers of SSCM are limited to conformance to standard, profit and adhering to the company's value system. In addition to these drivers, the SSCM adoption in the UK is motivated by the need for supply chain integration, cost and organizational image.

6.11 Summary

In this chapter, analysed data was critically evaluated. The drivers and barriers to SSCM on the case study countries were identified as well as the influence of country's level of development on SSCM in the context of the case study countries. Also, SSCM measures adopted in the case-study countries were identified and discussed. Thus, addressing the research questions for this study. Furtherance on the achievement of the research aim of this study, the next chapter addresses the framework development for SSCM adoption in the Nigerian downstream oil industry.

7 Discussion - Framework Development & Validation

7.1 Introduction

In this chapter, a SSCM framework is developed and validated for the Nigerian downstream oil industry. The framework addressed the three dimensions of sustainability, proposed improvements necessary to help the supply chain become more sustainable and metrics for measuring performance and progress.

The chapter begins with an overview of current SSCM challenges in the Nigerian downstream oil sector. After which a SSCM framework adaptable in the Nigerian downstream oil industry was developed. This is followed by the validation process for the developed SSCM framework. The concluding part of this chapter identified performance metrics for the developed framework.

7.1.1 Developing a SSCM Framework for the Nigerian Downstream Oil Industry

In SSCM discussions, the integration of sustainability into the management of supply chain processes takes centre stage and can be described as the distinction between everyday traditional supply chain management and a positively impacting sustainable supply chain (Al Odeh and Smallwood 2012, Jia, Diabat and Mathiyazhagen 2015 and Schwartz, Tapper and Font 2008).

Organisations seeking to be sustainable and manage a positively impacting supply chain have to seek out sustainability opportunities. Sustainability-oriented opportunities provide solutions to existing sustainability problems and managing such opportunities is is dependent on deliberate effort towards improvement (Schalteggar and Burrit 2014).

Thus, for the Nigerian downstream oil industry supply chain to manage a positively impacting sustainable supply chain, it is imperative that a sustainability enhancing road-map that incorporates necessary strategies and performance measurement tailored to suit the country's level of development is developed to be adopted by the industry.

In order to propose possible sustainability enhancing solutions in the form of a SSCM framework for the Nigerian downstream oil industry and any industry in particular, it is required that, knowledge about the SSCM challenges are known (Schalteggar and Burrit 2014). These challenges have already been captured in the collected data of this research study. This is an especially important aspect of the framework development as there are country-specific challenges that have not been captured in any

literature with regards to SSCM in the industry. Many works have showcased SSCM problems in developed countries (Carter and Rogers 2008, Fabbe-Costes, Roussat and Colin 2010, Fabbe-Costes *et al*. 2014, Wolf 2011) and in cases where developing countries have been the focus of SSCM studies (Jia, Diabat and Mathiyazhagen 2015, Zailani et al. 2012) none has been developed specifically for the downstream oil industry.

Thus, identifying SSCM challenges in the downstream oil industry in a developing oil producing country like Nigeria is novel as no work has been done in this regard.

Whilst some of the SSCM challenges in the Nigerian downstream oil industry may be generic and are not necessarily specific to the industry sector or the country in particular, many of the identified challenges are not covered in the frameworks identified and seem to be particular to the oil sector and country specifically. Issues such as sustainability awareness and personnel training and managing organisational change can be considered as generic and cuts across various organizations as these are some sustainability challenges that have been identified in literature (Linnenluecke and Griffiths 2010, and Post and Altman 1994).

Modern day organisations that are determined to stay competitive and thrive economically are constantly setting organisational goals and seeking ways to manage changes required to be implemented for the achievement of such goals (Todnem By 2005). However the problem with managing change in organizations, stem from the fact that many change policies are implemented as "*quick fixes*" which is often times focused on an aspect of development of the organization without taking into cognizance possible limiting effects on other aspects of the organization. Thus, thus creating unanticipated and unwanted disruptions in the change process (Gill 2003). Change management can be described as the process that furthers the renewal of an organization's structure and capabilities to meet evolving customer needs (Moran and Brightman 2000). Thus change is required for innovative and developmental strategies to be adopted and implemented in an organization, and its management which is largely anchored on leadership style, organizational values and effective communication is crucial to the successful transition of the organisation from its current status to a desired future status (Gill 2003).

Corporate sustainability is thus closely intertwined with organizational culture as any organization seeking to be perceived as adhering to sustainability policies as well as imbibing positively impacting sustainability measures need to firstly integrate the sustainability paradigm into its organizational

culture and corporate strategy (Carter and Rogers 2008 and Linnenluecke and Griffiths 2010). This can be achieved by the recognition of the fact that a change is required and the deliberate management of that change via planning, monitoring, controlling and the adoption of strategies that motivate and inspire those involved in the change process or affected by it (Gill 2003).

However desirable corporate sustainability is, and efforts put in place to manage the change required to actualise this goal by a company's management team or decision makers, more is required as the management of change in itself though necessary; is not sufficient to guarantee a smooth transition to organizational sustainability. Rather, an encompassing system that adequately identifies an organization's sustainability vision, required strategy and resources and integrates necessary expertise and skills whilst not neglecting internal organizational factors such as human resource management and personnel performance evaluation.

Also, in order to integrate the sustainability vision as well as embrace its measures across organizational functions, it is imperative that employee training and empowerment become important features of the implementation process (Linnenluecke and Griffiths 2010 and Schwartz, Tapper and Font 2008). Inadequate investment in training and lack of technical knowledge and skills as well as competence with regards to sustainability adoption, implementation and continuing practice is a key challenge in SSCM as it encourages a nonchalant attitude towards sustainability issues and its applicability in everyday operations. Thus, even when an organization pledges allegiance to a sustainably managed supply chain, it is business as usual with a few minor changes which does not bring about full benefits of a well-managed and progressive sustainable supply chain. Integrating SSCM policies requires a clear definition of job requirements and functions as new measures are being integrated to steer the organization towards its sustainability goals. This sometimes drastic change or added job functionalities require adequate training to bring employees up to necessary capabilities and understanding of the importance of the procedures and its implementation. Organizational environments where this is lacking, are exposed to a failed transition process or a caricature level of sustainability integration (Sarkis, Gonzalez-Torre and Adenso-Diaz 2010).

In order to develop employee engagement towards environmental sustainability improvements, Ramus (2001) advocates organizational policies that encourage employee eco-initiatives through providing support from line managers, making out time for innovative explorations and experimenting, introducing reward system for sustainability improvement and making available employee competence building opportunities as well as openness to innovative ideas from employees. Hence, building

competences through knowledge acquisition and across all business functionalities, so that sustainability initiatives and adoption is not restricted to certain or specific roles within the organisation but rather, is made accessible and doable by all employees.

As indicated in the previous paragraph, organizations that are determined to travel through the sustainability route and adopt sustainability initiatives are often times faced with challenges such as change management and organizational culture. Barriers such as these can be overcome via regular training programmes, seminars and other employee knowledge acquisition scheme (Sarkis, Gonzalez-Torre and Adenso-Diaz 2010). In the case of the Nigerian downstream oil industry, it is evident from statements made by respondents that various training programmes are in place to address sustainability in the organization. However, further probing shows that many of these trainings are usually directed towards ISO and TQM programmes. As stated in the previous section, research has revealed that implementing the ISO 14000 environmental management system can drive organizational sustainable supply chain strategy (Curkovic and Sroufe 2010) and thus training in this regard will be beneficial to the organization's management of its supply chain in a sustainable manner.
However, it will be inadequate to base all sustainability measures, even the environmental aspect on ISO standards as these do not by itself competently address sustainability issues as well as SSCM adoption. In fairness, it can be described as a tool for setting in motion or identifying the methodology for fostering improvements in business processes which may be regarded as sustainability enhancing such as waste reduction. The standards are not definitive but rather advocate continuous improvements and as such can be perceived as vague (MacDonald 2005). Also, there have been claims that some organizations only use the standards as a "… label for image building" (Rondinelli and Vastag 2000: 499). In addition, it will be unsatisfactory to assume that the adoption of ISO standards in itself will bring about improvements in environmental performance and thus sustainable business improvements (Krut and Gleckman 1998). Thus, training focused on ISO standards as the primary route to achieving a sustainably managed supply chain is incomplete and is insufficient for the achievement of the required competencies, knowledge and expertise to effectively move the Nigerian downstream oil industry towards SSCM. Rather, an encompassing training that focuses on skill and knowledge acquisition in the practice and adoption of sustainability measures across supply chain activities with focus on all three dimensions of sustainability is required for the initial adoption, implementation and continuing development of SSCM in the industry sector.

As discussed in chapter 6, SSCM challenges such as difficulty in transporting products and infrastructure vandalism are inter-related and the former can be described as one of the negative effects

of the latter. The reason for this conclusion can be attributed to interview responses where respondents claim that with regards to logistics and transportation, although it is cheaper to convey refined products through pipelines, the company still has to resort to sea transport with heavy security as a result of the pipeline vandalism problem. This added cost to the industry's expenses in addition to the cost of lost products as a result of pilfering by small time vandals to the magnanimous looting of refined products by oil vandalism syndicates and barons all add up to cause huge losses for the organisation (Anifowoshe, Lawler and Lee Chapman 2012 and Onuoha 2007). Apart from the huge economic loss, there is also the environmental and social dimension as many at times these illegal fuel scooping and oil vandalism has led to loss of lives and property as well as huge environmental damage via oil disasters and fires as shown in figure 7.1.

Other challenges such as ageing downstream infrastructure, lack of supplier confidence in the system, low in-country manufacturing, foreign exchange fluctuations and lack of basic amenities to the best of the author's knowledge are not covered in any of the reviewed literature as SSCM challenges. The reason for this may be attributed to the fact that literatures tend to focus on the immediate organisational challenges and often times generalise observed challenges irrespective of a firm's operational base in terms of country of operation and consequently the level of development in such countries.

Another reason which seems logical to the author is that these challenges are specific to the downstream oil industry and specifically present in a developing economy like Nigeria where many factors such as low technological advancement, large dependence on foreign exchange earnings from crude oil sale, high inflation rates, high levels of corruption, declining per capital income and slow-developing government structures are persistent issues (Dike 2005, Nwabuozor 2005 and Odularu 2005).

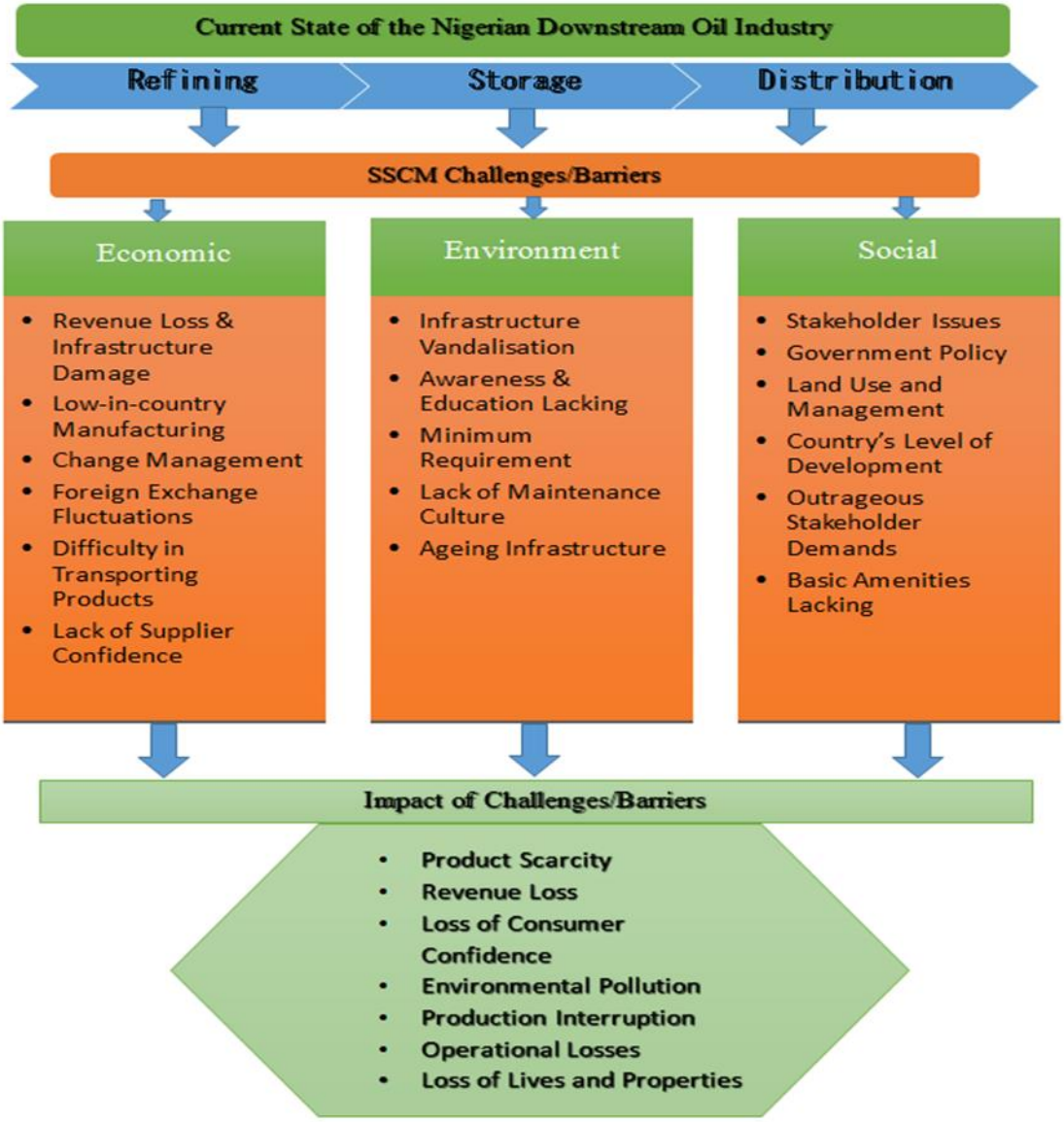


Figure 7.1 Current State of the Nigerian Downstream Oil Industry (Source: Author 2017)
Figure shows the current SSCM challenges and impact of challenges in the refining, storage and distribution supply chain links in the Nigerian downstream oil industry.

Nigeria derives more than 90% of its export income and over 80% of its national revenue from oil sale (Abu 2016). This shows the heavy reliance of the country on the oil sector and exports; and is known to be responsible for the economic volatility and negative shocks causing impromptu disruptions in government development programmes, high poverty levels and monetary disequilibria in the economy (Ross 2003 and Odularu 2007). This reliance has also affected other sectors that once thrived well before the oil boom. Income generating sectors such as agricultural exports and the then rising manufacturing sectors became unpopular after the Nigerian oil boom as ill-managed exchange rate appreciation and increasing low private investments further caused havoc on the growth and sustenance of these sectors (Odularu 2007 and Ucha 2010). Thus, it may be fair to infer that the oil boom or sometimes referred to as the *resource curse* problem plays a major role in many of the SSCM

problems in the Nigerian downstream oil industry such as; low in-country manufacturing, lack of basic amenities and ageing infrastructures.

Parente and Prescott (1994) in their work on challenges to technology adoption in firms and the disparity in barriers faced by organizations stated that, the larger the barriers experienced by an organization, the higher the required firm's investment for advanced technology adoption. Barriers identified by the authors ranged from regulatory constraints, corruption in form of bribes to be paid, violence, deliberate sabotage and strike actions by workers (Parent and Prescott 1994). Thus organizations with minimal or reduced barriers and which enjoy encouragements for technological innovation as well as opportunity enhancing environment often outshine those without such privileges. Thus the presence of social, economic and even workplace barriers are also factors drawing the Nigerian downstream oil industry supply chain backwards and slowing down its developmental process.

The challenge of gaining supplier confidence which was also identified as a huge problem in the industry can also be traced back to the social problems in the country. This is because as mentioned in previous section, the sector is largely controlled by the Nigerian government and as such, is prone to government bureaucracy and its associated effects. This is because, government agencies are strongly restricted by the inability of managers to make certain business decisions especially purchasing and sale decisions without gaining approval from necessary government authorities which in many cases are usually numerous and involves various stages of approval (Wilson 1989). Thus, slowing down the entire process and sometimes ultimately leading to backlog of approvals waiting in-line to be evaluated and approved; and in the Nigerian case, as indicated by respondents, causing payment delays to suppliers. Thereby, leading to trust issues and lack of supplier confidence in the system. Trust and confidence are necessary elements for fostering strategic alliance and partnerships (Teng 1998). Modern day supply chain management advocates supplier partnerships and alliances in the oil industry in order to improve supply chain performance and assist businesses in gaining competitive edge (Chima 2007). However, a low confidence level can discourage the development of strategic partnerships and also cause partners to have doubts about each other; thus, leading to other damaging effects on the supply chain relationship and the collaborative process if the partnership is entered into (Teng 1998).

7.2 Proposed SSCM Framework Measures for the Nigerian Downstream Oil Industry

Sustainability admits the inter-relationship existing between the environment, economic and its social dimension (Hutchins and Sunderland 2008). Thus, in order to propose SSCM measures, a critical evaluation of possible sustainability enhancing course of action for current scenarios and hence challenges is required and this was the first step in the framework development process.

The SSCM framework developed in this study describes the economic, environmental and social improvement areas necessary for the adoption, implementation and continuous improvement of the Nigerian downstream oil industry. These are the three major components of this framework. It highlights actions to be taken in the short term and long term for improvements to be made in the downstream oil industry supply chain. These improvement areas define necessary measures to be put in place for each sustainability dimension so as to help achieve a systematic integration and attainment of a positively impacting supply chain via the dynamic coordination of the Nigerian downstream supply chain activities.

The supply chain covered in this framework in line with the area of focus for this research, covers the NNPC refineries, depots and refined products storage facilities. The framework also focuses on specific players in the supply chain links and these are suppliers to the downstream supply links of study, local communities around these downstream facilities and infrastructures and the Nigerian government. A careful understanding of the multifaceted role the Nigerian government plays in the affairs of the downstream oil industry is necessary so as to appreciate its influence on the downstream oil industry and local communities in question. As stated in previous sections, apart from the fact that local communities expect the oil industry to fill the socio-economic void which ordinarily is the responsibility of the Nigerian government, there is also the issue of the government's active involvement in the sector, thus, strategically positioning the Nigerian government in a position to make policies that will help enable SSCM. This key position of the Nigerian government is represented by double arrows linking it to the NNPC refineries and depots on one hand and local communities on the other hand. It is also linked to the SSCM challenges in the industry. This link can be traced to its active involvement in the activities of the industry and the fact that absurdly, the Nigerian government is a capable polluter (Ambituuni *et al*. 2014).

The improvement measures highlighted in this framework however do not exist in isolation, but rather are interlinked as improvements, and benefits will noticeably be apparent across the supply chain, with a proper strategic system in place to encourage adherence and implementation of required changes

along the supply chain. However, suggested measures in this framework are designed specifically for the Nigerian downstream oil supply chain under study and it is expected that if managers in the industry adopt the suggested measures, then sustainability can be integrated into the management of the downstream oil industry supply chain, and thus, lead to remarkable improvements in sustainability performance.

Current SSCM barriers in the Nigerian downstream oil industry are presented in figure 7.1. These are also classified under the sustainability dimensions, with the resulting impact of these challenges listed as; product scarcity, revenue loss, loss of consumer confidence, environmental pollution, production interruptions, operational losses and loss of lives and properties. This list of impacts as well as itemized barriers evolved from empirical findings from this study. In order to ascertain what barriers fell under what dimension, the SSCM barriers were classified by establishing the sustainability dimensions where the impact of the barrier was experienced and this was identified after a careful review of literature and also from the evaluated interview responses.

After carefully identifying the SSCM barriers, a list of the barriers was sent to industry experts for their feedback and to ascertain that the list was not missing out important features and did not include irrelevant information. The feedback received was implemented and that informed figure 7.2 and thus informed the development of the first version (V1) of the framework.

Three versions of the framework were developed and this followed a continuous iterative and updating process following feedback from academics and industry experts in the field, and this is all novel work. The first version of the framework evolved basically by evaluating generic and industry specific SSCM methodologies in literature whilst not undermining the specificity and unique SSCM challenges being faced by the Nigerian downstream oil industry. This was followed by a careful comparison of different SSCM approaches with a deliberate effort at emanating measures, both short term and long term that would be adoptable for the industry sector. Thus, based on initial data collection, analysis, review of literature and discourse with industry professional, version One (V1) of the framework was developed as shown in figure 7.2.

7.2.1 Economic Improvement Areas

As previously stated, SSCM measures for dimensions of sustainability in the industry sector were represented in the framework. Economic improvement measures described in the framework are aimed at the achievement of the industry's economic goals within the supply chain structure.

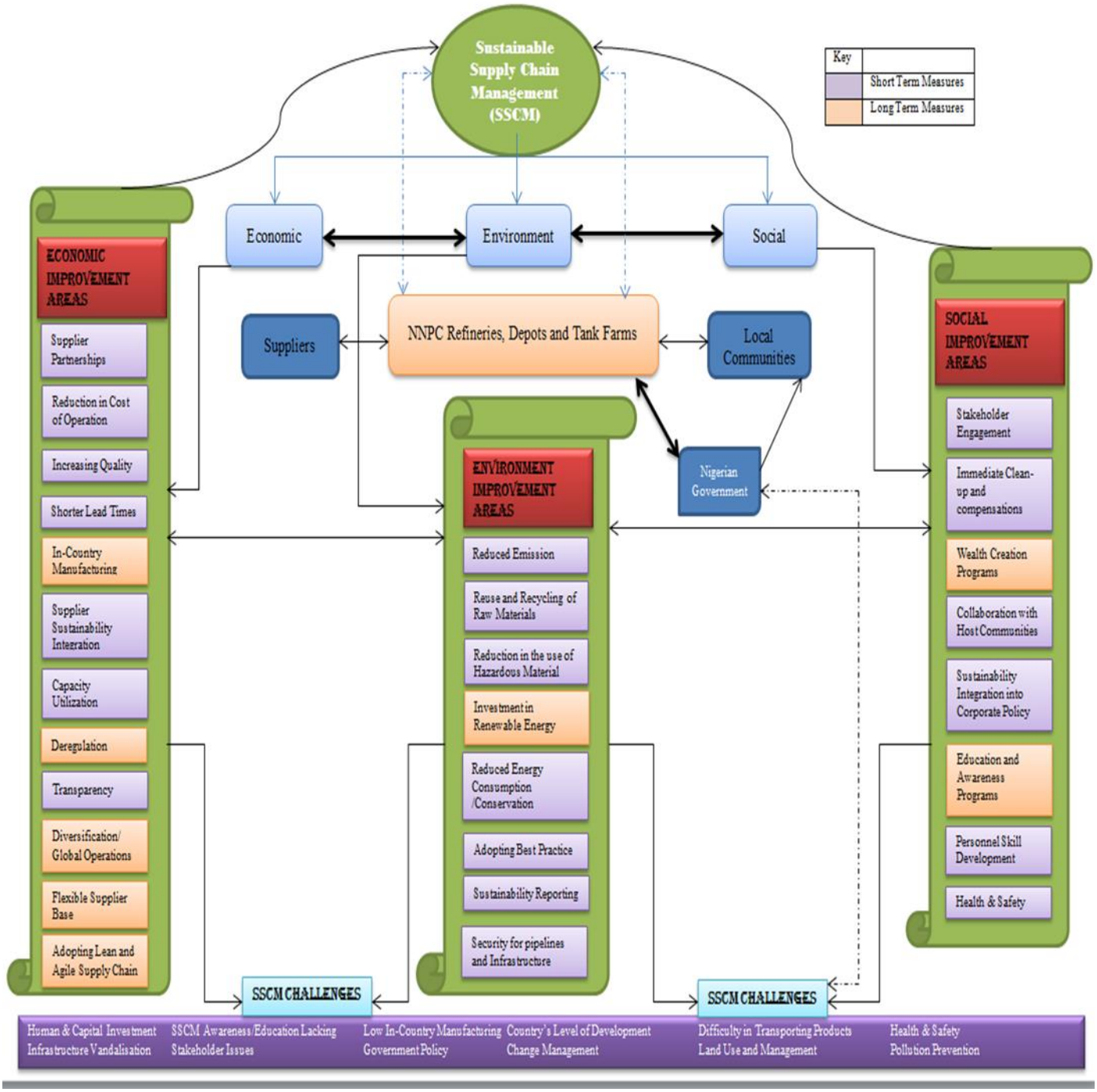


Figure 7.2 SSCM Framework for the Nigerian Downstream Oil Industry (V1)

Measures evaluated from the economic standpoint and added to the framework are designed to make the supply chain profitable or and better still reduce the current cost in the supply chain (Teuterberg and Wittstruck 2010). Seven short term measures were identified and these are; supplier partnerships, reduction in cost of production, increasing quality, aiming towards shorter lead times, supplier sustainability integration, transparency and capacity utilization. Two of these economic improvement measures (supplier sustainability integration and supplier partnership) are novel and newly proposed measures for economic improvement in the Nigerian downstream oil industry.

In the long-term, five necessary measures for an economically positively impacting SSCM are identified in the framework and these are; in-country manufacturing, deregulation of the sector, transparency, diversification and internationalizing the sector, adopting a flexible supplier base, and adopting a lean and agile supply chain. Two of these measures that is, in-country manufacturing, and diversification of operations are novel measures to the Nigerian downstream oil industry. The author is proposing these as new measures as they have not been identified in literature nor applied in the Nigerian downstream oil sector.

7.2.1.1 Supplier Partnerships

Supplier partnership focuses on the maintenance of long-term alliances and on-going relationship between partners whilst incorporating cooperative elements of mutual reliance, information sharing and problem solving. Studies have shown that organizations that rely heavily on important external resources will benefit economically by increasing coordination with other supply chain members, reducing the risk of losing strategic suppliers, gaining market knowledge, accessing supplier technologies, and entering into strategic alliances with suppliers (Arminas, 2004 and Carter and Rogers 2008).

Empirical findings from this study have shown that the Nigerian downstream oil industry is supplier dependent with regards to equipment and raw material purchase. Most of these are sourced from outside the country despite the Nigerian local content law which is adopted in project and contract dealings in the industry (Olatoye 2013). The Nigerian content law which is designed to promote the participation of Nigerians in the oil and gas industry (ALP 2016) gives primary priority to Nigerian independent operators and indigenous service companies in the award of operational licenses, contracts and projects across the Nigerian upstream and downstream oil industry. The rationale behind this act is aimed at promoting local participation and to encourage the growth of private investments and small businesses in the country. However, many of the existing service suppliers are characteristically from developed countries where they have the technological know-how and knowledge for manufacturing and production (Olatoye 2013). Even in instances where oil industry contracts are awarded to local companies, many of such indigenous contractors lacking the technical and financial resources to carry through, often resort to partnering with foreign companies so as to benefit from their equipment, knowledge and technical support (Balouga 2012). In order for the industry sector to achieve a SSCM, collaborations with suppliers must be integrated in organizational policy and culture. Hence, rather than the traditional adversarial and competitive approach where many suppliers are made to bid and compete for contracts which are often short term and subject to renewal with focus on price, long term

cooperative relationship with fewer suppliers and focus on continuous improvements and joint problem solving should be adopted as a practice in the industry sector. In this foregoing, an important step towards economic sustainability and thus SSCM for the Nigerian downstream oil industry is for industry decision makers to create policies that foster partnerships with their suppliers, either foreign or local based, as the case may be, as this would reduce the risk of production interruptions, improve efficiency and competitiveness for the industry sector, thus directing the industry towards economic sustainability.

7.2.1.2 Reduction in Cost of Operation

Studies have shown that cost reduction is one of the main drivers of environmental sustainability. Putting in place measures that allow reductions in operational cost is important for organizations seeking to be economically sustainable (Carter and Rogers 2008, Epstein and Roy 2001). Cost savings can be made from recycling, low energy consumption during production, reduced waste disposal, material trade-off, reduced packaging, reduced inventory and cost of handling (Epstein and Roy 2001) and also cost savings from reduced fines and remediation for accidental discharges and accidents (Zhu and Sarkis 2004). These cost reductions are usually beneficial to not only the organization, but most often than not, are also often experienced by stakeholders such as customers who benefit from the cost savings in form of cheaper or better quality products.

In order for the Nigerian downstream oil industry to move towards economic sustainability without the necessary dependence on income from the upstream sector of the industry, a system that embraces reduced energy losses during operations, lower emissions, encourages recycling of waste streams and raw-material trade-offs and reduced inventory. Putting in place these measures to reduce operational cost will not only be economically beneficial, but it will also be of great benefit to the social and environmental dimensions as well and cost savings made can be diverted to the improvement and further development of the sector.

7.2.1.3 Quality Improvements

Organizations that invest resources and efforts into quality improvement are better positioned to benefit from increased competitiveness (Powell 1995 and Rao and Holt 2005). In the Nigerian downstream oil industry, it is apparent that in order for the industry to derive SSCM benefits from quality improvements, there is a need to advance further from the currently adopted traditional quality management system TQM and ISO 9001 to a supply chain management outlook that takes into cognizance supply network relationships and quality benefits necessary to remain competitive (Robinson and Malhotra 2005). The TQM and ISO 9001 should not be viewed as contradictory but rather, complimentary

quality management tools (Curry and Kadasah 2002). The TQM paradigm embraces the implementation of a culture that focuses on customers alongside continuous improvement, strategic and quality planning, workforce empowerment and a research-driven decision making process (Curry and Kadasah 2002, Kannan and Tan 2005 and Samson and Terziovski 1999). Of these elements, commitment of senior management, workforce empowerment and organizational culture in relation to quality are critical to the successful adoption and implementation of TQM in organizations (Curry and Kadasah 2002 and Powell 1995).

Empirical findings from this study have shown that the Nigerian downstream oil industry is not new to TQM and the ISO 9001 quality management system and have over the years integrated this ISO standard quality management systems into day-to-day operations and activities in the industry. Analysed data from the industry shows evidence of some of the twelve TQM factors identified in the work of Powell (1995). These twelve factors are; leadership commitment, TQM adoption and communication, better knitted organizational-customer and supplier relationship, benchmarking, increased employee training, open organization, workforce empowerment, zero-defects and accident policy, robust manufacturing and goal oriented measurements. Of these factors, empirical findings from interview responses showed that the Nigerian downstream oil industry has adopted and are implementing some of these factors. Of notable mention are the zero-accident policy being currently practiced, communication and adoption of TQM, committed leadership, increased training, process improvement and goal focused measurement; as these factors were mentioned in all interviews with industry respondents. The reason for this adoption may be attributed to the fact that many organizations have over time come to the realization that quality is an important driver of business performance (Powell 1995 and Tena, Llusar and Puig 2001). Saying this, it is important to note that with regards to TQM, quality management driven continuous improvement is dependent on the complete adoption of both the "hard" and "soft" dimensions that defines it (Douglas 2015). The hard dimension of TQM covers factors such as measures, set quality targets, and techniques while the soft dimension is characterized by team work, committed leadership that encourages and facilitates employee empowerment. Many managers tend to pay more attention to the hard dimensions whilst neglecting the soft dimensions of TQM, thus leading to low TQM and organisational performance, endangering organisational sustainability (Douglas 2015: 214) and thus economic sustainability.

In the Nigerian downstream oil industry, findings showed that targets and measurement forms an integral part of the organization's quality management practice, thus ticking the boxes in the hard dimension list. However, how much of the soft dimension is being adhered to and practiced, especially

with regards to team work and employee empowerment cannot be ascertained and is not covered within the confines of this research work and may be a good research area for further studies. NNPC leadership is however committed to advancing organisational performance via quality management and this is evidenced in the emphasis placed on the adoption and practice of the TQM and ISO 9001 quality standards as shown in interview responses and also in company reports.

Organizations that chose to remain competitive evidenced by improved supply chain performance and profitability focus on quality improvements via quality management system adoption amongst other measures (Samson and Twerziovski 1999). In order to fully accept quality as a SSCM measure, organizations have to maintain a sustained commitment to its management over time (Curry and Kadasah 2002), hence adopting a practice of continuously doing the rights things *"effectiveness"* and doing it right *"efficiency"* (Douglas 2015) so as to maintain organizational competitiveness and thus remain sustainable (Zairi 2002). This is crucial to the development, performance and sustenance of a long lasting supply chain as sustainability does not only evaluate improvement for now, but future development and this is unachievable by "…doing the wrong things right" (Douglas 2015: 213). This further emphasizes the need for organizations striving to be economically sustainable to aim for continuous business development via quality improvements in their supply chain network. With this in mind, in order to have a lasting and positively impacting SSCM in the Nigerian downstream oil industry, it is imperative that the organization go the extra mile, by making further resource and time investments in quality enhancing operations and activities that identifies customers' needs, ways of meeting these needs, customer satisfaction, efficient information sharing, improved problem solving capabilities, improved employee motivation and allegiance and better supplier relationship across the supply chain to ascertain continuous and sustainable improvements that competitively positions the industry and ascertains improved profitability (Powell 1995).

7.2.1.4 Shorter-Lead Times

The shortening of lead-times in supply chains is critical to the achievement of lean and agile supply chains. It plays an important role in product availability, customer service level and hence an agile supply chain; and cost reduction via shorter cycle time and waste elimination to achieve a lean supply chain. The concept of lean and agile supply chain is discussed as an economic SSCM measure further down in this section.

Responding to customer demands has taken a new turn in many industries and many organisations are following in this trend of faster delivery times characterised by competitiveness and market forces. One of the main challenges facing the oil and gas industry is the delivery of the final products to

customers at a cost that is as minimal as possible (Chima 2007). Also, price volatilities, narrow profit margins, and meeting stringent fuel specifications are also some of the challenges plaguing the industry sector (Mohite 2013). Thus, the adoption of short-cycle time in the downstream industry's already confined budget which is usually characterised by low profit margins compared to its upstream counterpart, introduces an additional constrain to the economic sustainability of the sector (UKPIA 2017). However, the industry in developed economies like the UK continue to strive for a strong supply chain that meets consumer demands whilst focusing on future availability of supplies and at competitive market prices (UKPIA 2017).

The dependence of the Nigerian downstream oil sector on foreign refined products alongside fluctuating international crude oil prices and sometimes acts of sabotage ultimately has its effect on the downstream supply chain and may make it seem that the supply chain is somehow incapacitated to adopt an improvement measure such as shorter cycle or product delivery time. In order for the downstream oil industry supply chain to be deemed successful, the availability of products to consumers at the right time is a necessity and is key to survival (Christopher and Towill 2001). Thus, being able to match supply to demand and reducing the current high level of uncertainty in the supply chain is a necessity for economic sustainability to be achieved. In establishing a supply chain strategy that embraces shorter delivery times and accessibility to refined products to the Nigerian consumer, it is imperative that the industry clearly understands market place constraints and requirements; whilst factoring in the peculiarity of the Nigerian oil industry and militating internal and external factors such as infrastructure vandalisation, volatility of crude prices and global economic influences. In order to adopt a strategy that shortens cycle time, at least to allow for the availability of refined products to consumers and eliminate the long queues at filling stations as currently being experienced in the country at the moment (Eboh 2016), it is necessary that a system is put in place by the NNPC and by extension the Nigerian government that allows optimal production in the country's refineries such that locally refined products accounts for a larger percentage of supply, thus cutting down on the dependence on foreign refined products and thus longer product to market time as well as cost reduction. Cost savings made here can thus be redirected into further improvements in the refining processes as well as optimising the refineries to further harness continuity in SSCM implementation in the sector.

7.2.1.5 Supplier Sustainability Integration

To adequately address sustainability in the supply chain, it is imperative that organizations evaluate its entire supply chain and not restrict itself to direct suppliers, but rather the entire supply network required to meet customer demands in a global market (Hutchins and Sutherland 2008 and Rao and

Holt 2008). Thus engaging suppliers even in relation to sustainability adoption is a necessary step if an organization is to move towards SSCM. Many organizations are beginning to take into account supplier sustainability performance and tend to integrate environmental evaluation criteria into their purchasing guidelines and procedures. This is achieved via supplier assessment policies and management information systems to ensure that suppliers are conversant and follow sustainability requirements of the organisation in accordance with the sustainability values upheld by the organisation (Green, Morton and New 1996 and Rao and Holt 2008).

The Nigerian downstream oil industry will benefit from a supplier engagement strategy that is focused on sustainability integration. This can be achieved by involving suppliers in their sustainability quest, in a manner that allows supplier involvement even in the management of emission issues, waste reduction and the management of the supply chain as a whole. Implementing this measure will reduce operating costs in the industry as well as improve customer service (Rao and Holt 2008 and Walton, Handfield and Melnyk 1998).

7.2.1.6 Adopting Lean and Agile Supply Chain

While the lean paradigms is characterised by waste reduction or elimination, agile depicts quick response to market and customer demands (Christopher and Towill 2001 and Naylor, Naim and Berry 1999).

The adoption of a lean strategy is particularly useful for performance improvements in the downstream industry in general and specifically for the NNPC downstream sector. This is because demand for refined products in this sector of the oil industry is relatively stable, predictable, high volume and with minimal variety. This is in line with arguments made by Christopher (2000) that states that for products whose demand can be foretold to a certain level of reliability, and with a low customer requirement for variety, the lean concept is adoptable and applicable. However for products where there is a high level of volatility in demand and customer demand for variety is high, a high level of agility is prescribed.

7.2.1.7 Capacity Utilization

Defined as extent to which the production capacity of a plant is being harnesses to produce goods and services (Business Dictionary 2017). Calculated as a ratio, it is a measure of the actual output to the maximum output or capacity (Corrado and Mattey 1997).

In the refining of crude oil, refinery capacity utilization play a prominent role in refining revenue accrued (Rey 2015). This is because the higher the refining capacity utilization, the higher the production rates and the higher the revenue from product sales. With four government owned refineries that are all performing below their optimal capacity, incessant product shortage and continuous importation of refined products has over the years defined the Nigerian downstream oil sector (Christopher and Adepoju 2012 and Iwayemi 2008)). These underperforming refineries do not only lead to a shortage in national revenue, but they also have negative socio-economic effects on the country (Iwayemi 2008). In order for the supply chain to run effectively and defined by reliable product availability, there is a need for private investments in the establishment of more refineries as well as the expansion and optimal running of existing refineries to increase their capacity and productivity. This is currently in the pipeline as a number of private investors have shown interest in refinery construction. Also, the NNPC recently announced a revamping of one of its refineries as well as set a target 80% refining capacity in 2018 (Guardian 2017).

Increasing the capacity utilisation of the refineries as well as building new refineries will apart from ensuring product availability, it will also reduce the country's heavy dependence on imported refined products and reduce the current deficit in national earnings form crude oil exportation.

7.2.1.8 Transparency

Nigeria ranks high in countries with high levels of corruption. Corruption is a well-known problem of the country and has been blamed for the current level of development that characterises the country despite its possession of abundant natural resources. Combating corruption which can also be described as a global problem require the pursuance of transparency via openness and access to accurate information at different levels of governance (Bertot, Jarger and Grimes 2010).

Transparency in business disallows hidden motives and conditions whilst encouraging availability of information to effect a collaborative and informed decision making process. In supply chains, transparency implies the availability of product and process related information such that supply chain stakeholders have access to undistorted, timely and relevant information (Egles-Zanden, Hulthen and Wulff 2015 and Wognum et al. 2011). Transparency in modern supply chains is motivated on one hand by regulatory requirements and the increasing need to keep stakeholders aware of an organization's business practice. As a supply chain sustainability measure, transparency includes stakeholder engagement and communication pathways to ensure stakeholder collaboration and ultimately improved supply chain processes (Carter and Rogers 2008). Organizations in developing

countries that integrate transparency in their supply chain stand an increased chance of sticking to their sustainability commitment (Egles-Zanden 2007). Transparency of business and operational activities in the Nigerian downstream oil sector will not only help improve relations between the sector and its stakeholders, but will also ensure that sustainability standards and conditions are adhered to as the activities of the sector to a degree becomes an open book and sustainability claims can be independently monitored and verified (Laudal 2010).

7.2.1.9 In-Country Manufacturing

This is a long-term SSCM measure for the Nigerian downstream oil sector. Generally, Nigeria's investment in research and development, technology transfer and adopting innovative technology is quite low. This coupled with the brain-drain phenomenon as well as reduced investment in education that characterised the country starting from the 80s has had a negative effect on productivity as well as in-country manufacturing (Adenikinju 2005) and cumulatively affected economic development in the country. The manufacturing sector has been described as the catalyst for economic development (Szirmai and Verspagen 2015) especially in developing countries (Szirmai 2012).

Supply chain globalisation has made it possible for the outsourcing of manufacturing activities as well as tasks that involve purchasing of needed wares or goods from various locations and countries (Meixell and Gargeya 2005). In-country manufacturing implies the local production of goods as against its purchase from other countries for local consumption and exports. As a sustainability measure, it is aimed at economic development as it fosters the growth of the manufacturing sector of the country, creates employment, as well as increases avenues for foreign exchange earnings from exports (Tybout 1999).

In the Nigerian downstream oil sector, in-country manufacturing should be a long-term goal as the sector is currently dependent on sourcing and purchasing of equipment outside the country. This will not only solve the problem of long lead times and production interruptions as mentioned by respondents, but will also encourage innovative and technological development in the country. However, with regards to cost, a trade-off may be required between the cost of outsourcing or equipment purchase outside the country and the cost of in-country manufacturing as in the short term, the cost of putting in place necessary infrastructures for manufacturing within the country may be on the high side. Nevertheless, with the current development level of the country and the associated socio-economic problems, the downstream oil sector and the country in general will benefit from investments towards increasing manufacturing capacity.

7.2.1.10 Deregulation

As mentioned in earlier sections, there has been calls for the complete deregulation of the Nigerian downstream oil sector (Aigbedion and Iyayi 2007 and Ehinomen and Adeleke 2012) and there has been improvements in this regard in recent times. Already, some public sector organisations in Nigeria such as telecommunication, banking and the aviation industry have been privatised and or deregulated for reasons ranging from operational inefficiencies, lack of accountability, need for employment generation and for economic stability (Kalejaiye, Adebayo and Lawal 2013). Of recent, the pricing of petroleum products has been deregulated after several years of persistent pump price hike, refined product scarcity and government subsidization of refined products. This development has been welcomed with mixed reactions as the benefits and disadvantages of removing subsidies and inviting private investors to participate in the importation of refined products into the Nigerian market is viewed from different perspectives by scholars and the Nigerian populace as a whole (Arong and Ikechukwu 2013, Kalejaiye, Adebayo and Lawal 2013, Godwin and Dagogo 2011).

Evaluating the benefits of deregulation which includes economic benefits, market competition and higher number of choices for consumers to select from makes the adoption of a deregulated system attractive. As a sustainability measure for the Nigerian downstream oil industry, while the deregulation of product pricing is a welcome development, further involvement of private sector participation in the construction and management of refineries and storage terminals within the country is necessary. Increase in local refining capacities as a result of increased number of refineries can boost oil exports as excess volume of refined products after domestic consumption has been catered for can be exported to nearby African countries or to international borders where there is need for it (Ikein 2016). Thus, not only discouraging the continuous importation of refined products, but also enhancing economic growth via exportation, balance of payment, job creation, as well as ensuring product availability introducing market competition.

7.2.1.11 Diversification of Operations

This implies the enlargement or varying of an organization's product range or operational competencies. As a corporate strategy, organizations diversify by sourcing for new markets and products for investment to reduce risk or market volatility (Chapman, MacKinnon and Cumbers 2004).

In the oil industry, change and stepping into new markets as a diversification strategy is not new (Mitchell and Mitchell 2014). A typical example in this regard is the across the border business operations of Saudi Aramco, a state owned oil company which in alliance with other oil majors refine and market petroleum products in international markets. Also, many of the downstream oil majors

have assets and business interests outside the UK with more than 50% of Petroplus and INEOS refining capacity outside the UK (Wood Mackenzie 2009). The Kuwati National Oil Company (NOC) operates refineries outside its borders and several distribution stations across the globe (Stonham 2000). It would be right to compare the Nigerian oil industry with these NOCs on the level of ownership and management. As a long term goal, the diversification of the downstream oil portfolio into other investments based on the large capital capabilities of the Nigerian oil sector will be an added advantage to the current market volatilities and profitability of the oil sector as a whole. Also, the recent interest in shale oil by America, which is a major importer of Nigeria's oil, calls for a more focused strategic planning of the sector by seeking new alliances and cooperation that fosters investments and spreading of assets in fertile business ventures.

In this regard, a not far off investment would be in the oil sector itself as mentioned in the previous section; improving refining capacity and harnessing exports from supply to neighbouring African countries whilst also meeting domestic consumption. Also, apart from crude oil, Nigeria is also well endowed with natural gas and ranks seventh largest global producer, with reserves estimated at about 182trillion cubic feet (Odumugbo 2010). Natural gas demand across the globe is increasing as it is versatile, produces cleaner fuel and is said to be more environmentally friendly (Aigbedion and Iyayi 2007 and Odumugbo 2010). Currently, Nigeria is still far behind in harnessing this golden opportunity where gas volumes in excess of industrial consumption are routinely flared and making the country rank as a top global gas flaring country (Akachidike 2008). Over the years, structures have been put in place to effectively manage gas reserves in the country as well as legislations to abolish gas flaring, opportunities still abound to monetize this huge volume of natural resource in the domestic and international market.

7.2.1.12 Flexible Supplier Base

Integrating flexibility in supply chains can be described as a proactive measure which incorporates allowance for change to save time, cost, required endeavour, quality or performance (Gosling 2010 and Morlok and Chang 2004). A flexible supply chain would exhibit characteristics that make it adaptable to market shifts, respond to short-term disruptions in supply and demand and implement incentives for improved supply chain performance (Lee 2004). Supply chain flexibility is necessary for reasons ranging from volatility in demand, fluctuations in production schedule, Just In Time (JIT) purchasing, and low stock of equipment parts to mention a few ((Tachiazawa and Thomsen 2007).

Where sole-sourcing has advantages of low unit cost and SCM cost, sourcing from a single supplier can also be problematic when managing disruptions or unanticipated demand (Tang 2006), Sourcing flexibility creates room for a larger supplier base such that the supply chain can be reconfigured as required to add value to supply chain activities and organisational flexibility (Gosling, Purvis and Naim 2010).

At the moment, many of the high-tech equipment used by NNPC are sourced internationally and as required. Adopting flexible sourcing by increasing the supplier base for parts and raw materials needed for supply chain activities by downstream NNPC will increase the adaptability and resilience of the supply chain. This will assist in eliminating production challenges and disruptions caused by downtime and shut-downs resulting from equipment malfunctioning and delays in purchase of replacement equipment.

7.2.2 Environment Improvement Areas

Resolution of environmental issues in the supply chain is an important aspect of SSCM (Linder, Bjorkdahl and Ljungberg 2014). Similar to the economic improvement areas, environmental improvement measures described in the framework are aimed at the industry's achievement of high performing supply chain with particular emphasis on the reduction of negatively impacting processes and activities along the supply chain to ensure environmental safety and an extended improvement in social and economic aspects as well.

Measures evaluated from the environmental standpoint and added to the framework are designed to address environmental concerns whilst minimizing waste and achieving savings (Shaw, Grant and Mangan 2010). Seven short term measures were identified and these are; reduced emission, reuse and recycling of raw materials, reduction in the use of hazardous materials, reduced energy consumption/conservation, adopting best practice, sustainability reporting and providing security for pipelines and infrastructures. One of these measures (providing security for pipelines and infrastructures) is novel and unique to the Nigerian case-study as sabotage and vandalism is a critical challenge in the industry and is responsible for many of its environmental and social problems. To the best of the author's knowledge, this measure is novel and has not been seen in any literature as a sustainability measure.

In the long-term, one necessary measure for an environmentally positively impacting SSCM is identified in the framework and this is; investment in renewable energy. The author is proposing this

as a new measure as though this has been identified in literature; it is yet to be applied in the Nigerian downstream oil sector.

7.2.2.1 Reduced Emissions

Developing countries do not perceive climate change as top priority as they are often faced with many socio-economic problems requiring attention (Winkler, Howells and Baumert 2002). This regardless, emission reduction is a necessity to achieve the goals of a sustainable society (Hubbard 2009) even as current unsustainable practices for energy production needs to be remodelled to effect improved processes with reduced negative impacts (Blok *et al*. 2015).

In the UK downstream oil industry, reducing emission is a top priority necessitated by regulations governing the industry. This is required if the UK's emission target is to be met. As it is, standards in the UK and Europe allows the blending of biofuels with refined products to improve fuel efficiency and importantly, reduce greenhouse gas emissions.

The Nigerian oil sector, although still far behind in cutting down emissions (see figure 3.14), is not left behind in achieving reductions in GHG and carbon emissions as though still developing, it has started looking in the direction of biofuel development even as investments and efforts are being directed towards its growth (Abila 2012). Also, there is a renewed commitment to cutting down on carbon emissions via "The Clean Development Mechanism" (CDM) project, also titled "The Oil and Gas Sector Carbon Initiative" by the current minister of the Nigerian oil sector (NNPC 2016). It is the plan of the organisation to invest in CDM projects that would lead to capturing Certified Emission Reductions (CERs). Certified Emission Reductions are emission credits, also referred to as carbon credits issued by the board of CDM for emission reductions. Carbon credits is an emission reduction strategy where a reduction in CO2 or greenhouse gas emissions is used to offset or balance out a greenhouse gas emission (Isa 2014 and Okonkwo 2015). These projects are to be established in due course and would involve the organisation partnering with other established oil giants to progressively achieve reduced carbon emissions in all sectors of the industry.

Where this is a welcome development, it would be beneficial if effort is also directed towards improving energy efficiency and introducing strategies that reduce operational emissions via venting and both intended and unintended releases or fugitive emissions (Lekwot *et al.* 2014). Also, setting achievable emission reduction targets within a timeframe and adhering strictly to a set programme to facilitate its achievement will be a good starting point for improvements in emission reduction in

NNPC downstream operations. Finally, supporting and collaborating with other industries and importantly, academia to discover and develop innovative emission reduction technologies best suited for their supply chain activities will go a long way in not only improving the supply chain sustainability of the sector, but also position the organisation alongside technologically advanced organisations.

7.2.2.2 Reuse and Recycling of Raw Materials

Changing regulations and compliance requirements in the downstream oil sector has driven the need for improved efficiency in operational processes even as the sector thrive to remain profitable and achieve its sustainability goals. These has led to the recycling and reuse of process waste and raw-materials in the sector.

In the downstream oil industry, process effluents are often recycled and reused to maximise product recovery as well as comply with industry regulations. As a sustainability measure for the Nigerian downstream oil sector, recycling and reusing of effluent streams and raw materials will provide a basis for reduction in resource depletion and waste reduction, thus minimising their negative impact on the environment (Reijnders 2000). As a cleaner production strategy, recycling and reusing of raw materials and process streams allows for improvement in the management of material flow, efficient energy consumption, compliance with regulatory framework and use of natural capital in a sustainable manner (Glavic and Lukman 2007). The industry stands well to benefit from this sustainability measure even as it forges towards the achievement of environmental improvements in its operations.

7.2.2.3 Reduction in the Use of Hazardous Materials

Reducing the use of hazardous raw materials in the supply chain is a way of adopting environmental sustainable practice by taking into consideration the harmful effects of raw materials during product design, material sourcing and selection, product manufacturing up to the product end-of –life cycle and disposal (Azevedo 2011 and Srivastava 2007). It may also involve completely switching from or eliminating a negatively impacting process or product that can be done without whilst still striving to maintain product quality (Schaltegger and Burritt 2014). This may require sourcing for adequate substitute materials with less harmful effects on the environment. However, considering the environmental benefits now and in the future as well as benefits across other sustainability dimensions, sourcing responsibly by purchasing and producing with environmentally friendly materials should be adopted as a progressive stance towards sustainable production and overall business performance.

7.2.2.4 Adopting Best Practice

In order to achieve sustainable development, it is imperative that traditional supply chains have to revamp their processes by integrating practices that promote sustainable production. Best practices

are generally acceptable techniques that have been proven to yield desirable organisational results via research and experience. Organisational best practice in sustainability discussions involve taking steps towards energy savings, emission reduction, recycling and other positively impacting SSCM measures.

The NNPC already has in place ISO and quality management strategies and these have been integrated in the organization's policies. Further improvements in this regard will be supply chain reengineering to accommodate improvements that pursue the sustainability agenda and allows total adherence to best practice strategies even as the industry aims to improve on its operational capabilities (Glover *et al*. 2014).

7.2.2.5 Sustainable Reporting

This is a report published by an organization indicating its performance across the three sustainability dimensions. It is a way organisations communicate their response to the changing views of its relevant public (Patten 1992: 471) whilst also setting and managing sustainability enhancing targets (Global Reporting 2017). This is needed to stir organisations in the direction of accountability and the embedment of sustainability into corporate culture.

The adoption of sustainability reporting by the NNPC as a sustainability measure and international best practice will be a good starting point for performance measurement in the organization. This will allow the establishment of indicators with accompanying targets that can be measured over specific time frames (Kolk 2004).

Research has shown that sustainability reporting gives the added benefit of promoting sustainability awareness and morale amongst employees by improving their knowledge and understanding of the importance of sustainability and its reporting (Adams and McNicholas 2006: 397). Asides this, some organisations tend to omit and not report important data that show good effort towards sustainability due to lack of experience and knowledge on reporting. Thus, apart from the educational benefit that the NNPC stand to gain through sustainability reporting, the practice can also improve the current image of the organisation by bringing to limelight the corporate effort being invested by the organisation towards reducing its negative environmental, economic and social footprints. The organisation will stand well to benefit from improved transparency that sustainability reporting promotes by communicating its endeavour in this regard, to not just its stakeholders, but the general public. This is necessary, judging by the negative image with regards to its supply chain activities, which currently characterises the organisation.

7.2.2.6 Security for Pipelines and Infrastructure

The challenge of constant vandalism of NNPC infrastructures and pipelines requires both short and long term solutions as the root of the problem transcends the NNPC as an organisation and is rather deeply rooted in socio-economic problems characterising the country (Akpan and Nnamseh 2014). On the long term, continuous engagement of stakeholders is via discussions that addresses their concerns and issues is necessary to prevent further hostilities and establish a cordial working relationship with the NNPC. Efforts in this vein are already yielding results as recent NNPC report has shown that there has been a considerable reduction in pipeline vandalism as a result of the ongoing engagement between the Nigerian government, NNPC and stakeholders (NNPC Monthly Report 2016).

However, a short-term solution will be the provision of adequate security for downstream infrastructures. This can be achieved via outsourcing and the use of technology enhanced security measures for pipelines and other infrastructures to ensure a smooth running supply chain. The protection of government infrastructure from acts of sabotage and terrorism is becoming a popular trend necessary to halt the negative economic and social implications of such acts (Seidl and Sima 2012). Pipelines and other downstream infrastructures which can also be described as critical infrastructures are state assets that contribute immensely to supply chain activities of the NNPC and the country as a whole in the conveyance and provision of crude oil and refined products to the Nigerian populace (Dvorak, Leitner and Mocova 2016). Providing adequate monitoring and security systems to prevent the activities of unauthorized persons, sabotage, unsafe conditions for personnel and surrounding communities and to ensure continuous operations and supply activities in the Nigerian downstream oil sector is an important investment that should not be compromised (Dvorak, Leitner and Mocova 2016).

As a sustainability measure, investments should be made in providing high-tech security for pipelines and associated infrstructures. This should include enhanced monitoring device, tracking systems, communication and current restriction rules to critical infrastructures by unauthorized persons (Omodanisi, Eludoyin and Salami 2015).

7.2.2.7 Investment in Renewable Energy

Like many other countries, Nigeria is blessed with renewable energy sources such as solar, biomass, wind and so on. Harnessing renewable energy sources in developing countries is crucial to the socio-economic growth in such countries (Omer 2011). Renewable energy is already gaining momentum in developed economies like the UK, although forecast shows that it will not replace crude oil as the main source of transport fuel until 2030 (UKPIA 2016).

Investments in renewable resources is a good way to reduce GHG emissions as well as ensure continuous energy availability (Glavic and Lukman 2007). Apart from these, renewable energy technologies also have the benefits of reduced operating costs, decreased fossil fuel dependence, creation of employment opportunities, improved life quality and local development (Stigka, Paravantis and Mihalakakou 2014).

The NNPC already has an established renewable energy division with the goal of producing biofuels and other renewable sources, eliminate the sector's carbon footprints, diversify the economy and promote sustainable development (NNPC 2016). This was inaugurated in 2005 in accordance with the Kyoto agreement. Of recent, the drive towards renewable energy received a boost with plans underway for a 300million dollar investment into the establishment of a renewable energy plant via a joint partnership scheme (Vanguard 2017). This is a welcome development that can reduce the country's complete dependence on fossil fuel whilst also tackling the carbon emission challenge. This is a long-term sustainability measure to achieve a positively impacting supply chain.

7.2.3 Social Improvement Areas

In order for supply chains to evolve and journey through the path of being socially sustainability, the starting point would be to identify the issues at hand followed by the adoption of measures required for performance outcomes (Yarwar and Seuring 2015). This may involve minor or even major changes to already designed business routine and procedure and may require investments in safer technologies, product or processes (Epstein and Roy 2001).

Thus, social improvement measures indicated in the framework are aimed at practices that will promote ethical and socially acceptable supply chain activities in the Nigerian downstream oil supply chain. Eight social sustainability measures were added to the framework. Six of these are short-term measures and two of which are long term measures. Short-term measures identified are: stakeholder engagement, immediate clean-up and compensations, collaboration with host communities, sustainability integration into corporate policy, personnel skill development and health and safety. Long term measures identified are: wealth creation programme and education and awareness programme.

7.2.3.1 Stakeholder Engagement

This is an important measure in ensuring social sustainability. This is because social sustainability apart from evaluating the wellbeing and safety of people in the supply chain, it also takes into cognizance internal; employees, suppliers, customers and so on and external stakeholders such as

communities and the larger society (Mani, Agrawal and Sharma 2015). With regards to supply chain sustainability, it becomes even more endearing to ensure that stakeholders are carried along even in decision making stages of the supply chain (Podolak *et al*. 2017).

With supply chain success in mind, it is important for the NNPC to prioritise and engage their stakeholders by promoting an environment that allows dialogue with stakeholders so as to address their concerns to facilitate a lasting and cordial organization-stakeholder relationship. As a requirement, stakeholders should be involved in discussions centred on sustainability issues, concerns, planned actions, decisions and performance updates (Rinaldi, Unerman and Tilt 2014).

Amongst other benefits, adopting stakeholder management as a sustainability measure will better position the NNPC to identify and manage supply chain risks, improve company reputation as well as set the pace for a better understanding of their business environment and militating cultural dynamics (Rinaldi, Unerman and Tilt 2014). It is a good way for the NNPC to learn whilst also educating and influencing their stakeholders for the overall good of all concerned. It would also enable a trust-centred relationship as it promotes transparency from all parties.

7.2.3.2 Immediate Clean-up and Compensations

Where Nigerian environmental laws and its enforcement are still evolving compared to its developed counterpart, managing oil spills and compensation schemes are far from being adequate (Ambituuni, Amezaga and Emeseh 2014).

In combatting spills, efforts must be made to avoid further pollution increased effort should be directed towards the development of a comprehensive framework that allows monitoring, immediate clean-up and paying of compensations for oil spills and damages.

Alongside the *goal zero policy* being adopted in the NNPC downstream and the current spill management procedure, the development of a comprehensive blueprint for the management of oil spills via early detection, monitoring, clean-up and remediation of spill sites should be integrated into the corporate sustainability policy. As a sustainability measure, adequate planning and preparation should be made to deal with spill incidences in order to avoid a situation where the clean-up process is slow and ineffective whilst the spill continues to pollute the environment creating an unsafe society (Rim-Rukeh 2015). Clean-up should be timely, safe and effective. Also, implementing an effective compensation payment procedure which allow a detailed investigation into claims at the shortest possible time-frame

is a good way to show commitment to safer supply chain operations and taking responsibility for operational inefficiencies and eventualities.

7.2.3.3 Collaboration with Host Communities

Collaboration is an important element for "*unlocking sustainability*" (Gray and Stites 2013) even as across diverse settings, community engagement and participation has been proven to influence sustianbiltiy prospects (Koontz 2006: 15). Socially sustainable supply chains often interact with their stakeholders (Hutchins and Sutherland 2008). Such interactions may include pioneering or contributing to development programmes in surrounding communities or larger society. It may also involve entering into partnerships or collaborative schemes to develop programmes that are beneficial to these communities (Rondinelli and Berry 2000).

Collaborative initiatives have the potential of achieving improved social sustainability (Selin, Schuett and Carr 2010), even as positive interactions with host communities improves how an organization and its business activities are perceived (Hutchins and Sutherland 2008). With the ever changing challenges associated with sustainability, it is necessary for organisations to commit to a collaborative relationship with communities. This will alienate conflicting perspective and create an environment for the development of a constructive and improving relationship where participants build agreement and symbiotically harness and derive benefits from the relationship.

As a sustainability measure, establishing transformational partnerships with host communities by the NNPC should be an important feature in the organization's corporate agenda. While partnerships can take many forms ranging from philanthropic initiatives to definitive forms of stakeholder engagement, it is important that emphasis is placed on the achievement of developmental and sustainability goals (Gray and Stites 2013).

7.2.3.4 Sustainability Integration into Corporate Policy

Socially sustainable supply chains tend to evaluate their outlook towards SSCM and are inclined to incorporate expectations of the larger society into their business agenda. This is not only aimed at gaining a competitive advantage, but also and importantly, to adopt a responsive stance to increasing pressure from stakeholders and the general public (Petrini and Pozzebon 2010). However, a starting point for supply chain restructuring to reflect allegiance to positively impacting practice with accorded due importance in corporate policy, begins with top management commitment (Leug and Radlach 2015 and Petrini and Pozzebon 2010).

Senior management commitment is vital to the adoption and implementation of a lasting and beneficial SSCM. Revamping SCM practice to reflect a remodelled focus on sustainability issues requires top management input and high level decisions. Also, creating awareness and legitimizing organisational sustainability goals and strategies to effect a corporate culture and value change depend largely on top management commitment and mirrored in corporate policy (Leug and Radlach 2015 and Petrini and Pozzebon 2010).

Currently, the organizational focus is more on HSE, which though important can be described as an aspect of SSCM and can be captured under the sustainability umbrella. Restructuring to accommodate and integrate sustainable practices to reorientate traditional supply chain activities will necessitate innovative ideas and tools. It will also require familiarising and educating internal and external stakeholders on the sustainability vision.

Adopting and implementing SSCM as organisational policy by the NNPC will be the first step towards an enhanced supply chain. This would ensure a top-down briefing of the goals and expectations with regards to supply chain sustainability. This can be achieved by a clarity in SSCM definition, how it is perceived and plans to implement it, and the promotion of educational programmes centred on sustainability for the benefit of employees and other stakeholders (Leug and Radlach 2015)

7.2.3.5 Personnel Skill Development

Organizations that perceive their workforce as an element of strategic advantage, rather than a cost to the supply chain often tend to outperform their counterparts (Pfeffer 1995). Firms gain a competitive edge by harnessing its resources which include physical and human resources in a manner that distinct it from its competitors whilst adding value to its supply chain. Thus, prioritizing continuous skill development and wellbeing of employees is an important element of social sustainability. Putting in place a mechanism that ensures continuous training and characterized by overall improvements in employee capabilities, quality of work, job satisfaction and wellbeing is paramount to a forward a forward moving sustainable supply chain (Velva and Ellenbecker 2001).

Further investment in employee skill development in the NNPC downstream sector is a necessary requirement for creativity and capability improvement for the adoption and implementation of a gainful sustainability strategy (Dao, Langella and Carbo 2011 and Hart 1995).

7.2.3.6 Health and Safety

A measure that is already in place in the Nigerian downstream oil sector but requiring improvements such that it takes into consideration dimensions of sustainability and is practiced as a sustainability strategy. As a social sustainability measure, health and safety takes into consideration the provision of a safe and healthy working environment with focus on worker's and community well-being and safety and which "… translates into higher productivity, reduced compensation and damage suits, and reduced costs for social services and medication" (Azapagic 2003:304).

Organizations that consider occupational health and safety as a core value, tend to commit resources to its improvement and performance outcomes (Sinelnikov, Inouye and Kerper 2015). Hence, investment directed towards health and safety improvements such as safety training, innovative process solutions and improved working conditions have the potential of improving employee drive and productivity leading to reductions in lost hours due to absenteeism and improved turnover. Improved workplace health and safety apart from the benefit of ensuring workers and community well-being, it also has the potential of lowering cost (Azapagic 2003).

7.2.3.7 Wealth Creation Programme

Poverty alleviation is crucial to the achievement of sustainable development globally and especially in a developing country like Nigeria where there is a high level of poverty, unemployment, illiteracy and lack of basic amenities (OECD 2001).

Philanthropic contributions of an organization can help supplement government effort towards the provision of social amenities and in this case self-improvement schemes that have the capacity of empowering community members for a better life (Hutchins and Sutherland 2008). As a sustainability measure, investments by the NNPC in wealth creation programmes targeted towards improved living standards and community empowerment, will help reduce the high level of unemployment in these areas as well as improve relations between the NNPC and these communities. A cordial relationship will alienate aggression and hostilities from members of the community, most especially if they believe they are deriving benefits from NNPC's supply chain activities.

7.2.3.8 Education and Awareness Programme

Analysed interview response indicated that some members of the community deliberately spill oil on their farmlands by vandalising NNPC installations for monetary reasons. With regards to sustainability enhancing actions, there is still an unclear link between actions and its impact on sustainability dimensions. This is because a simple negatively impacting action often goes through a rather unstaraightforward process, making it difficult for individuals responsible for the action to trace

the effect to themselves (Azapagic 2000). Hence, there is often a dissociation between action and its contribution to sustainability issues in the local and global environment, signifying a lack of understanding with regards to sustainability issues. This lack of awareness and clarity on the implications of pollution and sustainability indicates a knowledge gap that can be filled through proper education on sustainability matters.

With regards to supply chain sustainability in developing countries, focal companies have to go the extra mile to create awareness to motivate stakeholders towards safe practices with the goal of improved sustainability performance (Silvestre 2015). As a sustainability measure, creating awareness and a learning platform educating and stimulating surrounding communities towards positively impacting practice is not only beneficial to these communities, but to NNPC and the wider public.

7.3 Framework Validation

Validity is an important factor in the application of an instrument as it evaluates the degree to which an instrument does or performs what it is designed to do (Lynn 1986). The instrument in this context is the framework which is designed for SSCM adoption and implementation in the Nigerian downstream oil industry. Validating the framework required an evaluation of the its content in relation to the purpose of measurement (Sireci 1998).

The framework validation process was aimed at substantiating the applicability of the designed framework alongside proposed SSCM measures for the NNPC. In validating the framework, particular attention was paid to content validity. Content validity is the degree to which the items on a measure assesses the content it is measuring (Rubio *et al*. 2003). It may be categorised into face or logical validity. Face validity is described as the level of representativeness or relevance of a test "*at face value*" while logical validity requires the judgement of subject experts on the validity of a test or measure (Rubio et al. 2003). Amongst other advantages of clarity of information of items in an instrument, content validity provides the opportunity for the instrument to be evaluated by subject experts and judgement and feedback as required.

Against this backdrop and due to the nature of this research and the expected final output; which is the framework, the developed framework is subject to improvements and corrections based on industry opinion. This is to ensure that the design is not simply an academic exercise, but also captures its applicability in the Nigerian downstream oil sector which is the case-study industry-sector. The framework in itself should be concise, clear and easy to understand.

In line with the above, the framework validation process followed an iterative process which involved seeking expert judgement in the evaluation of the proposed SSCM framework and various consultations with senior managers and decision makers in the Nigerian downstream oil industry with respect to the applicability of the framework. This process evolved two more versions of the framework as important and relevant feedback were added and or removed as the case may be (Schwartz, Tapper and Font 2008).

The validation process began with a detailed examination of proposed measures within the context of its relevance to the adoption and implementation of SSCM in the downstream unit of the NNPC's supply chain. This was carried out by seeking the judgement of three SCM and three sustainability subject experts in academia on the proposed framework V1 (Version 1). Feedback from this exercise informed the design of V2 (Version 2) of the framework. Some of the feedback given included; attaching a worksheet describing briefly the framework and SSCM measures proposed for easy understanding, clarifying the relationships in the framework as depicted by the arrows to elucidate supply chain actors and their role in SSCM adoption and implementation, taking out measures that were already in place and captured under more than one improvement areas. These feedback were implemented and necessary corrections made. The corrected version (V2) of the framework was sent back to the subject experts to ensure that all raised points had been addressed (Hussain, Khan and Al-Aomar 2016 and Richardson 2005). Response from the subject experts indicated that the framework was ready to be sent to industry executives to ascertain its applicability and obtain feedback on proposed measures.

Presenting the refined framework to decision makers, senior executives and supply chain managers in the NNPC was a key aspect of the validation process. This was essential in order to ascertain the appropriateness of the framework for the NNPC and that its application in the organization's supply chain was within the capacity of the NNPC leadership (Schwartz, Tapper and Font 2008). In light of the fact that it is crucial that the framework is seen as a tool that can actually help managers identify and deliver appropriate elements of SSCM, that is, a useful tool that can form the basis of an effective and structured improvement programme, it was imperative that the discussion would capture the usefulness and the applicability of the framework to the NNPC downstream.

Hence, the exercise was aimed at obtaining feedback on the framework and affirming the applicability of the framework by the organisation. As a starting point, contact was made with six selected senior

executives (four executives and two senior supply chain managers) of the NNPC with the capacity of making strategic decisions that allowed changes in supply chain practices. This was followed by a consultation meeting via the telephone where the research study and the purpose of the framework was discussed. This was to ensure that the purpose of the validation exercise was understood. Afterward, the refined framework (V2) was sent via email to the senior executives alongside a worksheet with a brief description of the measures and the framework as a whole and a feedback questionnaire on the framework. The questionnaire was aimed at evaluating the accuracy, completeness, feasibility and acceptability of the framework on a scale of 1 to 5. A time-frame was set for a feedback interview on the framework and the return of the framework feedback questionnaire. All six feedback questionnaires were completed and returned. Completed response showed the percentage of acceptability of the framework as shown in table 7.3. Feedback was also given on the framework and these were highlighted for further deliberation at the interview stage of the validation process.

Afterward, telephone interviews were conducted with each of the selected NNPC officials. These interviews lasted for about one hour on the average and all protocols observed and highlighted in the data collection stage of this research work were observed. The focus of the interview questions were on the responses from the feedback questionnaire and the applicability of the framework in the organisation. Also, the willingness of the NNPC to adopt the framework was a major part of the discussion.

Table 7.1 Feedback Questionnaire Response Showing Perception of NNPC Senior Executives on SSCM Framework

	Percentage of Agreeability of Proposed SSCM Framework				
Improvement Areas	**Accurate**	**Complete**	**Feasible**	**Cost Acceptable**	**Appropriateness of Measure**
Environment	100%	50%	100%	17%	100%
Economic	83%	66%	100%	17%	100%
Social	83%	83%	100%	17%	100%

7.3.1 Framework Validation Feedback/Discussion

Interview responses showed that proposed measures for all three dimensions of sustainability were accurate based on percentage responses of 100%, 83% and 83% for environment, economic and social improvement areas as shown in table 7.1. This portrays the framework as being accurate and addresses most of the challenges in the industry sector.

In the same vein, proposed measures were deemed feasible with all respondent being in agreement in this regard. This shows a consensus in the preparedness of the NNPC to move the supply chain away from unsustainable practices and towards positively impacting supply chain activities.

Also, there was a general consensus on the need for appropriate performance measurement to monitor progress. Thus, whilst the implementation of SSCM is important, it is equally necessary for scales of measurement for SSCM to be put in place to monitor progress against the positively impacting initiatives across the sustainability dimensions (Schaltegger and Burritt 2014).

With regards to the cost of implementation, only 17% of respondents agreed to the cost being acceptable. The reason given for this stance according to respondents during the interview was that the Nigerian downstream is currently underperforming economically due to the many challenges it is being faced with and any additional cost is currently not encouraged at the moment but maybe considered in the nearest future. Furthermore, emphasis was made on the fact that the NNPC is a state-owned organisation and any additional spending on the implementation of sustainability measures was subject to government funding.

With regards to completeness, suggestions and minor corrections were made on the framework and these informed a further refinement of figure 7.3 and the development of figure 7.4. These suggestions and alterations were welcomed and discussed in detail during the interview. Some of the points made during the interview included;
The need for the NNPC to harness and leverage on carbon credit. As an environmental improvement measure, this was already captured under "*Reduced Emissions*" in the framework.

- Driving and entrenching green practice in the downstream supply chain. This was already captured under investment in renewable energy as an environmental measure.
- Job creation and upholding the tenets of CSR. Captured as a social sustainability measure as investment in wealth creation programmes.
- The importance of the Nigerian government in overseeing NNPC activities and implementing changes. Attention was drawn to the fact that for there to be turn-around positive changes in the downstream supply chain, much of work depended on the Nigerian government by virtue of its ownership of the organisation.

- A need for repositioning the Nigerian government in the framework as a standalone influence on NNPC supply chain activities, suppliers and local communities. With suppliers, the government's influence is empiric in the significance of the tendering process which takes into consideration the Nigerian content and public procurement acts adopted in the NNPC and institutionalised by the Nigerian government. These are designed to encourage organizations to patronize local businesses to boost the local economy and strengthen technology transfer, in-country manufacturing and transparency. Also the NNPC as a government entity, and the position of the Nigerian government in the realization of SSCM and socioeconomic improvements that positively improve the livelihood of local communities were reiterated as the influence of the Nigerian government on local communities.
- Cost of implementation was also directed back to the government's capability to provide funding required to revamp the supply chain and stimulate sustainable practice across the entire oil industry. This is a significant issue in terms of the framework being adoptable. In view of the positive response from the senior executives of the NNPC, who see the process valuable, the author proposes a two-track approach to help unlock funding to start the implementation of this framework.

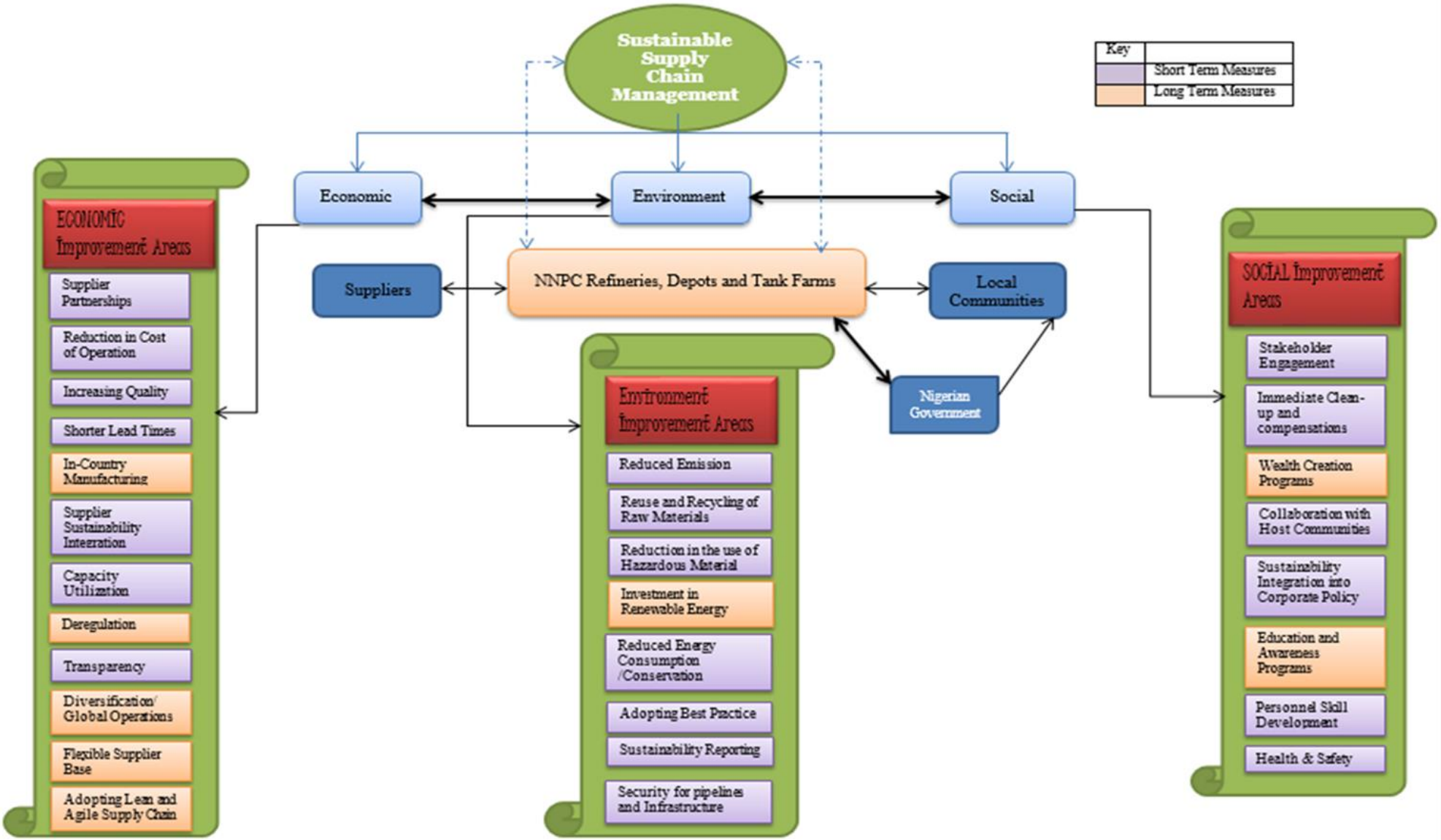


Figure 7.3 SSCM Framework for the Nigerian Downstream Oil Industry (V2)

Figure shows refined SSCM framework after deliberations with subject experts. The framework shows the economic, environmental and social improvement areas alongside measures required for these improvements

Firstly, that senior NNPC managers lobby the Group Managing Director (GMD), presenting a cost-benefit analysis in order for funds to be released. Secondly, that pilot study implementations be undertaken in parts of the supply chain that will demonstrate significant quick wins.

- The availability of environmental laws governing NNPC activities and the adoption of some of the environmental improvement measures in the framework. These efforts are however rendered insignificant by the many challenges being faced by the sector's challenges.

Overall, respondents iterated that judging by the potential benefits that accompany a sustainably managed supply chain both for the NNPC, and its stakeholders, adopting and implementing the proposed framework is necessary for restrategising the organisation and its operations towards a competitive, profitable and socially acceptable supply chain.

Figure 7.4 shows a refined framework (V3), developed based on interview feedback and suggestions stated above. The framework (V3) was sent to three SSCM subject experts in academics for feedback on changes made based on industry feedback. Positive response was obtained from this exercise after which the framework was sent back to interviewed senior executives for a final check and to ensure that all raised points had been clarified and necessary changes made. A positive feedback was obtained and no alteration was required on the framework. Thus, V3 of the framework emanated as the final version of this research study.

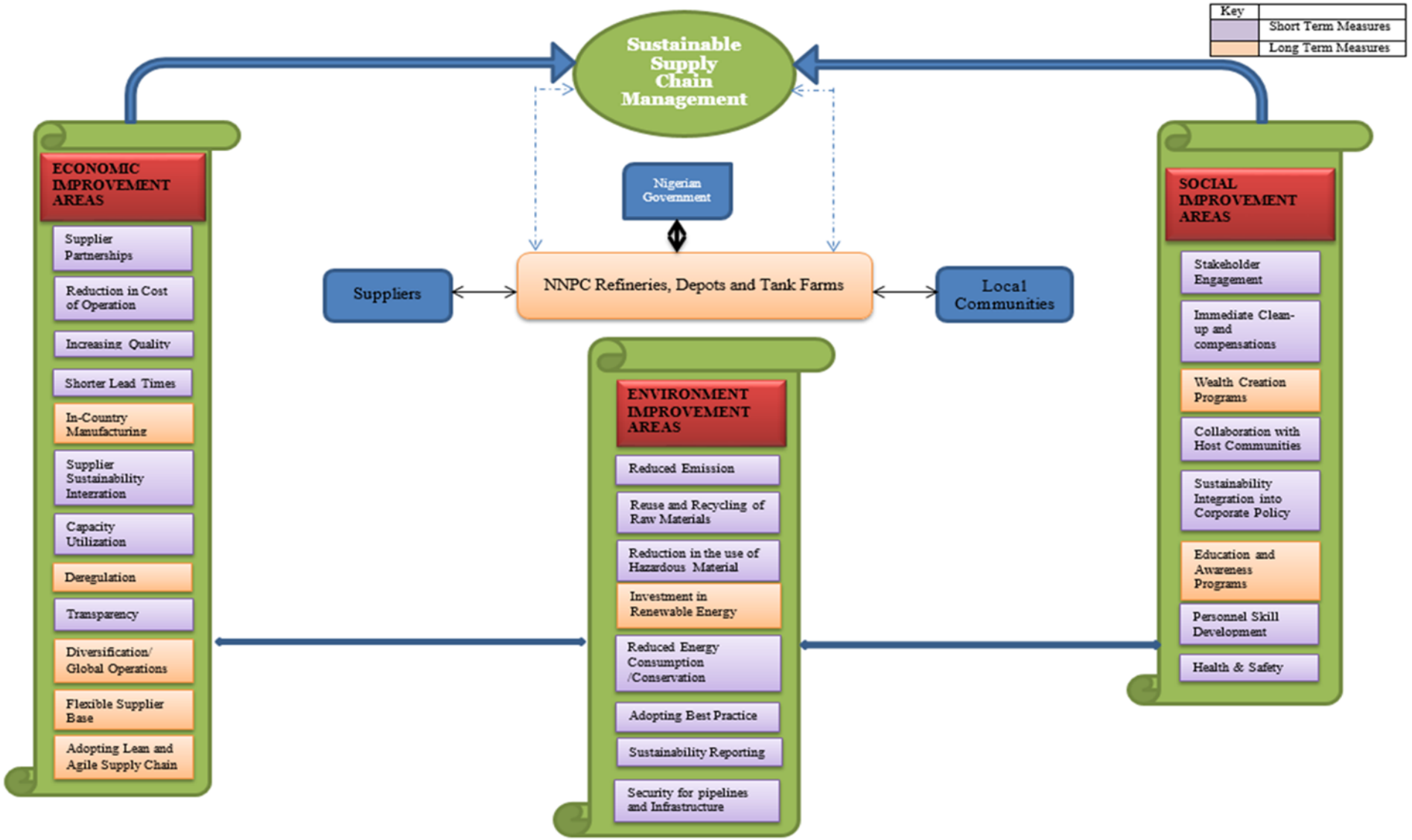


Figure 7.4 SSCM Framework for the Nigerian Downstream Oil Industry (Version 3 - Validated)

7.3.2 Performance Metrics for Sustainability Measures

In practice, sustainable development will continue to be a set goal without the incorporation of appropriate metrics that enables performance measurement of specific processes (Feng *et al*. 2010). Many organisations quantify their sustainability efforts by making use of an array of sustainability performance metrics (Epstein and Roy 2001). In order to ascertain sustainability enhancing improvements in processes and in this case, the Nigerian downstream oil industry supply chain, it is imperative that a 'toolkit' that provides a structure for performance measurement is integrated to ensure that there are actual improvements in processes and products and such improvements can be tracked and improved upon (Varsei *et al*. 2014). Performance measurement entails the selection of metrics to quantify benefits accrued via the implementation of sustainability.

Performance metric can be defined as a "…standard means of measuring and tracking an indicator" (Feng *et al*. 2010). An indicator provides information about the state of a sustainability dimension. It is a parameter that depicts the condition of a phenomenon and this can be measured or observed. As is customary in benchmarking exercises of this nature, it is required that metrics adopted should be collected and measured consistently over a number of years in order to derive the full benefit of identifying trends and added value as a result of adopting sustainable practices (IChemE 2016).

In order to measure and ascertain performance for the sustainability improvement areas identified in this work, a total of 122 metrics are being proposed (see Table 7.1). These metrics were selected after a detailed and extended review of literatures on sustainability, SCM, downstream oil industry and developing countries. Established sources of metrics in this area include, the GRI sustainability metrics (GRI 2016), Sustainable Development Progress Metrics (IChemE 2016), and United Nations Nations Climate Change (UNCC 2017), with other author's works including Ahi and Searcy (2015), Acquaye *et al*. (2014), Azapagic (2004), Braungart *et al*. (2017), Das (2017), Glover *et al*. (2014), Schaltegger and Burrit (2015) and Lighter (2015) . Whilst not all authors agree , there is a core of consistency , and this formed the basis for proposing the typical metrics as tabulated in table 7.1.

Table 7.1 Performance Metrics for SSCM Framework for the Nigerian Downstream Oil Industry

Environment Improvement Areas	Sustainability Performance Metrics	Information Provided By Metrics	Unit
Reduced Emission *Short Term Improvement* *Impact Areas; reduced operational emissions and carbon footprint as operations are tailored towards gradual reduction in CO_2 emissions and GHG* *Targets based on reducing overall emissions in line with international standards for the process industry (IChemE 2016, UNCC 2017, Acquaye et al. 2014)*	• CO_2 emission intensity	CO_2 emission from supply chain value-adding processes	Tonnes of CO_2/Year
	• Emission of GHG (CO2, CH4, N2O, HFCs, PFCs, SF6)	Emission of greenhouse gases across processing units and locations to estimate contributions to global warming and ozone depletion	Tonnes/Year
	• Total Number of trees required for sequestration of CO_2 emissions	Theoretical number of trees that would sequester CO_2 emissions from supply chain activities	Number/Year
	• Net CO_2 emissions (total CO_2 emission from supply chain activities minus the quantity potentially sequestered by trees	Total CO_2 emission sequestered by planting of trees by NNPC	Tonnes/Year
Reuse and Recycling of Raw Materials *Short Term Improvement* *Impact Area; Significant impact expected in the use and conservation of resources, recycling, reusing and reclaiming effluents and wastes* *Targets based on reducing negative impact on resource availability and contributing to its availability in-line with GRI standards (GRI 2016)*	• Recycling rate	Percentage of recycled and reused chemicals and materials	%
	• Waste chemicals processed and unprocessed	Percentage of reused chemicals	%
	• Quantity of water used (surface and underground water)	Volume of water used in production processes	M^3/Year
	• Percentage of water recycled and reused	Quantity of water used in production and recycled relative to water withdrawn from the environment	%

Reduction in the Use of Hazardous Materials *Short Term Improvement* *Impact Area; Significant reduction expected in the use of raw materials that pose health, safety and environmental risks* *Targets based on reducing hazards from use of hazardous raw material in line with international standards for the process industry (IChemE 2016, Zhu et al. 2008)*	• Hazardous raw materials used • Total amount of substituted hazardous chemicals • Quantity of hazardous raw materials used per unit of product	Sources and quantity of hazardous chemicals used in supply chain processes Substituted hazardous chemicals and quantity used Hazardous raw material consumed per unit of product	Kilogram/year Kilogram/Year Kilogram/Unit
Investment in Renewable Energy *Long Term Improvement* *Impact Area; Significant impact expected in combating climate change associated risks and environmental footprint via adoption of renewable energy sources; biofuel* *Targets based on reducing overall environmental footprint associated with supply chain activities in-line with global standards (GRI 2016 and UNCC 2017)*	• Energy from renewable sources • Investment in renewable energy sources • Number of programs aimed at renewable energy sources	Percentage total net of energy sourced from renewables Total investment in renewable energy options Total number of programs indicating company's efforts towards renewable energy sources	% Monetary unit /year Number/year
Reduced Energy Consumption/Conservation *Short Term Improvement* *Impact Area; Significant impact expected in energy consumption and efficiency via energy conservation and efficiency initiatives* *Targets based on improving energy efficiency and reducing non-renewable energy consumption in line with global standards (GRI 2016, ICheme 2016, Zhu et al. 2008, Azevedo et al. 2012)*	• Total energy Usage • Total energy usage per unit of product/service • Total energy usage per value added	Total energy consumption for supply chain activities Energy consumed per unit of product produced Total energy consumed in supply chain activities to create added value	Joule/year Kilojoule/kg Kilojoule/$

Adopting Best Practice *Short Term Improvement* *Impact Area; Significant impact expected in health, safety and working environment via safe processes, equipment, practices and working conditions.* *Targets based on improving best practice with the overall objective of re-engineering supply chain activities to integrate sustainable practice (GRI 2016, Glover et al. 2014)*	• Number of unintentional discharges	Total number of accidental discharges	Number /year
	• Number of workplace accidents	Total number of accidents in the workplace leading to injury	Number /year
	• Number of accidental pollution	Total number and type of unintentional emission into the environment and resulting pollution	Number/year Description
	• Number of near-misses	Total number of accidents in the workplace not leading to injury	Number/year
	• Number of prosecutions for non-compliance	The level of compliance with industry regulations and legislation	Number/year Description
	• Number of raised health and safety complaints from local communities	Number and type of pollution related issues raised by local communities around facilities	Number/year Description
Sustainability Reporting *Short Term Improvement* *Impact Area; Significant impact expected in sustainability performance and transparency* *Targets based on improved consideration and integration of sustainability dimensions into NNPC's core corporate strategy with the overall objective of diffusing sustainable practice across supply chain model and reporting transparently (GRI 2016)*	• Public disclosure of sustainability assessments	Public disclosure of environmental and social impact assessments	Number/year Description
	• Percentage of operations conducted with impact assessment	Total percentage of operations conducted with impact assessment on sustainability dimensions	%
	• Number of incidents of violations on local community	Total number of identified incidents of violations on local community in the reporting period	Number/year
	• Management approach to sustainability impact management	Report on the management approach adopted for sustainability impact management	Description

Security for Pipelines and Infrastructure *Short Term Improvement* *Impact Area; Significant potential reduction in oil spill related pollution, infrastructure vandalism and increased availability of products through reduced acts of sabotage* *Targets based on increasing security across NNPC infrastructures with the overall objective of reducing the number of infrastructure destruction and sabotage (Omodanisi, Eludoyin and Salami 2015)*	• Investment into pipeline and infrastructure security	Total investment into pipeline security infrastructure	Monetary unit /Year
	• Number of pipeline vandalism incidences	Total number of pipeline incidences that occurred over the year	Number/Year
	• Number of pipeline vandalism incidences avoided	Total number of pipeline vandalism incidences prevented as a result of better security	Number/Year
	• Percentage of reduction in pipeline incidences	Percentage of reduction in pipeline and infrastructure vandalism from previous years	%
	• Savings from reduction in infrastructure vandalism	Total savings made from reduction in vandalism incidences	Monetary unit /Year
	• Number of prosecutions for pipeline and infrastructure vandalism	Total number of prosecutions for vandalism incidences	Number/Year
	• Percentage of security personnel trained to secure pipeline and infrastructures	Percentage of security personnel with specific formal training in pipeline and infrastructure security	%

Social Improvement Areas	Sustainability Performance Metrics	Information Provided By Metrics	Unit
Stakeholder Engagement *Short Term Improvement* *Impact Area; Significant impact in the assessment, planning and reduction/mitigation of negative effects on surrounding communities (GRI 2016)* *Targets based on avoiding or decreasing negative effects of supply chain activities on stakeholders (local communities) with the overall objective of fostering a cordial relationship with stakeholders and ensuring a safe environment and socio-economic atmosphere (GRI 2016, Azapagic 2004)*	• Number of meetings/consultations with stakeholders	Total number of meetings with local communities regarding company activities and operations	Number/Year
	• Number of stakeholder complaints received	Number of complaints and issues raised by local communities regarding company operations	Number/Year
	• Number of stakeholder grievances addressed	Total number of local community grievances addressed successfully and satisfactorily	Number/Year
Immediate Clean-Up and Compensations *Short Term Improvement* *Impact Area; Significant impact in the reduction/mitigation of negative effects on surrounding communities and improved management of grievances and compensation process* *Targets based on decreasing negative effects of supply chain activities on local communities with the overall objective of effectively managing residual negative impacts and appropriately managing grievances and compensations (GRI 2016, Velva and Ellenbecker 2001)*	• Number of clean-ups conducted	Total number of clean-ups conducted during the reporting period	Number/year
	• Duration of clean-up process	Time span for clean-ups conducted	Days or Months
	• Number of remediation plans that have been implemented	Total number of remediation plans implemented and reviewed via internal review process	Number/year
	• Percentage of incidents that require no further action	Percentage of total pollution incidents that require no further action . Percentage of incidents that have been successfully resolved via clean-ups, remediation, compensation, and so on and requires no further action	%
	• Number of compensation payments made	Total number of compensation and settlement made	Number/year Descriptive

Wealth Creation Programs *Long Term Improvement* *Impact Area; Significant impact in socio-economic development via human-capital development; job creation, skill development, scholarships and community empowerment programmes* *Targets based on improving skills, literacy level and economic independence of surrounding local communities with the overall benefit of reducing poverty, unemployment, illiteracy and lack of social (GRI 2016, Azapagic 2004)*	• Indirect benefit accrued by local communities per unit value added • Direct benefits to local communities per unit value added • Total investment in entrepreneurial programs	Indirect benefit accrued by local communities as a result of company's operations Direct benefits accrued by local communities as a result of company's operations Investment in wealth creation and entrepreneurial programs in local communities	Monetary unit /value added Monetary unit /value added Monetary unit /year
Collaborations with Host Communities *Short Term Improvement* *Impact Area; Significant impact in relationship with local communities and establishing communication and collaboration pathways between NNPC and key interest groups in the surrounding communities* *Targets based on increasing the number of development programmes and partnership schemes between NNPC and surrounding local communities with the overall benefit of improved engagement with communities and socio-economic development (GRI 2016, Azapagic 2004 and Veleva and Ellenbecker 2001)*	• Number of development programs focused on local communities' needs • Collaborations with local communities • Local community involvement in decision making process	Number of company sponsored programs aimed at improving quality of life in local communities Type and scope of collaborative programs and projects with local communities aimed at improving relationship with them Commitment to local community involvement in the decision making process	Number/year Descriptive Descriptive

Sustainability Integration into Corporate Policy *Short Term Improvement* *Impact Area; Significant impact in the restructuring of NNPC supply chain to reflect a sustainability focused value-adding supply process facilitated by corporate policy* *Targets based on the integration of sustainability goals into company policy to ensure the effective adoption and practice of SSCM via a trickle-down process from top management down to lower cadre employees. (GRI 2016, Leug and Radlach 2015)*	• Number of sustainability strategies implemented • Type and scope of organizational policy towards sustainable supply chain • Percentage of revamped supply chain activities to enhance sustainability • Percentage of budget earmarked for sustainability improvement	Number of strategies implemented to enhance sustainability across the supply chain Management approach and policies enacted towards the achievement of a sustainable supply chain Percentage and type of supply chain processes and activities that has been revamped for the achievement of a more positively impacting supply chain Percentage of company's annual budget designated for improving sustainability across the supply chain	Number/year Descriptive Percentage Descriptive Monetary unit /year
Education Awareness Programs *Long Term Improvement* *Impact Area; Significant impact in the reduction of deliberate spill and sabotage of NNPC infrastructures by surrounding communities via improved sustainability awareness and knowledge across surrounding local communities* *Targets based on increasing resource towards or number of education awareness programmes and active stakeholder engagement process focused on sustainability awareness, impacts and improvement (GRI 2016, Silvestre 2015).*	• Investment in educating local communities on safeguarding the environment • Number of awareness programs undertaken • Feedback from local communities on awareness programs	Total investment in creating awareness and a learning platform for local communities on pollution and the importance of safeguarding the environment Total number of awareness and educational programs undertaken Feedback and comments from the public indicating the effectiveness of the program	Monetary unit /year Number/year Descriptive

Personnel Skill Development *Short Term Improvement* *Impact Area; Significant impact in employee skill acquisition, upgrade and self-development through Internally or externally facilitated training programmes as well sabbatical periods of training and pre-retirement plans for intended retirees* *Targets based on increased number of education and training programmes for employees with the objective of enhancing organisational efficiency, creativity and career development (GRI 2016, Veleva and Ellenbecker 2001, Azapagic 2004, Das 2017 and ICheme 2016)*	• Percentage of employees that received career development reviews	Percentage of employees that participated in career and performance reviews during the reporting period	%
	• Number of training hours undertaken by employees	Average hours of training undertaken by employees during the reporting period	Hours/year
	• Number of employees provided with upgraded skills	Number of employees that received career upgrading skills	Number/year
	• Type of skill improvement programs implemented	Type and scope of programs implemented to develop and upgrade employee skills and to manage employee career endings	Description
Health and Safety *Short Term Improvement* *Impact Area; Significant impact in ensuring the health and safety of workers through trainings and health and safety enhancing policies* *Targets based on increased number of occupational health and safety trainings, corporate policies, recording and investigating health and safety related incidents and effectively managing health and safety risks (GRI 2016, ICheme 2016, Azapagic 2004, Das 2017 and Schaltegger and Burritt 2014)*	• Number of fatalities at work	Number of deaths at work	Number/year
	• Percentage of training hours on health and safety	Percentage of training hours on health and safety received by employees relative to the total working hours. Measures the frequency of accidents	%
	• Down-time caused by workplace accidents	Total number of hours lost due to workplace accidents	Hours/year
	• Down-time caused by workplace accidents relative to the total working hours	Percentage of accident related lost-time relative to the total working hours	%
	• Percentage of hours of leave based on safety issues relative to the total working hours	Percentage of sick-leave relative to the total working hours. It is indicative of the frequency and possibility of health and safety issues	%
	• Compensation paid towards occupational disease	Compensation paid towards work related disease and sickness	Monetary unit /year Description

	• Number of employees with occupational disease	Total number of employees recorded with occupational diseases	Number/year Description
Economic Improvement Areas	**Sustainability Performance Metrics**	**Information Provided By Metrics**	**Unit**
Supplier Partnerships *Short Term Improvement* *Impact Area; Significant improvement in supplier relationship to enhance long term partnerships and collaborations with suppliers resulting in sustainability focused equipment design, and process innovation and smooth supply chain efficiency* *Targets based on increased developing supplier partnerships with the overall objective of reducing lead time, improving quality, reducing cost, and supply chain risk management (Ahi and Searcy 2015, Das 2017, Azapagic 2004 and Burritt and Schaltegger 2014)*	• Number of existing supplier partnerships • Supplier risk and reward sharing initiatives • Number of suppliers in the supply chain • Percentage of quality complaints and delivery delays • Percentage of contract terminations	Total number of supplier partnership relationships existent in the supply chain Type and scope of supplier risk and reward sharing initiatives. Includes incentive schemes, performance gates and cost structure Total number of suppliers participating in the supply chain Percentage of complaints and issues related to quality and delivery delays from suppliers Percentage of contract terminations due to non-compliance and irresponsible practices	Number Descriptive Number/year %/year %/year
Increasing Quality *Short Term Improvement* *Impact Area; Significant impact on efficiency and quality of service and product through quality monitoring, product and equipment innovation, continuous improvement and sustainable practices* *Targets based on increased percentage of high quality products produced and value added with the overall benefit of driving business performance (Das 2017, and Burritt and Schaltegger 2014)*	• Percentage yield • Suppliers Quality Incoming • Percentage of customer rejects/returns	The percentage of products produced correctly and meeting specified standards the first time Percentage of high quality materials procured from suppliers Percentage measure of rejects and returns of products due to poor quality or not meeting required specification	% % %

Shorter Lead Times *Short Term Improvement* *Impact Area; Significant impact on market responsiveness, delivery (JIT) and product availability via enhanced inventory management system and optimal local refinery production* *Targets based on increased percentage of product delivery efficiency and refinery production with the overall objective of increased product availability and on-time-delivery (Carter and Rogers 2008, Eboh 2016 and Das 2017)*	• Percentage of orders fulfilled on time	Percentage of total orders fulfilled on schedule	%
	• Percentage of delivery that meets specified requirements	Percentage of total delivery meeting customer's requirement	%
	• Percentage of delivery delays	Percentage measure of delivery delays and late deliveries	%
	• Percentage reduction in delivery delays	Total reduction in number of delays expressed as a percentage	%
	• Percentage of damage free delivery	Percentage measure of deliveries that are damage free and delivered according to quality specification	%
In-Country Manufacturing *Long Term Improvement* *Impact Area; Significant impact on production efficiency, technological advancement and economic development via collaboration with local manufacturing companies and research centres* *Targets based on increased percentage of locally sourced products and services and investment in local manufacturing sector with the overall objective of increasing local manufacturing capacity (Szirmai 2012 and Adenikinju 2005)*	• Percentage of budget earmarked for products and services sourced locally	Percentage of procurement budget assigned to in-country purchases	%/year
	• Number of purchases done in-country	Number of products and services purchased locally	Number/year
	• Percentage of in-country manufactured purchases	Percentage of in-country manufactured equipment, products and services procured during the reporting period	%
	• Investment in in-country manufacturing industry	Investment efforts towards the development of the manufacturing industry to cater for procurement needs of the company. This also covers investment into innovative research in local universities	Monetary unit /year
	• Percentage of in-country manufacturers	Percentage of local manufacturers in the supply chain	**%**

Supplier Sustainability Integration *Short Term Improvement* *Impact Area; Significant impact on sustainability performance and cost savings via supplier involvement in sustainability adoption and management across the supply chain* *Targets based on increased percentage of supplier-sustainability focused improvements with the overall objective of achieving a high performing sustainable supply chain (Carter and Rogers 2008, Rao and Holt 2008)*	• Investment made towards supplier sustainability • Company policy towards supplier sustainability • Screening criteria for suppliers' sustainability practice • Percentage of suppliers screened for environmental, economic and social impact • Type and scope of actual and potential negative impact on the supply chain • Percentage of suppliers that have made improvements in sustainability practice based on assessment	Investment made towards assisting suppliers to embrace sustainable practice Management policy towards suppliers' adoption of sustainable practice Criteria for assessing supplier sustainability practice Percentage of suppliers screened for sustainability impact Actual and potential negative impacts identified in the supply chain Percentage of suppliers that have made significant improvements in sustainability practice based on company's sustainability stance and on their own sustainability management systems	Monetary unit/year Descriptive Descriptive % Descriptive % Descriptive
Capacity Utilization *Short Term Improvement* *Impact Area; Significant impact on product availability and foreign exchange earnings in the country through improved local production of refined products to meet market demand* *Targets based on optimal refinery production and increased refinery index with the overall objective of increased product availability and on-time-delivery (Christopher and Adepoju 2012)*	• Maximum capacity utilised • Opportunity gap • Type and value of capacity underutilization losses	The actual plant output as a ratio of maximum capacity. Provides information on Percentage of plant capacity utilised. This is the gap in capacity utilization which shows the difference in the production capability of a plant and what it actually produces Type and scope of losses occurring and the cost of such losses	% % Descriptive Monetary unit /year

	• Asset utilization program	Company's asset utilization program and policy for effective capacity utilization and value creation	Descriptive
	• Percentage profit increase from reduced 'opportunity gap'	Profit increase as a result of reduction in capacity under-utilization	%
	• Increase in local production	The increase in refined product production as a result of increased refinery capacity utilization	Tonnes/year
Deregulation *Long Term Improvement* *Impact Area; Significant impact on product availability and foreign exchange earnings in the country through privatisation of the sector* *Targets based on increased private sector participation and optimal refinery production with the objective of improved pricing policy, product availability and foreign exchange earnings (Ikein 2016)*	• Percentage reduction in imported refined products	Reduction in refined product importation as a result of increased number of refineries (privately owned local refineries)	%
	• Downstream product pricing policy	Company policy on pricing of refined products, continuous review and improvements undertaken to ensure price fairness, market competition and consumer satisfaction	Descriptive
	• Percentage increase in local refining capacity	Increase in locally refining capacity and products due to increase in the number of privately owned refineries	%
	• Number of participating private companies	Total number of participating private companies in the transportation, storage and refining links of the supply chain	Number/year

Transparency *Short Term Improvement* *Impact Area; Significant impact on development and supply chain efficiency via improved information flow and resource availability and management* *Targets based on increased openness and anticorruption policies with the overall objective of supplier and stakeholder engagement and fairness and decreased resource mismanagement and (GRI 2016, Azapagic 2004, Das 2017 and EglesZanden, Hulthen and Wulff 2015)*	• Company's policy on openness and transparency	Policy on information dissemination to suppliers and local communities	Descriptive
	• Number of trainings given on company's anti-corruption policy	Total number of trainings given to employees (all cadre) on company's anticorruption policies and standards	Number/year
	• Number of prosecutions for corrupt practices	Total number of prosecutions conducted by organisation internally and externally for corrupt practices	Number/year
	• Number and nature of discipline for incidents of corruption in the organisation	Total number of confirmed corruption incidents in the organisation in the recording period and actions taken	Number/year Descriptive
	• Number of contracts with suppliers terminated for corruption	Total number of contracts with suppliers terminated or discontinued by organisation due to violations related to openness and corruption	Number/year Descriptive
	• Number of corruption related legal cases against the organisation and its employees	Total number of corruption related legal cases brought against the organisation or its employees by the public and its outcome	Number/year Descriptive
Diversification /Global Operations *Long Term Improvement* *Impact Area; Significant impact on profits and overall growth of the industry sector through portfolio expansion* *Targets based on increased competitiveness and market expansion (Odumugbo 2010)*	• Return on investment on natural gas project	Profit made from investment into natural gas development and sale	Monetary unit
	• Return on investment on market expansion	Profit made from investment in increasing refining capacity and sale of refined products to neighbouring countries	Monetary unit

Flexible Supplier Base *Long Term Improvement* *Impact Area; Significant impact on efficiency, lead-time, market adaptability, quality and cost via improved supply chain flexibility and resilience* *Targets based on increased number of suppliers, and sourcing flexibility with the overall objective of increased supply chain efficiency and performance (Azapagic 2004, Carter and Rogers 2008, Carter and Easton 2011, Gosling 2010 and Seuring and Muller 2008)*	• Number of suppliers • Percentage of in-country suppliers • Number and type of impromptu sourcing conducted • Duration of equipment sourcing • Total number of production downtime	Total number of suppliers in the supply chain Percentage of local suppliers in comparison to the total suppliers in the supply chain Total number of procurement conducted outside the regular procurement process The average duration of equipment sourcing. This includes how long it takes to source and procure equipment Total Lost production time due to equipment and material unavailability	number % Number/year Descriptive Time unit Number
Adopting Lean and Agile Supply Chain *Long Term Improvement* *Impact Area; Significant impact on production cost and supply chain profitability through elimination of waste and supply chain responsiveness* *Targets based on cost savings made from waste reduction and reduced time-to-market of products with the overall objective of on-time-delivery and cost savings (Carter and Easton 2011 and Seuring and Muller 2008))*	• Company contingency retention policy • Cost reduction from waste elimination • Waiting time in between processes • Delivery speed • Number of product shortage incidences	Company's policy on inventory retention Savings made from eliminating waste and value added Average waiting-time in between processes where a product being produced waits or remains idle after an operation or process Quick response to demand. It is how fast products reach the market to meet demand Total number of product shortage incidences recorded and the geographical region affected	Descriptive Monetary unit Time unit Number/year Descriptive

7.4 Summary

In this chapter, the development of a SSCM framework for the Nigerian downstream oil industry sector, primarily for the NNPC was developed. The chapter began with a brief evaluation of sustainability frameworks in literature. After which a SSCM framework based on analysed and evaluated data from the NNPC was developed. This was followed by an evaluation of proposed measures and its applicability in the adoption of sustainable practice by the NNPC. This was followed by the validation of the framework via discussions and feedbacks from subject experts and NNPC senior executives. The chapter ends with a validated SSCM framework for the achievement of positively impacting supply chain activities and measurement metrics to monitor performance and progress.

8 Conclusion

8.1 Introduction

This chapter is the concluding part of this research work and discusses conclusions drawn from this study. It begins with an overview of the study and tasks undertaken. This is followed by a critical evaluation of the research questions and the answers provided to them. The chapter also discusses the contribution of this research work to knowledge and industry and identifies limitations of the study. These limitations are addressed in Chapter 10.

8.2 Research Overview

Studies into the adoption and implementation of SSCM in the downstream oil sector especially in developing oil countries are still lacking. Also, many studies have identified SSCM drivers and barriers. However, in cases where industry specific studies have been done on SSCM, very limited work has been done on the downstream oil industry and much less in developing countries. This research study set out to investigate variations and similarities in SSCM adoption and implementation in the downstream oil sector of a developing and developed oil producing country. Also another primary goal of this research study is the development of a framework with the potential to enhance SSCM in the downstream supply chain links in a developing oil producing country. Nigeria was selected for analysis in this work.

This study evaluated variations and similarities in SSCM in the downstream sector of two case study countries; a developed and a developing oil producing country respectively and investigated the influence of country's level of development, culture and government policies on SSCM practice. The study focused on a specific product stream (petrol) along the refining and storage downstream supply chain links. This research study is different from previously conducted studies and is therefore novel, as it specifically investigates SSCM in the downstream oil sector of a developing economy and compares SSCM practices between a developed and a developing country with the establishment of a framework for the implementation of a sustainably managed supply chain.

The introductory chapter of this thesis discusses the background and purpose of the research. This led to the establishment of the aims and objectives of this work and the development of a methodology basis for the achievement of the study aims and objectives.

Chapters 2 and 3 reviewed previous literature in the sustainability, supply chain and sustainable supply chain management fields. This involved an exploration of sustainability constructs and theories on SSCM. Chapter 3 speciifically looked at SSCM frameworks in literature and also presents an overview of the downstream oil industry in the case study countries.

A review of literature showed that sustainability is a fast growing integral part of many supply chains as organisations are continually being confronted with the need to minimise and better still mitigate their ecological footprints whilst still improving their economic and social performance (Infante *et al*. 2013, Wolf 2011 and Wu 2013). Hence the birthing of the SSCM concept (Kurnia *et al*. 2014) which is the integration of, and consideration for, sustainability dimensions (economic, social and environment) in supply chain activities (Touboulic and Walker 2015). This growing trend has brought forth the increasing realisation of industry sectors to adopt and implement positively impacting value-adding activities even as they are being scrutinised by the global public (Pies et al. 2010). The oil industry supply chain which plays a significant role in the world economy is not left out as its activities, though value-adding in the provision of energy requirements and petrochemical raw-materials, are still plagued by unsustainable practices (Ketola 2007). Literature on SSCM indicated that organisational adoption of SSCM is motivated by factors ranging from the increasing need to meet customer needs, improving product quality and services, government regulations and accompanying punitive measures, personal and ethical values of business owners and businesses, stakeholder pressures and cost (Daibat and Govindan 2011, Walker et al. 2008 and Yusuf et al. 2012). In the same vein, industry adoption and implementation of SSCM is challenged by factors such as; ineffective information flow, supply chain interaction complexities and stringent laws (Harms 2011). Research studies focused on the oil industry also identified these SSCM drivers and challenges as applicable to the oil industry supply chain.

The oil industry supply chain is made up of the upstream and downstream sector, with the upstream sector being responsible for petroleum forecasting, exploration, production and transportation while the downstream sector is majorly responsible for refining, storage and the final distribution of products to end-users (Briggs, Tolliver and Szmerekovsky 2012). Despite

the importance of both sectors, discussions on sustainability issues however seem to be centred on the upstream sector, while the downstream sector is often discussed in the shadow of the upstream sector, despite the complexities governing both sectors of the oil industry (Enyinda 2011 and Chima 2007).

The nature and sensitivity that characterises petroleum and its derivatives makes its supply chain an important area of investigation particularly as many value-adding activities in the downstream oil sector have the tendency to cause detrimental effects on the three dimensions of sustainability. These impacts are more pronounced in developing countries due to non-availability of basic amenities, poorly structured and monitored systems, ineffective and poorly regulated laws and other socio-economic problems. Continued review of literature showed that there was a gap in knowledge in the downstream oil industry SSCM practice, especially in developing countries.

Chapter 4 examined various research methodologies, philosophies, and strategies available. It presented a justification for the research method adopted for the achievement of the aim and objectives of this research study. The chapter also presents the data collection process. It maps out the collection of data via the use of the mixed (quantitative and qualitative) data collection methods (mixed method) through interviews and survey administration.

The analysis and evaluation of collected data is presented in chapters 5 and 6 respectively.

A discussion of findings from the study is presented in chapter 7 and the development and validation of a SSCM framework for the Nigerian downstream oil industry is presented.
Chapter 8 establishes the achievement of the aim and objectives of this research study.

8.3 Purpose of the Study and Research Questions

The oil industry's supply chain over the years has contributed to, as well as had detrimental effects on, the environment, standard of living and the social life of people. This is because supply chain activities from the upstream, i.e. exploration and production, then onto the downstream, i.e. refining, storage and distribution, have been known culprits of unsafe operations and environmental pollution, political unrest, depletion of resources as well as a

source of high energy and transportation cost, problems with stakeholders and other secondary effects, thus impacting all three sustainability dimensions. This effect is even more pronounced in a developing country like Nigeria where other socio-economic problems which are often blamed on the country's level of development make it difficult for organizations to focus on sustainable supply chain practice.

Many studies have looked at the upstream oil industry practice of SSCM with very little attention paid to the downstream sector. Likewise, many of these studies have focused on SSCM in developed countries. The downstream oil industry, by virtue of its value-adding activities, has been blamed for many accidents and disasters caused by some of its unsustainable and unsafe practices. This tends to be more pronounced in developing oil producing countries where such incidences are regular occurrences and are a characteristic of the industry sector as is seen in a developing country like Nigeria where there have been incidences including pipeline explosions, oil spills, and stakeholder issues. Such incidences are usually one-offs and not common in the downstream sector of a developed country such as the United Kingdom, and when such an incident occurs, it is usually managed such that the impact on sustainability dimensions is minimised whilst also putting in place measures to deter a future occurrence. Studies have shown that developed countries tend to be more informed in sustainability practice compared to their developing counterpart. Such incidences in Nigeria, a developing country, have and will continue to have, detrimental and negative effects on sustainability dimensions and is already costing the downstream sector of the country financial, material, human and environmental resources. These losses are additional problems to the poor economic state of the country and requires a re-evaluation of the sector in order to implement necessary changes capable of improving the sector performance and positively impacting sustainability dimensions.

As a starting point to adopting and improving SSCM in a developing country like Nigeria, it is beneficial to understand what its developed counterpart is doing differently and what similarities are there that can be improved upon for noticeably enhanced performance. There is therefore a need to investigate variations and similarities as well as drivers and barriers to SSCM in the downstream sector of a developed and developing oil producing country with the

aim of understanding the current supply chain practice and the influence of a country's level of development on the adoption and implementation of SSCM. There is currently no research in this area as little attention has been given to SSCM in the downstream oil industry in the case study country and specifically the influence of the country's level of development, on the adoption and implementation of high performing SSCM. Based on the foregoing, the purpose of this research study was to investigate variations and similarities in SSCM practice in a developing and developed country and the development and validation of a SSCM framework with the potential of enhancing the level of sustainability in the downstream oil industry.

The research aim for this study is therefore to critically evaluate the variations in SSCM in the downstream activities of the oil industry and to develop a framework that will have the potential to enhance the levels of sustainability in the downstream oil industry.
The aforementioned research aims were to be achieved based on the following three objectives:

a) The investigation of variations and similarities in SSCM in the downstream sector of the oil industry in developed and developing regions/countries with specific emphasis on a product stream along the refining and distribution links of the supply chain.
b) The identification of the drivers and barriers of SSCM practice in the downstream oil industry in developing and developed oil producing regions/countries.
c) The development and validation of a framework to help evaluate and analyse the oil industry's downstream SSCM efforts in developing and developed regions.

Also three research questions were identified in this study based on the research aims and objectives and these are listed below:

1. What sustainability measures are deployed by the downstream oil industry – Nigeria and UK?
2. What is the influence of Nigeria's level of development on achieving effective downstream SSCM?
3. What are the drivers and barriers to SSCM in the Nigerian and UK oil industry and how do these impact SSCM in these countries?

8.4 Research Design and Methodology

An inductive approach was adopted in this research study and a mixed research strategy was employed in order to provide answers to the research questions for this work. The mixed method involves the use of both quantitative and qualitative data collection techniques. The use of the quantitative research technique was to complement the qualitative techniques being adopted in this work to ensure that detailed and information-rich data is obtained. Questionnaires and interviews were adopted as research instruments for the collection of quantitative and qualitative data respectively. These instruments were validated prior to them being used and administered as the case may be. In this study, a stakeholder prioritisation and selection was conducted in order to adequately select stakeholders based on their importance and impact on the research aim. Based on this, the selection of NNPC employees, Department of Petroleum Resources (DPR), suppliers, Nigerian government, and local communities emerged as important stakeholders.

Interviews were employed for collecting data from the supply chain and from sustainability managers in the state owned NNPC which is responsible for the downstream oil industry activities for the product stream and supply chain links being investigated, from DPR executives and from suppliers, while questionnaires were adopted for collecting data from local communities situated around NNPC downstream infrastructure and the downstream oil industry.

For the qualitatively collected data, a semi-structured interview type was adopted. The interview questions were in three parts and the sections covered were; general organisational sustainability practice, SSCM effort towards the environmental dimension, and effort towards socio-economic dimension. These questions were aimed at specifically measuring SSCM practice and the influence of a country's level of development on SSCM. Similarly, the questionnaire for the quantitative data collection was designed to elucidate the influence of the downstream oil sector supply chain on the local communities around its infrastructure and to evaluate accrued benefits if there were any. To ensure reliability and validity, drafts of the interview questions and questionnaire was sent to research instrument experts and SSCM

experts for evaluation and feedback. Suggestions from this exercise were inputted and the 2nd draft evolved which was employed in the pilot test.

Data for the UK case-study country was obtained from secondary sources. A detailed review and evaluation of data from secondary sources such as published government and regulatory sources, oil companies, oil industry trade associations and books and journals focused on the UK oil industry.

Two questionnaire sets were designed for this purpose and these were specifically to collect data from downstream oil industry supply chain links in addition to the data collected from interviews and for collecting data from local communities around downstream infrastructures. A total of 85 questionnaires were completed of which 79 were deemed useful. Also a total of 13 interviews lasting between forty-five minutes to two hours were conducted and the participants interviewed were senior managers across NNPC refineries, distribution centres, DPR and suppliers. The qualitative and quantitative data were analysed using the NVivo 10 and SPSS software respectively.

Analysed data showed variations and similarities in SSCM practice in the case study countries. It also showed different drivers and barriers to SSCM between the case study countries.

8.5 Answers to Research Questions

As stated earlier, the purpose of this research study was to understand the variations in SSCM practice in the downstream oil supply chain between a developed and a developing case study countries and to develop and validate a SSCM enhancing framework. Three research questions were identified in this study and these guided the research process for this study. Answers were provided for these questions via interview responses and survey by questionnaire. The research questions and their corresponding answers are provided below:

8.5.1 What Sustainability Measures are Deployed by the Downstream Oil Industry in the Two Case-Study Countries?

Sustainability takes into consideration the inter-relationships existing across environmental, social and economic systems and for sustainably managed supply chains to be implemented, it is necessary to integrate sustainability measures for the achievement of a high performing and

positively impacting supply chain. This realization and mind-set has already led to significant changes and improvements in the UK downstream oil industry, as analysed data shows that various sustainability measures are already in place and the focus now is targeted on improvement changes rather than adoption. Hence, the emphasis is on implementation strategies and progress measurements that can lead to remarkable improvements across the supply chain. Also, a proactive rather than a reactive stance is being adopted in the UK oil downstream and this has minimized the occurrence of unanticipated incidences that may negatively impact the supply chain. The UK downstream oil sector can be described as an established and ardent adopter of SSCM as the sector is strategically tuned towards the adoption of sustainability adopting measures. This has led to visible improvements in supply chain activities and has also become "part and parcel" of the industry sector. Empirical findings of sustainability measures being adopted and implemented in the UK refining and storage supply chain links are; CSR, climate change, safety improvements, HSE policies, stakeholder management, conformance to standards, low carbon agenda, cleaner fuels and best practice.

Similar to the UK, the Nigerian downstream oil industry already has in place some measures even though some of these are basically adopted as part of the TQM and HSE policies of the organisation. The sustainability measures already being implemented by the NNPC downstream as depicted in table 6.1 are: reducing air emissions /pollution, efficient waste management, decreased frequency of environmental spills and hazards, safe working conditions for employees, development of host community, stakeholder engagement, increased economic input to infrastructural development, reduction in energy use, reduced workplace accidents, employee education and skills development, reduction in pipeline accidents, satisfying stakeholders,, increased focus on customer satisfaction, and compliance to safety standards. Findings show that these supply chain enhancing practices adopted by the NNPC downstream stem from the organization's growing need to avoid stakeholder problems which seem to characterise the entire oil supply chain, compliance to industry regulations and standards and the achievement of economic benefits. Findings also show that, in contrast to its UK counterpart, a reactive stance is being adopted in the Nigerian downstream and despite efforts to reduce the impact of some of its supply chain activities, not much progress has being made in this regard.

Comparing the UK and Nigerian downstream supply chain links being investigated as shown in table 6.2, the number of sustainability measures being adopted in the UK far outnumber that of Nigeria as only five of the ten UK implemented measures are being adopted in the country's industry sector. Sustainability measures such as climate change, safety improvements, low carbon agenda, cleaner fuel and collaboration with suppliers were missing in the Nigerian downstream while these are practised measures in the UK downstream.

This study has shown that the downstream oil industry in Nigeria like its counterpart in developed case study country, has in place some sustainability measures. However, there are variations in the measures adopted as the Nigerian downstream oil sector is still behind in the adoption of some of the measures already in place in the UK downstream sector. Also, from these empirical findings, it can be deduced that a proactive and reactive sustainability stance is being adopted in the UK and Nigerian refining and storage supply chain links respectively. This difference in the type of sustainability being practiced in the case study countries may be responsible for the variation in performance, as progressive organisations tend to adopt a forward thinking position that includes the integration of preventative measures and the alienation of negatively impacting processes in order to ensure that continuous and innovative progress is made in supply chain sustainability.

8.5.2 What are the Drivers and Barriers to SSCM in the Nigerian and UK Oil Industry?

SSCM drivers can be described as motivators for SSCM adoption while barriers are challenges that hinder or prevent the adoption of SSCM. Various drivers and barriers to SSCM has been identified in literature. This research proposed to find drivers and barriers to SSCM in the case-study countries. These drivers and barriers are presented in figure 6.1 and 6.2 respectively. Empirical findings showed three SSCM drivers in the NNPC downstream and these drivers are: conformance to standards, sustainable profit, and the NNPC value system. In the UK, six SSCM drivers emanated and these are: conformance to standards, sustainable profit, gaining a competitive advantage, company image, cost reductions and supply chain integration. With these findings, SSCM is internally motivated by the sustainable profits and hence economic sustainability. Similarly, barriers to SSCM adoption in the case-study countries varied as many of the problems in the developing country (Nigeria), are socio-economic problems that characterise developing countries. SSCM challenges identified are;

change management capability, sustainability awareness, lack of personnel training, minimum compliance, lack of basic infrastructures, poor maintenance culture, ageing refineries, supplier confidence in the system, infrastructure vandalisation and stakeholder issues. These barriers can be attributed to the current developmental level in the country and thus are country-specific. In Nigeria, seven impact factors were observable and these are; product transportation problems, product scarcity, production interruption, environmental contamination, revenue loss, operational losses and loss of consumer confidence.

In contrast to the SSCM barrier types facing the Nigerian oil downstream sector, the UK is faced with challenges edging towards the economical sustainability of the sector. SSCM challenges in the UK emerging from this study are: excess capacity, market shift, high business risk, and cost of implementing sustainability. These challenges have led to four impact factors and these are; refinery closures, loss of profit margin, loss of competitive edge and further dependence on importation of petroleum and its products.

This research study is different from past work in that country specific drivers and barriers to SSCM in the downstream oil industry emanated from this work. Empirical findings on the SSCM drivers and challenges in the Nigerian downstream oil industry for the supply chain links understudy are novel and to the author's knowledge, are not reported in any literature.

8.5.3 What is the Influence of Nigeria's Level of Development on Achieving Effective Downstream SSCM?

A country's level of development can influence the achievement of a high performance supply chain. Findings from this research study show that the current developmental level of the case-study countries is crucial to SSCM adoption and implementation. While the UK benefits from a structured regulatory system, economic stability, environmental awareness and social prosperity; all characteristics of a developed economy, Nigeria is still far off from these benefits. The absence of these aforementioned attributes of a developed economy is evident in supply chain practices in the Nigeria. This by extension, inadvertently influences the adoption and practise of SSCM in the downstream oil industry. Empirical findings from this study shows low in-country manufacturing, lack of social amenities, slow momentum towards change, pipeline vandalism, minimum standard requirement, differing literacy levels,

government policies and lack of transparency are the areas influenced by Nigeria's current developmental level.

The importance of this finding is that there is a better understanding of the militating country-specific factors attributable to a country's level of development that come into play in SSCM adoption and practice. The fact that developed economies like the UK have made progress with regards to SSCM in the supply chain links understudy attests to the fact that progress towards SSCM is a possibility. However country-specific factors have to be taken into consideration when SSCM frameworks are being designed and measures introduced. This finding indicates that it will take some time before consistent progress can be made in SSCM adoption and implementation in a developing country like Nigeria in comparison to the UK downstream sector. However, taking small steps towards restrategising the supply chain to allow for sustainability integration via the adoption of the proposed framework from this work will make progress towards the sustainability-focused supply chain.

8.6 Achievement of Research Aim and Objectives

Objective a) (the investigation of variations and similarities in SSCM in the downstream sector of the oil industry in developed and developing regions/countries with specific emphasis on a product stream along the refining and distribution links of the supply chain) was satisfied in Chapter 6 of this research thesis, specifically in section 6.5 where sustainability measures employed in the case-study countries were considered.

Objective b) (Identifying the drivers and barriers of SSCM practice in the downstream oil industry in developing and developed oil producing regions/countries) was achieved in chapter 6 of this thesis, specifically in sections 6.6 and 6.7 where the drivers and barriers were considered.

Objective c) (the development and validation of a framework to evaluate and improve the oil industry's downstream SSCM efforts in a developing region) was achieved in chapter 7 of this research thesis. The development of the framework in section 7.2 was informed by an evaluation of frameworks from past research research (section 3.2), the current state of the Nigerian downstream oil industry alongside reviewed literature in chapter 2.

In section 7.3, version one of the framework was developed alongside improvement areas for all three sustainability dimensions. This framework was revised in the validation stage following feedback from subject experts and led to a revised version two in section 7.3. This was subsequently refined in section 7.3.1 to yield the final version of the framework following interviews with senior executives of the NNPC on the feasibility, adaptability, completeness and cost acceptability of the framework.

8.7 Contribution to Knowledge

In a world with continuing emphasis on sustainable operations and services, supply chains are the first point of call in sustainability discussions and the oil sector seems to be the most talked about. The downstream oil sector is therefore included in the sustainability equation. This research examines SSCM practice in a developed and a developing country. The research aims to critically evaluate the variations in SSCM in the downstream activities of the oil industry and to develop a framework that could be used to enhance the level of sustainability in the oil industry. This represents a new area of work. It is an extension to the sustainability field of knowledge in the oil industry as no work has been done in this specific area at the moment. The contributions of this research thesis to the body of knowledge are identified below:

8.7.1 The reviewed literature in chapter 2 of this thesis shows that there are still unsustainable practices as well as unclear variations in SSCM practice in the downstream oil sector despite the growing popularity of a sustainably managed supply chain in the oil industry and the allegiance of the industry to safe operations and processes. This work adds to the body of knowledge in SSCM especially in the downstream oil sector as most research study on the oil sector is usually focused on the upstream supply chain link.

This research thesis is novel as it delves in-depth into downstream activities for the refining and storage supply chain links and brings to light an aspect of the oil supply chain that is often overlooked in the context of sustainability practices.

8.7.2 Many research studies on SSCM in the oil industry are generic and often focused on developed countries. Thus, SSCM measures proposed are usually generic and suited for a developed economy. Also, instances where developed countries have been evaluated in the context of SSCM, the emphasis has been on the upstream sector and even at that, many of the

proposed SSCM measures have been generically developed and not country-specific. Thus, these measures are not often channelled to proffer solutions to country-specific challenges that often differentiate developing and developed countries, and the types of social problems that characterises them. An important and novel contribution of this work to existing SSCM theory is that, it demonstrates that a country's developmental level does not only influence SSCM adoption, but it also to a large extent dictates the type and prioritisation of SSCM measures.

8.7.3 An important contribution of this research study is enumerating drivers and barriers to SSCM practice in the downstream oil industry. These drivers and barriers are specific to the case study countries and are particularly responsible for the motivation and inhibition to SSCM in these countries. This knowledge is novel and is essential for SSCM implementation as it makes it possible to identify improvement areas for the achievement of a high performing supply chain.

8.7.4 Also, this work is one of the few studies to have specifically evaluated and compared SSCM practice in a developing and a developed oil producing country with the aim of investigating variations for the purpose of developing a framework best suited for the challenges specific to the case-study country. It also clarifies the reasons for variations in the SSCM practice in the case study countries.

8.7.5 The major and novel contribution of this study is the development and validation of a SSCM framework specific to the Nigerian downstream oil industry for the refining and storage supply chain links. This framework is designed to help improve the industry's sustainability performance across all dimensions of sustainability.

8.8 Contribution to Industry

The practical contributions of this study are many folds. Results from this study have shown that there are country-specific challenges and drivers in the downstream oil industry in the context of SSCM adoption and implementation. Identifying these challenges and drivers is crucial to safeguarding supply chain processes as well as driving downstream oil sector value adding activities towards a profitable and competitive terrain.

Also, results from this study have shown that a country's level of development influences SSCM adoption and implementation. Knowledge of this influence is especially beneficial to the industry sector in understanding how SSCM efforts can be reengineered for improved economic, social and environmental performance. Also this awareness of the link between a country's developmental level and SSCM practice is important in the case study country; Nigeria. This is because it sheds light on the limits of the industry sector's capabilities in managing some of its supply chain related socio-economic impact. This contribution to industry is beneficial to the NNPC's image improvement and perception by the general public. Another novel contribution is the SSCM-enhancing stakeholder classification presented in this study for the Nigerian downstream oil sector. This classification is country specific and enumerates and prioritises the downstream stakeholders specifically for SSCM improvement by assisting decision makers in the industry identify and develop a management plan that aligns supply chain activities and sustainability dimensions with the goal of mitigating stakeholder related feud, conflicts and financial losses.

A major contribution of this research study to the downstream oil sector and the oil industry in general is the SSCM framework developed in this work. This framework is specifically designed for the Nigerian downstream oil industry. The successful adoption and implementation of this framework alongside proposed measures will enhance the development of a comprehensive sustainable strategy that would enhance competitive advantage as well as improve industry-stakeholder relations. Financially, this would reduce operational losses, downtime, compensation and clean-up costs and other losses associated with sustainability issues in general.

The value of the framework could be demonstrated through a pilot study initially, and then rolled out progressively across the downstream supply chain. This is change, and so resistance may be encountered. This could be overcome, by encouraging very senior NNPC staff to be enthusiastic stakeholders in the activity.

8.9 Research Limitations and Recommendations for Further Research

Despite the benefits and the additional knowledge to the SSCM field, this study has a number of limitations. Study findings and results are based on data collected from a state owned

organization and a small group of respondents and sample size. This limits the generalizability of the study findings especially in the application of the framework for private organizations as these may result in different SSCM adoption and implementation strategies.

Also, there is a limitation in the degree of generalization in the context of a country's level of development as the study is country specific and focuses mainly on a developing country. In spite of the many similarities existing amongst developing countries across the world, they are also characterized by many differences and challenges. A typical example is the pipeline vandalisation problem in the Nigerian oil industry which to the author's knowledge is not reported in some other developing oil producing countries like Cameroun. Hence further studies may be required prior to the framework been adopted in other developing oil producing countries.

Also, this research study only focused on specific links of the downstream oil supply chain and did not investigate the entirety of the chain; from upstream to downstream nor the entire downstream supply chain. Thus relationships across the chain and impacts of other supply chain links were not considered in the framework design. As a recommendation, an analysis of supply chain relationships and impacts with detailed focus on all sectors of the chain in the context of SSCM adoption and implementation in developing oil producing countries is proposed for future research.

A final limitation in this research study was the use of secondary data for the UK case-study country and for comparison with collected Nigerian primary data. This may influence results obtained from the comparison as it limits the possibility of verbatim comparison. It is recommended that future comparative research study on SSCM adoption in developing and developed economies make use of primary data. Also, only two case study countries were focused upon in this study, thus leaving open researchable gaps for future studies.

8.10 Summary

This research work is novel as it has evaluated a new area of study, thus contributing to knowledge and industry. It focused on the downstream oil industry which is often overlooked in favour of its upstream counterpart. It also investigated SSCM in the context of country-

specific factors. Two case-study countries were evaluated, a developed and developing country for comparative study.

This work has made a beneficial contribution to the SSCM field and specifically to the industry through the evaluation of variations in the downstream oil sector supply chain and the development of a framework for the enhancement of SSCM in the Nigerian downstream oil sector.

The aim, objectives and research questions have all been delivered, and the author is confident that successful progressive application of the framework in the Nigerian downstream oil sector will help deliver improvements in SSCM.

REFERENCES

Abila, N. (2012) 'Biofuels Development and Adoption in Nigeria: Synthesis of Drivers, Incentives and Enablers'. *Energy Policy* 43, 387-395

Aboelmaged, M.G. and Ahmed, I.E.S. (2015) 'Adoption of Supply Chain Sustainability in Developing Countries: An Empirical Investigation'. in *Handbook of Research on Business Ethics and Corporate Responsibilities*. ed. by Palmer, D.E., IGI Global, 420-430

Abowitz, D. and Toole, T. (2010) 'Mixed Method Research: Fundamental Issues of Design, Validity, and Reliability in Construction Research'. *J. Const. Eng. Manage.* 136 (1), 108-116

Abu, N.I. (2016) 'The Influence of Deregulation and Privatisation of the Upstream and Downstream Oil and Gas Industry Promote national Sustainable Development in Nigeria'. *Journal of Emerging Trends in Economics and Management Sciences* 7 (3), 170-174

Achugbue, E.I. and Anie, S.O. (2011) 'ICTS and Information Needs of Rural Female Farmers in Delta State, Nigeria'. *Library Philosophy and Practice* [online] 118. available from http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1466&context=libphilprac> [16 July 2014]

Acquaye, A., Genovese, A., Barrett, J. and Koh, S.C.L. (2014) 'Benchmarking Carbon Emissions Performance in Supply Chains'. *Supply Chain Management An International Journal* 19 (3), 307-323

Adams, C.A. and McNicholas, P. (2006) 'Making a Difference: Sustainability Reporting, Accountability and Organisational Change'. *Accounting, Auditing & Accountability Journal* 20 (3), 382-402

Adebayo, A.A. (2013) 'Youths' Unemployment and Crime in Nigeria: A Nexus and Implications for National Development'. *International Journal of Sociology and Anthropology* 5 (8), 350-357

Adegoroye, A. (1994) *The Challenges of Environmental Enforcement in Africa: The Nigerian Experience'. Third Inter Regulations for Downstream Petroleum Industry Operations in Nigeria: Problems and Prospects*. 'Proceedings of the Third International Conference on Environmental Enforcement'. held at Oaxaca, Mexico

Adelabu, N.S. (2012) 'The Political Economy of Oil Deregulation in Nigeria's Fourth Republic: Prospects and Challenges'. *Journal of Emerging Trends in Educational Research and Policy Studios* 3 (3), 193-198

Adenikinju, A. F. (2005) 'Analysis of the cost of infrastructure failures in a developing economy: The case of the electricity sector in Nigeria'. *African Economic Research Consortium* 148, 1-44

Adenikinju, A.F. (2005) 'Productivity Performance in Developing Countries. Country Case Studies: Nigeria'. *United Nations Industrial Development Organisation*

Adenikinju, A.F. and Falobi, N. (2006) 'Macroeconomic and Distributional Consequences of Energy Shock in Nigeria'. *African Economic Research Consortium* 162

Adeoye, O.A. and Wissink, H. (2017) 'Public Sector Performance in the Nigerian Downstream Oil Sector: A Critical Reflection'. *Journal of Asian and African Studies* 1-15

Agus, A. and Shukri H. M. (2012) 'Lean Production Supply Chain Management as Driver Towards Enhancing Product Quality and Business Performance: Case Study of Manufacturing Companies in Malaysia'. *International Journal of Quality & Reliability Management 29*(1), 92-121.

Ahi, P. and Searcy, C. (2013) 'A Comparative Literature Analysis of Definitions for Green and Sustainable Supply Chain Management'. *Journal of Cleaner Production* 52, 329-341

Ahmad, W.N.K.W., Rezaei, J., Tavasszy, L.A. and de Brito, M.P. (2016) 'Commitment to and Preparedness for Sustainable Supply Chain Management in the Oil and Gas Industry'. *Journal of Environmental Management 180,* 202-213.

Aigbedion, I. and Iyayi, S.E. (2010) 'Diversifying Nigeria's Petroleum Industry'. *International Journal of Physical Sciences* 2 (10), 263-270

Akpoghomeh, O. S. and Badejo, D. (2006) 'Petroleum Product Scarcity: A Review of the Supply and Distribution of Petroleum Products in Nigeria. *OPEC Review* 30(1), 27-40.

Akpoghomeh, O.S. and Badejo, D. (2006) 'Petroleum Product Scarcity: A Review of the Supply and Distribution of Petroleum Products in Nigeria'. *OPEC Review: Energy Economics & Related Issues* 30 (1), 27-40

Al Zarooni, M. and Elshorbagy, W. (2006) 'Characterization and Assessment of Al Ruwais Refinery Wastewater'. *Journal of Hazardous Materials* 136 (3), 398-405.

Al-Odeh, M. and Smallwood, J. (2012) 'Sustainable Supply Chain Management: Literature Review, Trends and Framework'. *International Journal of Computational Engineering & Management* 15 (1), 85-90

Al-Othman, W.B.E., Lababidi, H.M.S., Alatiq, I.M. and Shayji, K.A. (2008) 'Supply Chain Optimization of Petroleum Organizations Under Uncertainty in Market Demands and Prices'. *European Journal of Operational Research* 189 (3), 822-840

Aldrick, P. (2013) 'UK Reclaims Sixth Largest Economy Slot'. *The Telegraph* [online] available from <http://www.telegraph.co.uk/finance/economics/9764781/UK-r reclaims-sixth-largest-economy-slot.html> [11 December 2013]

ALP-Akindelano Legal Practitioners (2016) Review of Nigeria's Local Content Legislation [online] available from <www.akindelano.com/dl/OD-Local Content Act.pdf> [17 March 2016]

Aluko, M.A.O. (2002) 'The Institutionalization of Corruption and Its Impact on Political Culture and Behaviour in Nigeria'. *Nordic Journal of African Studies* 11 (3), 393-402

Amaral, S.P. and La Rovere, E.L. (2003) 'Indicators to Evaluate Environmental, Social and Economic Sustainability: A Proposal for the Brazilian Oil Industry'. *Oil and Gas Journal* 101 (19), 30-35

Ambitunni, A., Amezaga, J. and Emeseh, E. (2014) 'Analysis of Safety and Environmental Regulations for Downstream Petroleum Industry Operations in Nigeria: Problems and Prospects'. *Environmental Development* 9, 43-60

Ameen, R.F.M. and Mourshed, M. (2016) '*Environmental, Social and Economic Challenges for Urban Development: Stakeholder's Perception in a Developing Economy*.' Proceedings of the 16th International Conference on Computing in Civil and Building Engineering

Amini, M. and Bienstock, C.C. (2014) 'Corporate Sustainability: An Integrative Definition and Framework to Evaluate Corporate Practice and Guide Academic Research'. *Journal of Cleaner Production* 76, 12-19

Aminu, S.A. and Olayinka, K.A. (2014) 'Achieving Petrol Conservation through Higher Pump Price in Nigeria: Evidence from the Transport Sector of Lagos State'. International Journal of Management Sciences and Humanities 2 (2), 102-122

Aminu, S.A. and Olusegun, P.O. (2014) 'Empirical Investigation of Challenges of Distribution of Premium Motor Spirit (PMS) in Federal Capital Territory (FCT), Abuja and Environs, Nigeria'. International Journal of Management Sciences and Humanities 2 (2), 11-38

Andersen, J.P., Prause, J. and Silver, R.C. (2011) 'A Step-by-Step Guide to Using Secondary Data for Psychological Research'. *Social and Personality Psychology Compass* 5 (1), 56-75

Anderson, C.L. and Bieniaszewska, R.L. (2005) 'The Role of Corporate Social Responsibility in an Oil Company's Expansion into New Territories'. *Corporate Social Responsibility and Environmental Management* 12, 1-9

Anifowoshe, B., Lawler, D.M. and Lee Chapman, D. (2012) 'Attacks on Oil Transport Pipelines in Nigeria: A Quantitative Exploration and Possible Explanation of Observed Patterns'. *Applied Geography* 32 (2), 636-651

Antara, M. (2012) *Crude Oil and What It Is Used For*. [7 February 2012] available from < http://blog.majuantara.com.my/2012/02/what-is-crude-oil-and-what-is-used-for.html> [28 May 2014]

Anyanwu, J.C and Erhijakpor, A.E.O. (2013) 'Does Oil Wealth Affect Democracy in Africa?'. *African Development Bank Group Working Paper Series* (184)

Aragon-Correa, J.A., Hurtado-Torres, N., Sharma, S. and Garcia-Morales, V.J. (2008) 'Environmental Strategy and Performance in Small Firms: A Resource-Based Perspective'. *Journal of Environmental Management* 86 (1), 88-103

Arezki, R. and Blanchard, O. (2014) *Seven Questions About the Recent Oil Price Slump*. [online] available from http://arabenergyclub.com/site/wp-content/uploads/2015/02/Seven-Questions-about-the-Recent-Oil-Price-1.pdf [01 July 2016]

Arminas, D. (2004) 'Steel Yourself for Price Increases'. *Supply Management* 9 (25), 14

Arnold, E. (2006) Alaska Oil Spill [online] available from http://www.npr.org/templates/story/story.php?storyId=5411425 [12 August 2015]

Arong, F.E. and Ikechukwu, E.M. (2013) 'The Perception of Nigerians on the Deregulation and Privatisation Moves of the Government in the Oil and Gas Industry In Nigeria'. *International Journal of Public Administration Research* 2 (1), 119-230

Aronson, J. (1995) 'A Pragmatic View of Thematic Analysis'. *The Qualitative Report* 2 (1), 1-3

Asaolu, T.O., Agboola, A.A., Ayoola, T.J. and Salawu, M.K. (2011) 'Sustainability Reporting in the Nigerian Oil and gas Sector'. Proceedings of the Environmental Management Conference

Asif, M. and Muneer, T. (2007) 'Energy Supply, Its Demand and Security Issues for Developed and Emerging Economies'. *Renewable and Sustainable Energy Reviews* 11 (7), 1388-1413

Atkinson, A.B. and Brandolini, A. (2000) 'Promise and Pitfalls in the Use of "Secondary" Data-Sets: Income Inequality in OECD Countries'. Bank of Italy, Research Department

Atkinson, P. and Hammersley, M. (1994) "Ethnography and Participant Observation". *Handbook of Qualitative Research* 1 (23), 248-261

Ayadi, O.F. (2005) 'Oil Price Fluctuations and the Nigerian Economy'. *OPEC Review* 29 (3), 199-217

Ayres, R.U., Van den Berrgh, C.J.M. and Gowdy, J.M. (1998) 'Viewpoint: Weak Versus Strong Sustainability'. *Tinbergen Institute Discussion Paper* 3, 98-103

Ayres, R.U., Van den Berrgh, C.J.M. and Gowdy, J.M. (2001) 'Strong Versus Weak Sustainability: Economics, Natural Sciences, and Consilience'. *Environmental Ethics* 23 (2), 155-168

Azapagic, A. (2003) 'Systems Approach to Corporate Sustainability- A General Management Framework'. *Trans IChemE* 81, 303-316

Azapagic, A. (2004) 'Developing a Framework for Sustainable Development Indicators for the Mining and Minerals Industry'. *Journal of Cleaner Production* 12 (6), 639-662

Azapagic, A. and Perdan, S. (2000) 'Indicators of Sustainable Development for Industry'. *Trans IChemE* 78, 243-261

Azevedo, S.G. (2011) 'The Influence of Green Practices on Supply Chain Performance: A Case Study Approach'. *Transportation Research Part E* 47, 850-871

Bai, C. and Sarkis, J. (2013) 'Flexibility in Reverse Logistics: A Framework and Evaluation Approach'. *Journal of Cleaner Production* 47, 306-318

Balouga, J. (2012) 'Nigerian Local Content: Challenges and Prospects'. International Association for Energy Economics 6 (3), 23-26

Balouga, J. (2012) 'The Political Economy of Oil Subsidy in Nigeria'. International Association for Energy Economics

Barclay, S., Todd, C., Finlay, I., Grande, G. and Wyatt, P. (2002) 'Not Another Questionnaire! Maximizing the Response Rate, Predicting Non-Response and Assessing Non-Response Bias in Postal Questionnaire Studies of GPs'. *Family Practice* 19 (1), 105-111

Barney, J.B. and Arikan, A.M. (2001) 'The Resource-Based View: Origins and Implications'. Handbook of Strategic Management 124188 [online] available from https://scholar.google.co.uk/scholar?hl=en&q=What+is+the+the resource+based+voew&btnG=&as_sdt=1%2C5&as_sdtp [09 June 2016]

Barriball, K.L. and While, A. (1994) 'Collecting Data Using a Semi-structured Interview: A Discussion Paper'. Journal of Advanced Nursing 19, 318-335

Basit, T.N. (2003) 'Manual or Electronic? The Role of Coding in Qualitative Data Analysis'. *Educational Research* 45 (2), 143-154

Bazilian, M. and Onyeji, I. (2012) 'Fossil Fuel Subsidy Removal and Inadequate Public Power Supply: Implications for Businesses'. *Energy Policy* 45, 1-5

BBC (2014) *British History* [online] available from < http://www.bbc.co.uk/history/british/victorians/> [22 October 2014]

Becker, T.E. (1992) 'Foci and Bases of Commitment: Are They Distinctions Worth Making'. *Academy of Management Journal* 35 (1), 232-244

Beddoes, C. (2014) *The Competitiveness of European Refining: Facing the Challenges* [online] available from <https://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3376158/0633975ADCAE7B9CE053C92FA8C06338.PDF> [28 June 2016]

Bello, K.O. and Idigbe, K.I. (2013) 'Re-Engineering the Downstream Sector of the Petroleum Industry in Nigeria: The Role of the Upstream Sector'. *Journal of Emerging Trends and Applied Sciences* 4 (4), 667-671.

Bentley, R.W. (2002) 'Viewpoint – Global Oil & Gas Depletion: An Overview'. *Energy Policy* 30, 189-205

Bentley, R.W., Mannan, S.A. and Wheeler, S.J. (2007) 'Assessing the Date of the Global Oil Peak: The Need to Use 2P Reserves'. *Energy Policy* 35, 6364-6382

Bento, J. (2003) 'Supply Chain Logistics Require Attention'. *Society of Petroleum Engineers*

BERA – Business & Economics Research Advisor (2013) *Oil & Gas Refining* [online] available from < http://www.loc.gov/rr/business/BERA/issue5/refining.html> [21 May 2014]

Berrios, G.E. (1989) 'What is Phenomenology? A Review'. *Journal of the Royal Society of Medicine* 82, 425-428

Berry, R.S.Y. (1999) 'Collecting Data By In-Depth Interviewing'. British Educational Research Association Annual Conference, University of Sussex

Bertot, J.C., Jaeger, P.T. and Grimes, J.M. (2010) 'Using ICTs To Create A Culture of Transparency: E-Government and Social Media As Openness and Anti-Corruption Tools for Societies'. *Government Information Quarterly* 27, 264-271

Beske, P., Land, A. and Seuring, S. (2014) 'Sustainable Supply Chain Management Practices and Dynamic Capabilities in the Food Industry: A Critical Analysis of the Literature'. *International Journal of Production Economics* 152, 131-143

Biernacki, P. and Waldorf, D. (1981) 'Snowball Sampling Problems and Techniques of Chain Referral Sampling'. *Sociological Methods and Research* 10 (2), 141-163

Binder, C. R., Feola, G., and Steinberger, J. K. (2010) "Considering the Normative, Systemic and Procedural Dimensions in Indicator-Based Sustainability Assessments in Agriculture". *Environmental Impact Assessment Review 30*(2), 71-81.

Bjornland, H.C., Thorsrud, L.A. (2016) 'Boom or Gloom? Examining the Dutch Disease in Two-speed Economics'. *The Economic Journal* 126 (598), 2219-1156

Blok, V., Long, T.L., Gaziulisoy,A.I., Ciliz,N., Lozano, R., Huisingh, D., Csutora, M. and Boks, C. (2015) 'From Best Practices to Bridges for a More Sustainable Future: Advances and Challenges in the Transition to Global Sustainable Production and Consumption'. *Journal of Cleaner Production* 108, 19-30

Blumberg, B., Cooper, D.R. and Schindler, P.S. (2011) *Business Research Methods*. London: McGraw Hill Education

Blumberg, B., Cooper, D.R. and Schindler, P.S. (2011) *Business Research Methods*. London: McGrawHill Education

Blumberg, B.F., Cooper, D.R. and Schindler, P.S. (2011) *Business Research Methods*. 4th Edn. Berkshire: McGraw-Hill Education

Boeije, H. (2002) "A Purposeful Approach to the Constant Comparative Method in the Analysis of Qualitative Interviews". *Quality & Quantity* 36, 391-409

Boland, R.J. (1986) 'Phenomenology: A Preferred Approach to Research in Information Systems'. in Trends in Information Systems. ed. by Langefors, B., Verrijn-Stuart, A.A. and Bracchi, G. The Netherlands: North-Holland Publishing Co., 341-349

Boohene, R. and Peprah, J.A. (2011) 'Women, Livelihood and Oil and Gas Discovery in Ghana: An Exploratory Study of Cape Three Points and Surrounding Communities'. *Journal of Sustainable Development* 4 (3), 185-195

Boslaugh, S (2007). *An Introduction to Secondary Data Analysis*. Cambridge University Press [online]. available from <http://www.langtoninfo.co.uk/ web_content/9780521870016_excerpt.pdf> [25 November 2015]

Bourlakis, M., Maglaras, G., Gallear, D. and Fotopoulos, C. (2014) 'Examining Sustainability Performance in the Supply Chain: The Case of the Greek dairy Sector'. *Industrial Marketing Management* 43, 56-66

Bowen, A.G. 'Naturalistic Inquiry and the Saturation Concept: A Research Note'. Qualitative Research [online] 8 (1), 137-152. available from <http://ruconnected.ru.ac.za/pluginfile.php/220694/mod_resource/content/1/04_Bowen_Naturalistic%20Inquiry%20and%20the%20Saturation%20Concept.pdf> [2 July 2014]

Bowen, F., Cousins, P., Lamming, R. and Faruk, A. (2001) 'Horses for Courses: Explaining the Gap between the Theory and Practice of Green Supply' *Production and Operations Management* 10 (2), 174-189

Bowen, G.A. (2008) 'Naturalistic Enquiry and the Saturation Concept: A Research Note'. *Qualitative Research* 8 (1), 137-152

Bowie, N. (2012) *The IMF and US African Command (AFRICOM Join Hands in the Plunder of the African Continent* [online] available from <http://www.globalresearch.ca/the-imf-and-us-african-command-africom-join-hands-in-the-plunder-of-the-african-continent/28520> [12 June 2014]

Boyatzis, R.E. (1998) *Thematic Analysis and Code Development; Transforming Qualitative Information*. United States of America: SAGE Publications

Boyer, K.K. and McDermott, C. (1999) 'Strategic Consensus in Operations Strategy'. *Journal of Operations Management* 17, 289-305

BP (2012) *Statistical Review of World Energy* [online] available from < http://www.bp.com/en/global/corporate/about-bp/statistical-review-of-world-energy-2013> [10 May 2013]

BP (2013) *Statistical Review of World Energy* [online] available from <http://www.bp.com/en/global/corporate/about-bp/statistical-review-of-world-energy-2013/review-by-energy-type/oil/oil-consumption.html> [25 September 2013]

Bracho, F. (ed) (2000) *The Future of Oil and Energy: Consequences for oil producing Countries*. 'Seminar on New World Trends and the Future of Oil and Energy'. held 13-15 June 2000 at Caracas, Venezuela. Venezuela: Camford Publishing Ltd

Bracken, S. () "Discussing the Importance of Ontology and Epistemology Awareness in Practitioner Research". Worcester Journal of Learning and Teaching 4

Brakewood, B. and Plodrack, R.A. (2013) 'The Ethics of Secondary Data Analysis: Considering the Application of Belmont Principles to the Sharing of Neuroimaging Data'. *NeuroImage* 82 (15), 671-676

Brannen, J. (2005) 'Mixed Methods Research: A Discussion Paper'. [online] available from <citeseerx.ist.psu.edu/viewdoc/download;jsessionid=667C73EBF04AF4BD0819B86F021456CF?doi=10.1.1.468.360&rep=rep1&type=pdf> [16 May 2016]

Brannen, J. (2005) 'Mixing Methods: The Entry of Qualitative and Quantitative Approaches into the Research Process'. *Int.J. Social Research Methodology* 8 (3), 173-184

Brathwaite, A. (2002) 'Selection of a Conceptual Model/Framework for Guiding Research Interventions'. *The Internet Journal of Advanced Nursing Practice* 6 (1), 1-8

Braungart, M., McDonough, W. and Bollinger, A. (2007) 'Cradle-to-Cradle Design: Creating Healthy Emissions – a Strategy for Eco-Effective Product and System Design'. *Journal of Cleaner Production* 15 (13), 1337-1348

Breiger, R. L. (1974) 'The Duality of Persons and Groups'. *Social Forces* 53(2), 181-190.

Briggs, C.A., Tolliver, D. and Szmerekovsky, J. (2012) 'Managing and Mitigating the Upstream Petroleum Industry Supply Chain Risks: Leveraging Analytic Hierarchy Process'. *International Journal of Business and Economic Perspectives* 7 (1), 1-20

Brocki, J.M. and Wearden, A.J. (2006) 'A Critical Evaluation of the Use of Interpretative Phenomenological Analysis (IPA) in Health Psychology'. *Psychology and Health* 21 (1), 87-108

Brollo, F., Nannicini, T., Perotti, R. and Tabellini, G. (2010) 'The Political Resource Curse'. *National Bureau of Economic Research Working Paper Series* (15705)

Bronn, P.S. and Vidaver-Cohen, D. (2009) 'Corporate Motives for Social Initiative: Legitimacy, Sustainability, or the Bottom Line?'. *Journal of Business Ethics* 87, 91-109

Bryman, A. (2006) 'Integrating Quantitative and Qualitative Research: How Is It Done'. *Qualitative Research* 6 (1) 97-113

Bryman, A. (2016) *Social Research Methods*. 5th Edn. United Kingdom: Oxford University Press

Bryman, A. and Bell, E. (2003) Business Research Methods. Oxford University Press: New York

Bulchholz, R.A. (1991) 'Corporate Responsibility and the Good Society: From Economics to Ecology'. *Business Horizons* 34 (4), 19-31

Burns, N. and Groves, S. (2001) *The Practice of Nursing Research, Conduct, Critique, & Utilization*. 4th Edn. Toronto, Ontario: W.B. Saunders Company

Burns, R.B. (2000) Introduction to Research Methods. London; Thousand Oaks, California; New Delhi: SAGE Publications

Burrell, G. and Morgan, G. (1979) *Sociological Paradigms and Organisational Analysis: Elements of the Sociology of Corporate Life*. USA: Ashgate Publishing Company

BusinessDictionary.com (2016) *Competitiveness* [online] available from <http://www.businessdictionary.com/definition/competitiveness.html> [28 June 2016]

Butler, T. (1998) 'Towards a Hermeneutic Method for Interpretive Research in Information Systems'. *Journal of Information Technology* 13, 285-300

Caldas, M.M., Sanderson, M.R., Mather,M., Daniels, M.D., Bergtold, J.S., Aistrup, J., Stamm, J.L.H., Haukos, D., Douglas-Mankin, K., Sheshukov, A.Y. and Lopez-Carr, D. (2015) 'Opinion: Endogenizing Culture in Sustainability Science Research and Policy'. *Proceedings of the National Academy of Sciences* 112 (27), 8157-8159

Cambridge Dictionary (2017) *Trade Routes* [online] available from http://dictionary.cambridge.org/dictionary/english/trade-route [27 March 2017]

Carr, E.C. (2001) 'The Use of Telephone Interview for Research'. *Nursing Times Research* 6 (1), 511-524

Carr, L.T. (1994) 'The Strengths and Weaknesses of Quantitative and Qualitative Research: What Method for Nursing'. *Journal of Advanced Nursing* 20, 716-721

Carroll, A.B. (1979) 'A Three-Dimensional Conceptual Model of Corporate Performance'. *The Academy of Management Review* 4 (4), 497-505

Carter, C. and Rogers, D. (2008) 'A framework of Sustainable Supply Chain Management: Moving Toward Theory'. *International Journal of Physical Distribution & Logistics Management* 38 (5), 360-387

Carter, C.R. and Easton, P.L. (2011) 'Sustainable Supply Chain Management: Evolution and Future Directions'. *International Journal of Physical Distribution & Logistics Management* 41 (1), 46-62

Carter, C.R. and Jennings, M.M. (2002) 'Social Responsibility and Supply Chains Relationships'. *Transportation Research* Part E 38, 37-52

Carter, C.R. and Jennings, M.M. (2004) 'The Role of Purchasing in Corporate Social Responsibility: A Structural Equation Analysis'. *Journal of Business Logistics 25* (1), 145-186

Carter, C.R. and Rogers, D.S. (2008) 'A Framework of Sustainable Supply Chain Management: Moving Toward New Theory'. *International Journal of Physical Distribution & Logistics Management* 38 (5), 360-387

Caspi, A., Moffitt, T.E, Thornton, A., Freedman, D., Amell, J.W., Harrington, H., Smeijers, J. and Silva, P.A. (1996) 'The Life History Calendar: A Research and Clinical Assessment Method for Collecting Retrospective Event-History Data'. *International Journal of Methods in Psychiatric Research* 6 (2), 101-114

Catterall, M. and Maclaran, P. (1997) 'Focus Group Data and Qualitative Analysis Programs: Coding the Moving Picture as Well as the Snapshots'. Sociological Research Online [online] 2 (1). available from <http://www.scoresonline.org.uk/2/1/6.html> [19 October 2015]

Chapman, K., MacKinnon, D. and Cumbers, A. (2004) 'Adjustment or Renewal in Regional Clusters? A Study of Diversification Amongst SMEs in the Aberdeen Oil Complex'. *Transactions of the Institute of British Geographers* 29 (3), 382-396

Chapple, A. (1999) 'The Use of Telephone Interviewing for Qualitative Research'. *Nurse Researcher* 6 (3), 85-93

Charmaz, K. (2003) 'Grounded Theory'. Qualitative Psychology: A Practical Guide to Research Methods 81-110

Chemicals-technology.com (2015) *Fawley Refinery and Petrochemical Plant* [online] available from <http://www.chemicals-technology.com/projects/fawley-refinery-petrochemical-plant-hampshire/> [5 March 2015]

Cheng, L. and Duran, M. (2003) 'World-Wide Crusade Transportation Logistics: A Decision Support System Based on Simulation and Optimization'.

Chima, C.M. (2007) 'Supply Chain Management Issues in the Oil & Gas Industry'. *Journal of Business & Economic Research* 5 (6), 27-36

Chima, C.M. (2007) 'Supply-Chain Management Issues in the Oil and Gas Industry'. *Journal of Business and Economics Research* 5 (6), 27-36

Chima, C.M. (2011) 'Supply-Chain Management Issues in the Oil and Gas Industry. *Journal of Business & Economics Research (JBER) 5*(6)

Chiu, R.L.H. (2004) 'Social Sustainability, Sustainable Development and Housing Development'. in *Housing and Social Change; East-West Perspectives*. ed. by Forrest, R. and Lee, J. London: Routledge, 221-239. available from <http://books.google.co.uk/books?hl=en&lr=&id=EsexCkdMAfEC&oi=fnd&pg=PA221&dq=constituents+of+social+sustainability&ots=EXVeH-LjaY&sig=Wh59vPaK0hJgRYxFZqDTij72ppU#v=onepage&q=constituents%20of%20social%20sustainability&f=false> [18 September 2013]

Cho, J. and Trent, A. (2006) 'Validity in Qualitative Research Visited'. *Qualitative Research* 6 (3), 319-340

Christmann, P. and Taylor, G. (2002) 'Globalization and the Environment: Strategies for International Voluntary Initiatives'. *Academy of Management Executive* 16 (3), 121-135

Christopher, E. and Adepoju, A. (2012) 'An Assessment of the Distribution of Petroleum Products in Nigeria'. *Journal of Business Management and Economics* 3 (6), 232-241

Christopher, M. and Holweg, M. (2011) 'Supply Chain 2.0": Managing Supply Chains in the Era of Turbulence'. *International Journal of Physical Distribution & Logistics Management*, *41*(1), 63-82.

Christopher, M. and Towill, D. (2001) 'An Integrated Model for the Design of Agile Supply Chains'. *International Journal of Physical Distribution and Logistics Management* 31 (4), 235-246

Christopher, M., Lowson, R. and Peck, H. (2004) 'Creating Agile Supply Chains in the Fashion Industry'. *International Journal of Retail and Distribution Management* 32 (8), 367-376

Christopher, M., Peck, H. and Towill, D. (2006) 'A Taxonomy for Selecting Global Supply Chain Strategies'. *International Journal of Logistics Management* 17 (2), 277-287

Clark, G. (2013) 'Secondary Data – Definitions and Functions'. in *Methods in Human Geography- A Guide for Students Doing a Research Project*. ed.by Flowerdew, R. and Martin, D. 2nd Edition. USA: Routeledge

Clarkson, M.B.E. (1995) "A Stakeholder Framework for Analysing and Evaluating Corporate Social Performance". *Academy of Management Review* 20 (1), 92-117

Cohen, L., Manion, L. and Morrison, K. (2007) *Research Methods in Education*. UK: Routeledge

Coia, A. (1999) 'Integrating Oil's Supply Chain'. *Traffic World* 259 (2), 18-19

Coleman, J.S. (1988) 'Social Capital in the creation of Human Capital'. *The American Journal of Sociology* 94, S95-S120

Connelly, F.M. and Clandinin, D.J. (1990) 'Stories of Experience and Narrative Inquiry'. *Educational Researcher* 19(5), 2-14

Cooper, D.R. and Schindler, P. (2008) Business Research Methods. New York: McGrawhill/Irwin

Cooper, M.C., Lambert, D.M. and Pagh, J.P. (1997). 'Supply Chain Management: More Than a New Name for Logistics'. *Journal of Logistics Management* 8 (1), 1-14

Corbetta, P. (2003) *Social Research: Theory, Methods and Techniques*. London: SAGE Publications Ltd

Corbin, J. and Morse, J.M. (2003) 'The Unstructured Interactive Interview Issues of Reciprocity and Risks When Dealing With Sensitive Topics'. *Qualitative Inquiry* 9 (3), 335-354

Corbin, J. and Strauss, A. (1990) 'Grounded Theory Research: Procedures, Canons and Evaluative Criteria'. *Qualitative Sociology* 13 (1), 3-21

Corrado and Mattey (1997) 'Capacity Utilization'. *The Journal of Economic Perspectives* 11(1), 151-167

Cowton, C.J. (1998) 'The Use of Secondary Data in Business Ethics Research'. *Journal of Business Ethics* 17, 423-434

Cowton. C.J. (1998) 'The Use of Secondary Data in Business Ethics Research'. *Journal of Business Ethics* 17, 423-434

Crabtree, B.F. and Miller, W.L. (1999) *Doing Qualitative Research*. 2nd edn. Thousand Oaks: SAGE Publications

Creswell, J.W. (1989) *Qualitative Inquiry and Research Design: Choosing Among Five Traditions*. Thousand Oaks; London; Delhi: SAGE Publications

Creswell, J.W. (1994) *Research Design: Qualitative and Quantitative Approaches*. Thousand Oaks, CA: SAGE Publications

Creswell, J.W. (1998) *Qualitative Inquiry and Research Design; Choosing Among Five Traditions.* United States of America: SAGE Publications

Creswell, J.W. (1998) Qualitative Inquiry and Research Design: Choosing Among Five Traditions. Thousand Oaks; London; Delhi: SAGE Publications

Creswell, J.W. (2003) 'A framework for Design'. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches 9-11

Creswell, J.W. (2010) Designing and Conducting Mixed Methods Research. London: SAGE

Creswell, J.W. (2013) *Qualitative Inquiry and Research Design: Choosing Among Five Traditions*. 3rd Edn. Thousand Oaks, CA: SAGE Publications

Creswell, J.W. and Plano Clark, V.L. (2011) Designing and Conducting Mixed Methods Research. Thousand Oaks, California: SAGE Publication

Creswell, J.W. and Plano Clark, V.L. (2011) Designing and Conducting Mixed Methods Research. Thousand Oaks, California: SAGE Publication

Cronbach, L.J. and Meehl, P.E. (1955) 'Construct Validity in Psychological Tests'. *Psychological Bulletin* 52, 281-302

CRS- Congressional Research Service (2014) *Small Refineries and Oil Field Processors: Opportunities and Challenges.* [online] available from < https://www.fas.org/sgp/crs/misc/R43682.pdf> [5 July 2016]

Curkovic, S. and Sroufe, R. (2010) 'Using ISO 14001 to Promote Sustainable Supply Chain Strategy'. *Business Strategy and the Environment* 20 (2), 71-93

Currall, S.C. and Towler, A.J. (2003) ed. by Tashakkori, A. and Teddlie, C. *Research Methods in Management and Organizational Research: Toward Integration of Qualitative and Quantitative Techniques*. Thousand Oaks, CA: Sage

Curry, A. and Kadasah, N. (2002) 'Focusing on Key Elements of TQM – Evaluation for Sustainability'. *The TQM Magazine* 14 (4), 207-216

Cuthbert, N., Leavens, J., Kennaby, D. and Birch, C. (2011) *Developments in the International Downstream Oil Industry Markets and their Drivers: Implications for the UK Refining Sector* [online] available from <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48142/2259-int-downstream-oil-mkts-drivers.pdf > [28 June 2016]

Czaja, R. and Blair, J. (2005) Designing Surveys: A Guide to Decisions and Procedures. Thousand Oaks, California; London; India: Pine Forge Press

Dashwood, H.S. (2014) 'Sustainable Development and Industry Self-Regulation: Developments in the Global Mining Sector'. *Business & Society* 55 (4), 551-552

Davies, S.J., Peters, G.P. and Caldeira, K. (2011) 'The Supply Chain of CO_2 Emissions'. *Proceedings of the National Academy of Sciences* 108 (45), 18554-18559

De Vaus, D. (2002) Surveys in Social Research. London and New York: Routeledge

DECC (2014) 'Review of the Refining and Fuel Import Sectors in the UK'. [online] available from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/302172/Refining_and_fuel_imports_in_the_UK__FINAL_VERSION.pdf [10 August 2016]

DECC- Department of Energy & Climate Change (2014) *Review of the Refining and Fuel Import Sectors in the UK* [online] available from < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/302172/Refining_and_fuel_imports_in_the_UK__FINAL_VERSION.pdf> [21 June 2016]

Deloitte (2012) *Study of the UK Petroleum Retail Market* [online] available from < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69760/7322-study-of-the-uk-petroleum-retail-market.pdf> [21 June 2016]

Demirel, P.and Kesidou, E. (2011) 'Stimulating Different Types of Eco-Innovation in the UK: Government Policies and Firm Motivations'. *Ecological Economics* 70 (8), 1546-1557

Dempsey, N., Bramley, G., Power, S. and Brown, C. (2011) 'The Social Dimension of Sustainable Development: Defining Urban Social Sustainability'. *Sus. Dev*. 19, 289-300

Denzin, N.K. (2012) 'Triangulation 2.0'. *Journal of Mixed Methods Research* 6 (2) 80-88

Department of Energy & Climate Change (2013) *UK Oil Reserves and Estimated Oil Recovery 2013* [online] available from

<https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/16090/UK >[11 December 2013]

Dey, A., LaGuardia, P. and Srinivasan, M. (2011) 'Building Sustainability in Logistics Operations: A Research Agenda'. *Management Research Review* 34 (11), 1237-1259

Dey, I. (1993) *Qualitative Data Analysis*. London and New York: Routledge

Diabat, A. and Govindan, K. (2011) 'An Analysis of the Drivers Affecting the Implementation of Green Supply Chain Management'. *Resources, Conservation and Recycling* 55 (6), 659-667

Diabat, A., and Govindan, K. (2011) 'An Analysis of the Drivers Affecting the Implementation of Green Supply Chain Management'. *Resources, Conservation and Recycling 55* (6), 659-667.

Diesendorf, M. (2000) 'Sustainability and Sustainable Development'. *Sustainability: The Corporate Challenge of the 21st Century* 2, 19-37

Diesing, P. (1966) "Objectivism vs. Subjectivism in the Social Sciences". *Philosophy of Science* 33 (1/2), 124-133

Dietz, S. and Neumayer, E. (2007) 'Weak and Strong Sustainability in the SEEA: Concepts and Measurements'. *Ecological Economics* 61 (4), 617-626

Dike, V.E. (2005) 'Corruption in Nigeria: A New Paradigm for Effective Control'. Africa Economic Analysis 24 (8), 1-22

Dincer, I. (1999) 'Environmental Impacts of Energy'. *Energy Policy* 27, 845-854

Dincer, I. (2000) 'Renewable Energy and Sustainable Development: A Crucial Review'. *Renewable and Sustainable Energy Reviews* 4, 157-175

Doane, D. and Mac Gillivary, A. (2001) 'Economic Sustainability: The Business of Staying in Business'. *R&D Report*

Doane, D. znd MacGillivray, A. (2001) 'Economic Sustainability: The Business of Staying in Business'. *The Sigma Project* 1-52

Dobers, P. and Halme, M. (2009) 'Corporate Social Responsibility and Developing Countries'. *Corporate Social Responsibility and Environmental Management* 16, 237-249

Douglas, A. (2015) 'TQM and Sustainability'. *Sinergie Italian Journal of Management* 33 (97), 213-215

Doyle, L., Brady, A. and Byrne, G. (2009) 'An Overview of Mixed Methods Research'. *Journal of Research in Nursing* 14 (2), 175-185

DPR (2004) Guidelines for the Establishment of Hydrocarbon Processing Plants in Nigeria [online] available from <http://dpr.gov.ng/index/wp-content/uploads/2013/09/GUIDELINES-REFINERY-AND-HYDROCARBON-PROCESSING-PLANTS> [25 January 2016]

Dresner, S. (2008) *The Principles of Sustainability*. London: Earthscan

Dresselhaus, M.S. and Thomas, I.L. (2001) 'Alternate Energy Technologies'. *Insight Overview* 414, 332-337

Drost, E. (2011) 'Validity and Reliability in Social Science Research'. *Education Research and Perspectives* 38 (1), 105

DTI (2003) 'Our Energy Future – Creating a Low Carbon Economy'. *Energy White Paper* [online] available from http://webarchive.national archives.gov.uk/+http://www.dti.gov.uk/files/file10719.pdf [5 August 2016]

Du Pasani, J.A. (2006) 'Sustainable Development – Historical Roots of the Concept'. *Environmental Science* 3 (2), 83-86

Dublin-Green, W.F., Nwakwo, J.N. and Ikechukwu, D.O. (1998) *Effective Regulation and Management of HSE Issues in the Petroleum Industry in Nigeria*. 'SPE International Conference on Health, safety and Environment in Oil and Gas Exploration and Production, SPE 46726'. held 7-10 June 1998 at Caracas, Venezuela.

Dukes, S. (1984) 'Phenomenological Methodology in the Human Sciences'. *Journal of Religion and Health* 23 (3), 197-203

Dunning, J.H. and Lundam, S.M. (2008) *Multinational Enterprises and the Global Economy*. Cheltenham: Edward Elgar

Duruigbo, E. (2005) 'The World Bank Multinational Oil Corporations and the Resource Curse in Africa' *Journal of International Economic Law* 26 (1), 1-68

Dvorak, Z., Leitner, B. and Mocova, L. (2016) 'Critical Infrastructure safety and Protection in Slovak Republic – Research and Education'. *MEST Journal* 4 (2), 49-55

Dyllick and Hockerts (2002) 'Beyond the Business Case for Corporate Sustainability'. *Business Strategy and the Environment* 11, 130-141

Dyllick and Hockerts (2002) 'Beyond the Business Case for Corporate Sustainability'. *Business Strategy and the Environment* 11, 130-141

Easterby-Smith, M., Thorpe, R. and Jackson, P.R. (2008) *Management Research*. 3rd Edn. London: SAGE

Easton, M. (2012) 'The Great Myth of Urban Britain'. The BBC News [online] 28 June. Available from < http://www.bbc.co.uk/news/uk-18623096> [16 December 2013]

Eboh, M. (2016) 'Be Patient, Fuel Crisis to End in Two Weeks NNPC Begs Nigerians'. *Vanguard Newspaper* [online] 04 April. available from < http://www.vanguardngr.com/2016/03/patient-fuel-crisis-end-two-weeks-nnpc-begs-nigerians/> [04 April 2016]

Egles-Zanden, N. (2007) 'Suppliers' Compliance with MNCs' Codes of Conduct: Behind the Scenes at Chinese Toy Suppliers'. *Journal of Business Ethics* 75, 45-62

Egles-Zanden, N., Hulthen, K. and Wulff, G. (2015) 'Trade-Offs in Supply Chain Transparency: The Case of Nudie Jeans Co'. *Journal of Cleaner Production* 107, 95-104

Ehinomen, C. and Adeleke, A. (2012) 'An Assessment of the Distribution of Petroleum Products in Nigeria'. *Journal of Business Management and Economics* 3 (6), 232-241

Ehrgott, M., Reimann, F., Kaufmann, L. and Carter, C.R. (2011) 'Social Sustainability in Selecting Emerging Economy Suppliers'. *Journal of Business Ethics* 98 (1), 99-119

Eisenhardt, K. (1989) 'Building Theories from Case Study Research'. *The Academy of Management Review* 14 (4), 532-550

Ekins, P. and Simon, S. (2001) 'Estimating Sustainability Gaps: Methods and Preliminary Applications for the UK and the Netherlands'. *Ecological Economics* 37, 5-22

Elkington, J. (1999) 'Triple Bottom Line Revolution – Reporting for the Third Millennium'. *Australian CPA* 69 (11), 75-76

Elkington, J. (2004) *Enter the Triple Bottom Line* [online] available from < http://kmhassociates.ca/resources/1/Triple%20Bottom%20Line%20a%20history%201961-2001.pdf> [11 September 2013]

Ellewood, C.A. (1916) "Objectivism in Sociology". *Journal of Sociology* 3 (22), 289-305

Elliot, S.R. (2005) 'Sustainability: An Economic Prospective'. *Resources, Conservation and Recycling* 44, 263-277

Ellram, L.M. and Cooper, M.C. (2014) 'Supply Chain Management: It's All About the Journey, Not the Destination'. *Journal of Supply Chain Management* 50 (1), 8-20

Energy Delta Institute (2011) The Gas Industry in Ukraine [online] available from< http://www.energydelta.org/mainmenu/energy-knowledge/country-gas-profiles/ukraine> [12 June 2012]

Energy Institute (2016) *Refining* [online] available from https://www.energyinst.org [28 June 2016]

Energy Security (2004) *North Sea Oil*. [online] available from < http://www.iags.org/n0524043.htm> [5 July 2016]

Enyinda, C.I., Briggs, C., Obuah, E. and Mbah, C. (2011) 'Petroleum Supply Chain Risk Analysis in a Multinational Oil Firm in Nigeria'. *Journal of Marketing Development and Competitiveness* 5 (7), 37-44

Epstein, M.J. (2014) *Making Sustainability Work: Best Practices in Managing and Measuring Corporate Social, Environmental, and Economic Impacts*. USA: Berrett-Koehler Publishers

Epstein, M.J. and Roy, M. 'Sustainability in Action: Identifying and Measuring the Key Performance Drivers'. *Long Range Planning* 34, 584-604

Erumban, A.A. and De Jong, S.B. (2006) 'Cross-Country Differences in ICT Adoption: A Consequence of Culture?' *Journal of World Business* 41, 302-314

Essar Oil (2016) *Essar Oil UK; About Us* [online] available from < https://www.essaroil.co.uk/about-us/> [23 June 2016]

Essar Oil UK (2016) 'Caring About Our Communities'. [online] available from https://www.essaroil.co.uk/responsibility/community [10 August 2016]

Essar Oil UK (2016) 'Health and Safety'. [online] available from https://www.essaroil.co.uk/responsibility/health-and-safety/ [8 August 2016]

Esso UK (2011) *Fawley Refinery and Petrochemical Plant* [online] available from http://www.ukpia.com/docs/default-source/default-document-library/fawley_2011.pdf?sfvrsn=0 [23 June 2016]

European Commission (2015) 'Paris Agreement'. [online] available from < https://ec.europa.eu/clima/policies/international/negotiations/paris_en> [01 January 2018]

Exxon Mobil UK (2016) 'Energy and the Environment'. [online] available from http://www.exxonmobil.co.uk/UK-English/energy_enviro.aspx [8 August 2016]

ExxonMobil (2015) *Fawley Refinery* [online] available from < http://www.exxonmobil.co.uk/UK-English/about_what_refining_fawley.aspx> [5 March 2015]

Ezeani, E.C. (2014) 'Removing Oil Subsidies in Nigeria: Between Necessity and False Economy'. Journal of World Energy, Law & Business 7 (4), 364-389

Fabbe-Costes, N., Roussat, C. and Colin, J. (2011) "Future Sustainable Supply Chains: What Should Companies Scan?" *International Journal of Physical Distribution & Logistics Management* 41 (3), 228-252

Fabbe-Costes, N., Roussat, C., Taylor, M. and Taylor, W.A. (2014) "Sustainable Supply Chains: A Framework for Environmental Scanning Practices". International Journal of Operations and Production Management 34 (5), 664-694

Fabiano, B. and Curro, F. (2012) 'From a Survey on Accidents in the Downstream Oil Industry to the Development of a Detailed Near-Miss Reporting System'. *Process Safety and Environmental Protection* 90, 357-367

Fadeyibi, I.O., Jewo, P.I., Babalola, O.S., Ugburo, A. and Ademiluyi, S.A. (2011) 'Burns and Disasters from Leaking Petroleum Pipes in Lagos, Nigeria: An 8-Year Experience'. *Burns* 37 (1), 145-152

Falola, T. and Genova, A. (2005) *The Politics of the Global Oil Industry: An Introduction*. London: Greenwood Publishing Group

Fereday, J. (2006) 'Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development'. *International Journal of Qualitative Methods* 5 (1), 80-92

Flora, C.B. (2016) 'Social Capital and Community Problem Solving: Combining Local and Scientific Knowledge to Fight Invasive Species

Font, X., Tapper, R., Schwatz, K. and Kornilaki, M. (2008) 'Sustainable Supply Chain Management in Tourism'. *Business Strategy and the Environment* 17 (4), 260-271

Fontana, A. and Frey, J.H. (1994) 'Interviewing: The Art of Science'. in *Handbook of Qualitative Research.* ed. by Denzin, N.A.Y.L. Thousand Oaks: Sage Publications, 361-376

Frank, O. and Snijders, T. (1994) 'Estimating the Size of Hidden Populations Using Snowball Sampling'. *Journal of Official Statistics* 10 (1), 53-67

Franke, G.R. and Nadler, S.S. (2008) 'Culture, Economic Development and National Ethical Attitudes'. *Journal of Business Research* 61, 254-264

Frederking, L.C. (2002) 'Is There An Endogenous Relationship Between Culture and Economic Development?' *Journal of Economic Behaviour & Organization* 48, 105-126

Freeman, R.E. (1984) *Strategic Management: A Stakeholder's Approach*. Boston: Pitman

Freeman, R.E. (1984) *Strategic Management: A Stakeholder's Approach*. Boston: Pitman

Freeman, R.E. and Reed, D.L. (1983) 'Stockholders and Stakeholders: A New Perspective on Corporate Governance'. *California Management Review* 25 (3), 88-106

Freeman, R.E., Martin, K. and Parmar, B. (2007) 'Stakeholder Capitalism'. *Journal of Business Ethics* 74, 303-314

Freeman, R.E., Wicks, A.C. and Parmar, B. (2004) 'Stakeholder Theory and The Corporate Objective Revisited'. *Organization Science* 15 (3), 364-369

Frynas, J.G. (1998) 'Political Instability and Business: Focus on Shell'. *Third World Quarterly* 19 (3), 457- 478

Frynas, J.G. (2005) 'The False Developmental Promise of Corporate Social Responsibility: Evidence from Multinational Oil Companies'. *International Affairs* 81 (3), 581-598

Fuel Oil News (2012) *Petroineos Grangemouth Refinery; Products and Markets* [online] available from <fueloilnews.co.uk/2012/12/products-and-markets> [27 June 2016]

Fuel Oil News (2013) *Valero: A Positive Story for the UK* [online] available from <fueloilnews.co.uk/2013/06/a-positive-story-for-the-uk/> [28 June 2016]

Fuel Oil News (2016) *The Humber Refinery – A Key Indigenous Source of Supply* [online] available from <fueloilnews.co.uk/2016/03/the-humber-refinery-a-key-indigenous-source-of-supply/> [27 June 2016]

Gainsborough, M. (2004) 'RFP4- Downstream Supply Chain Optimization'. BP Statistical Review of World Energy

Galal, N.M. and Moneim, A.F.A. (2016) 'Developing Sustainable Supply Chains in Developing Countries'. *Procedia CIRP* 48, 419-424

Ganeshan, R. and Harrison, T.P. (1995) 'An Introduction to Supply Chain Management'. *Department of Management Science and Information Systems, Penn State University, The United States* 1-7

Gardener, P. (1918) *A History of Ancient Coinage* UK: Oxford Clarendon Press

Garcia, J.P. (2016) 'Financial Performance in Upstream, Downstream and Integrated Oil companies in Response to Oil Price Volatility'. *Finance Undergraduate Honours Theses* 34

George, D. and Mallery, P. (2010) *SPSS for Windows Step By Step: A Simple Guide and Reference 17.0 Update* UK: Allyn and Bacon

Ghahramanpouri, A., Lamit, H. and Sedaghatnia, S. (2013) 'Urban Sustainability Trends in Research Literature'. *Asian Social Sciences* 9 (4), 185-193

Ghasemi, A. and Zahediasl, S. (2012) 'Normality Tests for Statistical Analysis: A Guide for Non-Statisticians'. *Int. Journal Endocrinol Metab*. 10 (2), 486-489

Gialdino, V. (2009) "Ontological and Epistemological Foundations of Qualitative Research*". Forum; Qualitative Social Research* 10 (2)

Gibson, B.J. and Mentzer, J.T. (2005) 'Supply Chain Management: The Pursuit of a Consensus Definition'. *Journal of Business Logistics* 26 (2), 17-26

Giddings, B., Hopwood, B. and O'Brien, G. (2002) 'Environment, Economy and Society: Fitting them Together into Sustainable Development'. *Sust. Dev*. 10, 187-196

Gill, R. (2003) "Change Management – Or Change Leadership". *Journal of Change Management* 3 (4), 307-318

Giunipero, L.C., Hooker, R.E. and Denslow, D. (2012) 'Purchasing and Supply Management Sustainability: Drivers and Barriers'. *Journal of Purchasing and Supply Management* 18 (4), 258-269

Glavic, P. and Lukman, R. (2007) 'Review of Sustainability Terms and Their Definitions'. *Journal of Cleaner Production* 15, 1875-1885

Glavic, P. and Lukman, R. (2007) 'Review of Sustainability Terms and Their Definitions'. *Journal of Cleaner Production* 15 (18), 1875-1885

Gliem, J.A. and Gliem, R.R. (2003) 'Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-Type Scales'. Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education,

Global Reporting Initiative (2017) About Sustainability Reporting [online] available from < <https://www.globalreporting.org/information/sustainability-reporting/Pages/default.aspx> [3 March 2017]

Glover, J.L., Champion, D., Daniels, K.J. and Dainty, A.J.D. (2014) 'An Institutional Theory Perspective on Sustainable Practices Across the Dairy Supply Chain'. *International Journal of Production Economics* 152, 102-111

Godwin, D.T. and Dagogo, D. (2011) 'Deregulation of the Nigerian Economy: The Theoretical Milieu'. *African Society for Scientific Research* 123-129

Gopalakrishnan, K., Yusuf, Y.Y., Musa, A., Abubakar, T. and Ambursa, H.M. (2012) 'Sustainable Supply Chain Management: A Case Study of British Aerospace (BAe) Systems'. *Int. J. Production Economics* 140, 193-203

Gopalakrishnan, K., Yusuf, Y.Y., Musa, A., Abubakar, T. and Ambursa, H.M. (2012) 'Sustainable Supply Chain Management: A Case Study of British Aerospace (BAe) Systems'. *Int. J. Production Economics* 140, 193-203

Gosden, E. (2013) 'BP Warns Gulf Spill Costs Will Exceed $42.4bn as Compensation Cost Rises'. *The Telegraph* [online] 30 July. available from <http://www.theguardian.com/business/2010/nov/02/bp-oil-spill-costs-40-billion-dollars> [20 May 2014]

Gosling, J., Purvis, L. and Naim, M.M. 'Supply Chain Flexibility as a Determinant of Supplier Selection'. *International Journal of Production Economics* 128, 11-21

Goulding, C. (2004) 'Grounded Theory, Ethnography and Phenomenology: A Comparative Analysis of Three Qualitative Strategies for Marketing Research'. *European Journal of Marketing* 39 (3/4), 294-308

GOV.UK (2013) *Oil and Gas: Decommissioning of Offshore Installations & Pipelines* [online] available from< https://www.gov.uk/oil-and-gas-decommissioning-of-offshore-installations-and-pipelines> [15 October 2013]

GOV.UK (2013) *Rural Urban Classification* [online] available from < https://www.go v.uk/government/publications/2011-rural-urban-classification> [16 December 2013]

Gov.UK (2014) *Petroleum* [online] available from< https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/447630/DUKES_2015_Chapter_3.pdf> [21 June 2016]

Graneheim, U.H. and Lundman, B. (2004) 'Qualitative Content Analysis in Nursing Research: Concepts, Procedures and Measures to Achieve Trustworthiness'. *Nurse Education Today* 24, 105-112

Gray, B. and Stites, J.P. (2013) 'Sustainability Through Partnerships: Capitalizing on Collaboration'. Network for Business Sustainability [online] available from < http://nbs.net/wp-content/uploads/NBS-Systematic-Review-Partnerships.pdf> [4 April 2017]

Greeley, B. (2014) 'Why Fuel Subsidies in Developing Nations are an Economic Addiction'. BloombergBusinessweek [online] 13 March. available from

<http://www.businessweek.com/articles/2014-03-13/why-fuel-subsidies-in-developing-nations-are-an-economic-addiction#p2> [12 June 2014]

Green, K., Morton, B. and New, S. (1996) 'Purchasing and Emnvironmental Management: Interactions, Policies and Opportunities'. *Business Strategy and the Environment* 5, 188-197

Green, K., Morton, B. and New, S. (1998) 'Green Purchasing and Supply Policies: Do They Improve Companies' Environmental Performance?'. *Supply Chain Management: An International Journal* 3 (2), 89-95

Greene, D.L., Hopson, J.L. and Li, J. (2006) 'Have We Run Out of Oil Yet? Oil Peaking Analysis from an Optimists Perspective' *Energy Policy* 34, 515-531

Greene, J.C., Caracelli, V.J. and Graham, W.F. (1989) 'Toward a Conceptual Framework for Mixed-Method Evaluation Designs'. *Educational Evaluation and Policy Analysis* 11 (3), 255-274

Greene, J.C., Caracelli, V.J. and Graham, W.F. (1989) 'Toward a Conceptual Framework for Mixed-Method Evaluation Designs'. *Educational Evaluation and Policy Analysis* 11 (3), 255-274

Greenhalgh, T. Russell, J. and Swinglehurst, D. (2005) 'Narrative Methods in Quality Improvement Research'. *Qual. Saf. Health Care* 14, 443-449

GRI (2012) *GRI Oil and Gas Sector Supplement* [online] available from https://www.globalreporting.org/resourcelibrary/OGSS-Summary-Guide-Quick-Ref-Sheet.pdf [13 March 2014]

GRI (2013) *About GRI* [online] available from https://www.globalreporting.org/Information/about-gri/Pages/default.aspx [17 July 2013]

Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M.C., Shyamsundar, P., Steffen, W., Glaser, G., Kanie, N. and Noble, I. (2013) "Policy: Sustainable Development Goals for People and Planet". *Nature*, *495*(7441), 305.

Grigore, S.D. (2007) 'Supply Chain Flexibility'. *Romanian Economic and Business Review* 2 (1), 66-70

Gualandris, J., Klassen, R.D., Vachon, S. and Kalchschmidt, M. (2015) 'Sustainable Evaluation and Verification in Supply Chains: Aligning and Leveraging Accountability to Stakeholders'. *Journal of Operations Management* 38, 1-13

Guarino and Giaretta (1995) "Ontologies and Knowledge Bases: Towards a Terminological Clarification". *Towards Very Large Knowledge Bases: Knowledge Building & Knowledge Sharing* 25, 32

Guarino, N. (1995) "Formal Ontology, Conceptual Analysis and Knowledge Representation". *Int. J. Human-Computer Studies* 43, 625-640.

Guba, E.G. and Lincoln, Y.S. (1994) 'Competing Paradigms in Qualitative Research'. *Handbook of Qualitative Research* 2, 163-194

Guest, G., Bunce, A. and Johnson, L. (2006) 'How Many Interviews Are Enough? An Experiment with Data Saturation and Variability'. *Field Methods* 18 (1), 59-82

Gunnasekaran, A., Lai, K. and Cheng, T.C.E. (2008) 'Responsive Supply Chain: A Competitive Strategy in a Networked Economy' *Omega* 36, 549-564

Gupta, S. and Palsule-Desai, O.D. (2011) 'Sustainable Supply Chain Management: Review and Research Opportunities'. *IIMB Management Review* 23 (4), 234-245

Gurău, C. and Ranchhod, A. (2005) 'International Green Marketing: A Comparative Study of British and Romanian Firms'. *International Marketing Review* 22 (5), 547-561

Gutés, M.C. (1996) 'The Concept of weak Sustainability'. *Ecological Economics* 17, 147-156

H.M. (2012) 'The UK Oil and Gas supply Chains: An Empirical Analysis of Adoption of

Haake, H. and Seuring, S. (2009) 'Sustainable Procurement of Minor Items – Exploring Limits to Sustainable Developments'. *Sus. Dev*. 17, 284-294

Hadisty, P.E. (2010) *Environmental and Economic Sustainability*. Boca Raton: CRC Press

Hair, J. Anderson, R.E., Tatham, R.L. and Black, W.C. (1995) *Multivariate Data Analysis*. 4th Edition. New Jersey: Prentice-Hall Inc

Hahn, R. and Kuhnen, M. (2013) 'determinants of Sustainability Reporting: A Review of Results, Trends, Theory, and Opportunities in An Expanding Field of Research'. *Journal of Cleaner Production* 59, 5-21

Hahn, R.W. and Guasch, J.L. (1999) 'The Costs and Benefits of Regulation: Implications for Developing Countries'. *The World Bank Research Observer* 14 (1), 137- 158

Halbesleben, J.R. and Whitman, M.V. (2013) 'Evaluating survey quality in health services research: a decision framework for assessing nonresponse bias'. *Health Serv. Res.* 48 (3), 913-930

Hallin, J., Sandberg, M. and Mantel, N.A. (2017) 'The InterBusiness Index: Developing a Tool for Measurement and Comparability of Holistic Sustainability in Business'. *Journal of Management and Sustainbility* 7 (2), 27-44

Hammond, P. (1998) 'Alternative Energy Strategies for the United Kingdom Revisited: Market Competition and Sustainability'. *Technological Forecasting and Social Change* 59 (2), 131-151

Handfield, R. B., Walton, S. V., Seegers, L. K., and Melnyk, S. A. (1997) ''Green'Value Chain Practices in the Furniture Industry'. *Journal of Operations Management 15* (4), 293-315.

Handfield, R., Sroufe, R. and Walton, S. (2005) 'Integrating Environmental Management and Supply Chain Strategies'. *Business Strategy and the Environment* 14 (1), 1-19

Handfield, R., Walton, S. V., Sroufe, R., and Melnyk, S. A. (2002) 'Applying Environmental Criteria to Supplier Assessment: A study in the application of the Analytical Hierarchy Process'. *European Journal of Operational Research 141* (1), 70-87.

Handfield, R.B., Walton, S.V., Seegers, L.K. and Melnyk, S.A. (1997) ''Green' Value Chain Practices in the Furniture Industry'. *Journal of Operations Management* 15 (4), 293-315

Hansen, E.G., Grosse-Dunker, F. and Reichwald, R. (2009) "Sustainability Innovation Cube- A Framework to Evaluate Sustainability of Product Innovations".

Hanson, G.H. and Robertson, R. (2008) 'China and Manufacturing Exports of Other Developing Countries'. *National Bureau of Economic Research*, w14497

Haque, S.M., Green, R. and Keogh, W. (2004) 'Collaborative Relationships in the UK Upstream Oil and Gas Industry: Critical Success and Failure Factors'. *Problems and Perspectives in Management* 1(1), 44-50

Harms, D. (2011) 'Environmental Sustainability and Supply Chain Management – A Framework of Cross-Functional Integration'. in 7th International Environmental Management Leadership Symposium, Rochester Institute of Technology in Rochester, New York, May 2011

Harris, H. (2001) 'Content Analysis of Secondary Data: A Study of Courage in Managerial Decision Making'. *Journal of Business Ethics* 34, 191-208

Harris, J.M. (2003) 'Sustainability and Sustainable Development'. *International Society of Ecological Economics* 1-12

Harris, R., & Khare, A. (2002) 'Sustainable Development Issues and Strategies for Alberta's Oil Industry'. *Technovation*, 22 (9), 571-583.

Hart, S.L. (1995) 'A Natural-Resource-Based View of the Firm'. *Academy of Management Review* 20 (4), 986-1014

Hazardex (2014) *UK Milford Haven Refinery Close Down* [online] available from < http://www.hazardexonthenet.net/article/87469/UK-Milford-Haven-refinery-to-close-after-sale-falls-through.aspx> [5 July 2016]

Hervani, A.A., Helms, M.M. and Sarkis, J. (2005) 'Performance Measurement for Green Supply Chain Management'. *An International Journal* 12 (4), 330-353

Hirsch, R. L., Bezdek, R. and Wendling, R. (2006) 'Peaking of World Oil Production and Its Mitigation'. *AIChE Journal* 52 (1), 2-8.

Hoejmose, S., Brammer, S. and Millington, A. (2013) 'An Empirical Examination of the Relationship between Business Strategy and Socially Responsible Supply Chain Management'. *International Journal of Operations & Production Management 33*(5), 589-621.

Hoepfl, M.C. (1997) 'Choosing Qualitative Research: A Primer for Technology Education Researchers'. Journal of Technology Education 9 (1),

Holden, E., Linnerud, K. and Banister, D. (2014) 'Sustainable Development Our Common Future Revisited'. *Global Environment Change* 26, 130-139

Holden, M.T. and Lynch, P. (2004) 'Choosing the Appropriate Methodology: Understanding Research Philosophy'. *The Marketing Review* 4 (4), 397-409

Holton, I., Glass, J. and Price, A.D.F. (2010) 'Managing for Sustainability: Findings from Four Company Case Studies in the UK Precast Concrete Industry'. *Journal of Cleaner Production* 18 (2), 152-160

Howes, R. and Fainberg, A. (1991) *The Energy Sourcebook*. New York: American Institute of Physics

Hsieh, H. and Shannon, S.E. (2005) 'Three Approaches to Qualitative Content Analysis'. *Qualitative Health Research* 15 (9), 1277-1288

Huang, Z. and Palvia, P. (2001) 'ERP Implementation Issues in Advanced and Developing Countries'. *Business Process Management Journal* 7 (3), 276-284

Hubbard, G. (2009) 'Measuring Organizational Performance: Beyond the Triple Bottom Line'. *Business Strategy and the Environment* 19, 177-191

Hughes, L. and Rudolph, J. (2011) 'Future World Oil Production: Growth, Plateau, or Peak'. *Current Opinion in Environmental Sustainability* 3, 225-234

Huizing, A. (2007) "The Value of a Rose: Rising Above Objectivism and Subjectivism". *Working Papers on Information Systems* 7 (11), 25

Husén, T. (1997) "Research Paradigms in Education". *Educational Research, Methodology, and Measurement: An International Handbook* 2, 16-21

Hussain, R., Assavapokee, T. and Khumawala, B. (2006) 'Supply Chain Management in the Petroleum Industry: Challenges and Opportunities'. *International Journal of Global Logistics & Supply Chain Management* 1 (2), 90-97

Hutchins and Sutherland (2008) 'An Exploration of Measures of Social Sustainability and their Application to Supply Chain Decisions'. *Journal of Cleaner Production* 16 (15), 1688-1698

Hutchins, M.J. and Sutherland, J.W. (2008) 'An Exploration of Measures of Social Sustainability and their Application to Supply Chain Decisions'. *Journal of Cleaner Production* 16, 1688-1698

Hycner, R.H. (1985) 'Some Guidelines for the Phenomenological Analysis of Interview Data'. *Human Studies* 8, 279-303

Hydrocarbon Oil Refineries Act, Cap H5, LFN (2004) Downstream Oil Industry Laws [online] available from <http://resources.lawscopeonline.com/LFN/HYDROCARBON_OIL_REFINERIES_ACT_CAP_H5_L.F.N._2004.htm> [25 January 2016]

Hydrocarbons Technology (2016) *Lindsey Oil Refinery* [online] available from www.hydrocarbons-technology.com/projects/lindsey-refinery/ [28 June 2016]

Ibanga, I. (2005) 'The Economics of Privatizing and Deregulating the Nigerian Downstream Sector'. Valore International

Ibrahim, A.D., Price, A.D.F. and Dainty, A.R.J. (2006) 'The Analysis and Allocation of Risks in Public Private Partnerships in Infrastructure Projects in Nigeria'. *Journal of Financial Management of Property and Construction* 11 (3), 149-164

ICAEW (2016) What is Economic Success [online] available from <www.icaew.com/en/technical/sustainability/what-is-economic-success-going-beyond

ICCT- The International Council on Clean Transportation (2011) *An Introduction to Petroleum Refining and the Production of Ultra Low Sulphur gasoline and Diesel Fuel* [online] available from < http://www.theicct.org/sites/default/files/publications/ICCT05_Refining_Tutorial_FINAL_R1.pdf> [28 June 2016]

Idemudia, U. (2009) 'Assessing Corporate – Community Involvement Strategies in the Nigerian Oil Industry: An Empirical Analysis'. *Resources Policy* 34 (3), 133-141

Idemudia, U. (2009) "Assessing Corporate – Community Involvement Strategies in the Nigerian Oil Industry: An Empirical Analysis". *Resources Policy* 34 (3), 133-141

Idemudia, U. and Ite, U. E. (2006) 'Corporate–Community Relations in Nigeria's Oil Industry: Challenges and Imperatives'. *Corporate Social Responsibility and Environmental Management*, 13 (4), 194-206.

Idemudia, U.,and Ite, U. E. (2006) 'Corporate–Community Relations in Nigeria's Oil Industry: Challenges and Imperatives'. *Corporate Social Responsibility and Environmental Management*, 13 (4), 194-206.

Ihlen, O. (2009) 'The Oxymoron of 'Sustainable Oil Production': the Case of the Norwegian Oil Industry'. *Business Strategy and the Environment* 18, 53-63

Ihlen, O. and Roper, J. (2011) 'Corporate Reports on Sustainability and Sustainable Development: 'We Have Arrived''. *Sustainable Development* 22 (1), 42-51

Ihua, U.B., Ajayi, C. and Eloji, K.N. (2009) 'Nigerian Content Policy in the Oil and Gas Industry: Implications for Small to Medium-Sized Oil-Service Companies'. in Signel, S. (ed.) *Proceedings of the 10th Annual Conference @2009 IAABD*, 'Repositioning African Business and Development for the 21st Century'.

Ikein, A. (2016) 'Nigeria Oil & External Exposure: The Crude gains and Crude Pains of Crude Export Dependence Economy'. *The Business and Management Review* 7 (3), 109-120

Ikram, A. (2004) "Supply Chain Management in the Oil and Gas Sector". Supply Chain Update, University of Wisconsin-Madison School of Business

IMF - International Monetary Fund (2013a) *IMF Calls for Global Reform of Energy Subsidies: Sees Major Gains for Economic Growth and the Environment* [online] available from < https://www.imf.org/external/np/sec/pr/2013/pr1393.htm> [12 June 2014]

IMF – International Monetary Fund (2013b) Energy Subsidising Reform in Sub-Saharan Africa [online] Washington, D.C: IMF Publication Services. available from < https://www.imf.org/external/pubs/ft/dp/2013/afr1302.pdf> [12 June 2014]

INEOS (2015) *Petroineos Grangemouth Refinery; Facts and Figures* [online] available from < http://www.ineos.com/sites/grangemouth/about> [24 June 2016]

Infante, C.E.D., Mendonca, F.M., Purcidonio, P.M. and Valle, R. (2013) 'Triple Bottom Line Analysis of Oil and Gas Industry with Multicriteria Decision Making'. *Journal of Cleaner Production* 52 (1), 289-300

International Monetary Fund (2012) *World Economic Outlook: Growth Resuming, Danger Remain* [online] available from < http://www.imf.org/external/pubs/ft/weo/20

12/01/pdf/text.pdf> [21 October 2013]

Isa, A.H., Hamisu, S., Lamin, H.S., Ya'u, M.Z. and Olayande, J.S. (2013) 'The Perspective of Nigeria's Projected Demand for Petroleum Products'. *Journal of petroleum and Gas Engineering* 4 (7), 184-187

Isa, R. (2014) 'Greenhouse gas (GHG) Emissions And Oil & Gas Revenue in Nigeria'. *Academic Journal of Interdisciplinary Studies* 3 (7), 127-133

Isehunwa, S.O. and Falade, G.K. (2005) 'Framework for Sustainable Indigenous technology Development and Capacity Building in Nigerian Petroleum Industry'. 'SPE International Conference, SPE 98835'. held 1-3 August 2005 at Abuja, Nigeria.

Ivankova, N.V., Creswell, J. W. and Stick, S. L. (2006) 'Using Mixed-Methods Sequential Explanatory Design: From Theory to Practice'. *Field Methods* 18 (1), 3-20

Ivanov, A., Stratiev, D. and Marinov, I (2013) *Improvement of Energy Efficiency in Oil Refining a Question of Survival*. '46th International Conference on Petroleum Processing'. held 7 June 2013 at Bratislava: Slovak Republic.

Jackson, G. (2009) *Actors and Institutions* [online] available from http://www.bath.ac.uk/management/research/papers.htm [14 October 2016]

Jenkins, G.P. and Wright, D.S. (1998) 'Managing Inflexible Supply Chain'. *The International Journal of Logistics Management* 9 (2), 83-90

Jernelov, A. (2010) 'The Threats from Oil Spills: Now, Then and in the Future'. *AMBIO* 39, 353-366

Jia, P., Diabat, A. and Mathiyazhagen, K. (2015) "Analyzing the SSCM Practices in the Mining and Mineral Industry by ISM Approach". *Resources Policy* 46 (1), 76-85

Jick, T. D. (1979) 'Mixing Qualitative and Quantitative Methods: Triangulation in Action'. *Administrative Science Quarterly* 24 (4) 602-611

Jobin, W. (2003) 'Health and Equity Impacts of a Large Oil Project in Africa'. *World Health Organization* 81 (6), 420-426

Joffe, H. and Yardley, L. (2004) "Content and Thematic Analysis". *Research Methods for Clinical and Health Psychology* 56 -66

Johnson, P. and Duberley. *Understanding Management Research: An Introduction to Epistemology*. London: SAGE Publications

Johnson, T.P., and Wislar, J.S. (2012) 'Response Rates and Nonresponse Errors in Surveys'. *JAMA* 307 (17), 1805-1806

Johnson, R.B. and Onwuegbuzie, A.J. (2004) 'Mixed Methods Research: A Research Paradigm Whose Time Has Come'. *Educational Researcher* 33 7, 14-26

Johnson, R.B. and Onwuegbuzie, A.J. (2004) 'Mixed Methods Research: A Research Paradigm Whose Time Has Come'. *Educational Researcher* 33 7, 14-26

Joseph, W.B., Gardner, J.T., Thach, S. and Vernon, F. (1995) 'How Industrial Distributors View Distributor-Supplier Partnership Arrangements'. *Industrial Marketing Management* 24, 27-36

Kadafa, A.A. (2012) 'Environmental Impacts of Oil Exploration and Exploitation in the Niger Delta of Nigeria'. *Global Journal of Science Frontier Research Environment and Earth Sciences* 12 (3), 18-28

Kalejaiye, P.O., Adebayo, K. and Lawal, O. (2013) 'Deregulation and Privatisation in Nigeria: The Advantages and Disadvantages So Far'. *African Journal of Business Management* 7 (25), 2403-2409

Kang, S. and Bae, H. (2012) 'Korea's Petroleum Refinery Industry: Its International Competitiveness and Policy Implications for Future Directions'. *World Review of Business Research* 2 (5), 160-177

Kannan, V.J. and Tan, K.C. (2005) 'Just In Time, Total Quality Management, and Supply Chain Management: Understanding their Linkages and Impact on Business Performance'. *Science Direct* 33, 153-162

Kaplan, B. and Maxwell, J.A. (2005) 'Qualitative Research Methods for Evaluating Computer Information Systems'. in Evaluating the Organizational Impact of Healthcare Information Systems. ed. by Anderson, J.G. and Aydin, C.E. USA: Springer New York, 30-55

Karl, T.L. (2007) 'Oil-Led Development: Social, Political, and Economic Consequences'. *Encyclopedia of Energy* 4, 661-672

Karon, T. (2001) *Ten Years After: Who Won the Gulf War?*. [16 January 2001] available from < http://content.time.com/time/world/article/0,8599,95352,00.html> [3 June 2014]

Kawachi, I., Kennedy, B.P., Lochner, K. and Prothrow-Stith, D. (1997) 'Social Capital, Income Inequality and Mortality'. *American Journal of Public Health* 8 (9), 1491-1498

Kelman, H.C. (1958) 'Compliance, Identification and Internalization: Three Processes of Attitude Change'. *Journal of Conflict Resolution* 51-60

Kemp, J. (2015) *Lindsey Oil Refinery Falls Victim to UK Policy and Shale*. Reuters [online] available from <http://www.reuters.com/article/refineries-britain-kemp-idUSL5N0VM44Q20150212> [28 June 2016]

Ketola, T. (2007) "Ten Years Later: Where is Our Common Future Now?". *Business Strategy and the Environment* 16, 171-189

Kimaro, H. and Nhampossa, J. (2007) 'The Challenges of Sustainability of Health Information Systems in Developing Countries: Comparative Case Studies of Mozambique and Tanzania'. *Journal of Health Informatics in Developing Countries* 1(1), 1-10

King, N. (2004) 'Using Templates in the Thematic Analysis of Text'. in Essential Guide to Qualitative Methods in Organizational Research. ed. by Cassell, C. and Symon, G. London: SAGE Publications, 256-270

King, N. (2004) 'Using Interviews in Qualitative Research'. in *Essential Guide to Qualitative Methods in Organizational Research*. ed. by Cassell, C. and Symon, G. London, Thousand Oaks, New Delhi: Sage Publications

King, N., Cassell, C. and Symon, G. (2004) 'Using Templates in the Thematic Analysis of Texts'. *Essential Guide to Qualitative Methods in Organizational Research* 256-270

Kleindorfer, P.R., Singhal, K. and Wassenhove, L.N. (2005) 'Sustainable Operations Management'. *Production and Operations Management* 14 (4), 482-492.

Kogg, B. and Mont, O. (2012) 'Environmental and Social Responsibility in Supply Chains: The Practise of Choice and Inter-Organisational Management'. Ecological Economics 83, 154-163

Kogg, B. and Mont, O. (2012) 'Environmental and Social Responsibility in Supply Chains: The Practise of Choice and Inter-Organisational Management'. *Ecological Economics* 83, 154-163

Kojima, M. (2013) Oil Price Subsidies – How are Developing Countries Adjusting to $100 Oil [18 July 2013] available from http://blogs.worldbank.org/energy/oil-price-subsidies-how-are-developing-countries-adjusting-100-oil [12 June 2014]

Kolk, A. (2003) 'Trends in Sustainability Reporting'. *Business Strategy and the Environment* 12, 279-291

Kolk, A. and Levy, D. (2001) 'Winds of Change: Corporate Strategy, Climate Change and Oil Multinationals'. *European Management Journal* 19 (5), 501-509

Kolk, J.E.M. (2004) 'A Decade of Sustainability Reporting: Developments and Significance'. *International Journal of Environment and Sustainable Development* 3 (1), 51-64

Kolk, J.E.M., Hong, P. and Van Dolen, W.M. (2010) 'Corporate Social Responsibility in China: An Analysis of Domestic and Foreign Retailers' Sustainability Dimensions'. *Business Strategy and the Environment* 19 (5), 289-303

Kontrovich, A.E., Epov, M.I. and Eder, L.V. (2014) 'Long-term and Medium-term Scenarios and Factors in World Energy Perspectives for the 21st Century'. *Russian Geology and Physics* 55 (5-6), 534-543

Koontz, T.M. (2006) 'Collaboration for Sustainability? A Framework for Analyzing Government Impacts in Collaborative-Environmental Management'. *Sustainability: Science, Practice & Policy* 2 (1), 15-25

Kothari, C.R. (2004) *Research Methodology: Methods and Techniques*. India: New Age International Publishers

Krajnc, D. and Glavic, P. (2005a) 'A Model for Integrated Assessment of Sustainable Development'. *Resources, Conservation and Recycling* 43, 189-208

Krajnc, D. and Glavic, P. (2005b) 'A Model for Integrated Assessment for Sustainable Development'. *Resources , Conservation & Recycling* 43 (2), 189-208

Krauss, 2005 'Research Paradigms and Meaning Making: A Primer'. The Qualitative Report 14 (4), 758-770

Kreiss, S. (2011) *The Origins of the Industrial Revolution in England* [online lecture] Lecture 17, Modern European Intellectual History, 12 August, 2011. available from < http://historyguide.org/intellect/lecture17a.html> [22 October 2014]

Krishnaswami, O.R. and Satyaprasad, B.G. (2010) *Business Research Methods (1)*. India: Himalaya Publishing House

KRPC – Kaduna Refinery and Petrochemical Company Limited (2006)

Krut, R. and Gleckman, H. (1998) ISO 14001: A Missed Opportunity for Sustainable Global Industrial Development. London: Earthscan,

Kuhlman, T. and Farrington, J. (2010) 'What is Sustainability?' *Sustainability* 2 (11), 3463-3448

Kuhn, T.S. (1996) *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press. cited in Carter, C. and Rogers, D. (2008) 'A framework of Sustainable Supply Chain Management: Moving

Toward Theory'. *International Journal of Physical Distribution & Logistics Management* 38 (5), 360-387:364

Kuo, T. and Chang, C. (2008) 'Optimal Planning Strategy for the Supply Chains of Light Aromatic Compounds in Petrochemical Industries'. *Computers and Chemical Engineering* 32, 1147-1166

Kurnia, S., Mahbubur, R.M.D., Samson, D. and Singh, P. (2014) 'Exploring the Adoption of Sustainabile Supply Chain Practices in Australia: Current Practices and Adoption Motivations'. *Proceedings of PACIS*. AIS Electronic Library

La Londe, B.J. and Masters, J.M. (1994) 'Emerging Logistics Strategies: Blueprints for the Next Century'. *International Journal of Physical Distribution & Logistics Management* 24 (7), 35-47

Lambert, D.M. and Cooper, M.C. (2000) 'Issues in Supply Chain Management'. *Industrial Marketing Management* 9, 65-83

Lambert, D.M., Cooper, M.C. and Pagh, J.D. (1998) 'Supply Chain Management: Implementation Issues and Research Opportunities'. *The International Journal of Logistics Management* 9 (2), 1-19

Landorf, C. (2011) 'Evaluating Social Sustainability in Historic Urban Environments'. *International Journal of Heritage Studies* 17 (5), 463-477

Laudal, T. (2010) 'An Attempt to Determine the CSR Potential of the International Clothing Business'. *Journal of Business Ethics* 96, 63-77

Lawal, Y. O. (2014) 'Subsidy Removal or Deregulation: Investment Challenge in Nigeria's Petroleum Industry. *American Journal of Social and Management Sciences* 5 (1), 1-10.

Lawal, Y.O. (2014) 'Subsidy Removal or Deregulation: Investment Challenge in Nigeria's Petroleum Industry'. *American Journal of Social and Management Sciences* 5 (1), 1-10.

Lawrence, A. T. (2002) 'The Drivers of Stakeholder Engagement'. *Journal of Corporate Citizenship*, 2002 (6), 71-85

Lawrence, E.O. (2016) 'The Missing Links: Towards the Effective Management and Control Of Corruption in Nigeria, Africa and the Global South'. *International Journal of Criminology and Sociology* 5, 25-40

LeCompte, M.D. and Goetz, J.P. (1982) 'Problems of Reliability and Validity in Ethnographic Research'. *Review of Educational Research* 52 (1), 31-60

Lee, H.L. (2004) 'A Triple-A Supply Chain'. *Harvard Business Review* 82 (10), 102-112

Lee, H.L. and Billington, C. (1995) 'The Evolution of Supply-Chain-Management Models and Practice at Hewlett-Packard'. *Interfaces* 25 (5), 42-63

Lee, K. and Ni, S. (2002) 'Onn the Dynamic Effects of Oil Price Shocks: A Study Using Industry Level Data'. *Journal of Monetary Economics* 49 (4), 823-852

Lehtonen, M. (2004) 'The Environmental – Social Interface of Sustainable Development: Capabilities, Social Capital, Institutions'. *Ecological Economics* 49, 199-214

Lenzen, M., Murray, J., Sack, F. and Wiedmann, T. (2007) 'Shared Producer and Consumer Responsibility – Theory and Practice'. *Ecological Economics* 61, 25-42

Leonard, N.H., Beauvais, L.L. and Scholl, R.W. (1999) 'Work Motivation: The Incorporation of Self-Concept-Based Processes'. *Human Relations* 52 (8), 969-998

Leornard_Barton, D. (1990) 'A Dual Methodology for Case-Studies: Synergistic Use of a Longitudinal Single Site With Replicated Multiple Sites'. *Organizational Science* 1 (3), 248-266

Leug, R. and Radlach, R. (2015) 'Managing Sustainable Development with Management Control Systems: A Literature Review'. *European Management Journal* 1-14

Leung, W. (2001) 'How to Design a Questionnaire'. Student BMJ 9 (11), 187-189

Levy, D.L. and Kolk, A. (2002) 'Strategic Responses to Global Climate Change: Conflicting Pressures on Multinationals in the Oil Industry'. *Business and Politics* 4 (3), 275-300

Linder, M., Bjorkdahl, J. and Ljungberg, D. (2014) 'Environmental Orientation and Economic Performance: A Quasi-Experimental Study of Small Swedish Firms'. *Business Strategy and the Environment* 23, 333-348

Linnenluecke, M.K. and Griffiths, A. (2010) "Corporate Sustainability and Organizational Culture". *Journal of World Business* 45 (4), 357-366

Linton, J.D, Klassen, R. and Jayaraman, V. (2007) 'Sustainable Supply Chains: An Introduction'. Journal of Operations Management 25, 1075-1082

Littig, B. and Grießler, E. (2005) 'Social Sustainability: A Catchword between Political Pragmatism and Social Theory'. *International Journal of Sustainable Development* 8 (1/2), 65-80

Lizuka, M. (2000) 'Role of Environmental Awareness in Achieving Sustainability Development'. *Economic Commission for Latin America and the Caribbean*

Lombardo, G. and Vigano, F. (2014) 'Exploring the Role of CSR Practices in Supply Chain Management'. *Impresa Progetto – Electronic Journal of Management* 3, 1-10

Longoni, A. and Cagliano, R. (2015) 'Environmental and Social Sustainability Priorities: Their Integration Strategies'. *International Journal of Operations & Production Management* 35 (2), 216-245

Lopez, V. (2012) 'Venezuela Refinery Death Toll Rises to 41'. *The Guardian* [online] 26 August. available from < http://www.theguardian.com/world/2012/aug/26/venezuela-refinery-explosion-death-toll> [20 May 2014]

Lummus, R.R. and Vokurka, R.J. (1999) 'Defining Supply Chain Management: A Historical Perspective and Practical Guidelines'. *Industrial Management and Data Systems* 99 (1), 11-17

Maak, T., and Pless, N. M. (2006) 'Responsible Leadership in a Stakeholder Society–A Relational Perspective'. *Journal of Business Ethics* 66 (1), 99-115.

MacDonald, J.P. (2005) "Strategic Sustainable Development Using the ISO 14001 Standard". *Journal of Cleaner Production* 13 (6), 631-643

Magis, K. and Shinn, C. (2009) 'Emergent Themes of Social Sustainability'. in '*Understanding the Social Aspects of Sustainability*'. ed. by Dillard, J., Dujon, V. and King, M.C. New York: Routeledge, 1-15

Majekodunmi, A. (2013) 'The Political Economy of Fuel Subsidy Removal in Nigeria'. International Journal of Management and Social Sciences Research 2 (7), 76-81

Managi, S.,Opaluch, J.J., Jin, D. and Grigalunas, T.A. (2005) 'Environmental Regulations and Technological Change in the Offshore Oil and Gas Industry'. *Land Economics* 81 (20), 303-319

Mangan, J., Lalwani, C., Butcher, T. and Javadpour, R. *Global Logistics & Supply Chain Management.* United Kingdom: John Wiley & Sons Ltd

Mani,V., Agrawal, R. and Sharma, V. (2015) 'Supply Chain Social Sustainability: A Comparative Case Analysis in Indian Manufacturing Industries'. *Social and Behavioural Sciences* 189, 234-251

Mann, C.J. (2003) 'Observational Research Methods: Research Design II: Cohort, Cross Sectional, and Case-Control Studies'. *Emerg Med J.* 20, 54-60

Manzano, F.S. (2005) *Supply Chain Practices in the Petroleum Downstream* [online] MEng dissertation. Massachusetts Institute of Technology. available from

<http://dspace.mit.edu/bitstream/handle/1721.1/33345/62395452.pdf> [15 October 2013]

Mariano, J.B. and La Rovere, E.L. (2008) 'Environmental Impacts of the Oil Industry' Encyclopaedia of Life Support Systems [online] available from < http://www.eolss.net/sample-chapters/c08/e6-185-18.pdf> [16 July 2014]

Marshall, M.N. (1996) 'Sampling for Qualitative Research'. *Family Practice- An International Journal* 13 (6), 522-525

Marshall, M.N. (1996) 'Sampling for Qualitative Research'. *Family Practice- An International Journal* 13 (6), 522-525

Matos, S. and Hall, J. (2007) 'Integrating Sustainable Development in the Supply Chain: The case of Life Cycle Assessment in Oil and Gas and Agricultural Biotechnology'. Journal of Operations Management 25 (6), 1083-1102

Maxwell, J.A. (2008) 'Designing a Qualitative Study'. *The SAGE Handbook of Applied Social Research Methods, Los Angeles*, 215-246

Maxwell, J.A. (2013) *Qualitative Research Design: An Interactive Approach*. Thousand Oaks, London, Singapore: SAGE Publications

May, K.A. (1991) 'Interview Techniques in Qualitative Research: Concerns and Challenges'. *Qualitative Nursing Research: A Contemporary Dialogue* 188-201

McKenzie, S. (2004) 'Social Sustainability: Towards Some Definitions'. Hawk Research Institute [online] 27, 1-31. Available from < http://w3.unisa.edu.au/hawkeinstitute/

McWilliams, A., Siegel, D. S., and Wright, P. M. (2006) 'Corporate Social Responsibility: Strategic Implications'. *Journal of Management Studies* 43 (1), 1-18.

McWilliams, A., Siegel, D. S., and Wright, P. M. (2006) 'Corporate Social Responsibility: Strategic Implications'. *Journal of Management Studies* 43 (1), 1-18.

Meixell, M.J. and Gargeya, V.B. (2005) 'Global Supply Chain Design: A Literature Review and Critique'. *Transport Review* 41 (6), 531-550

Mentzer, J.T., De Witt, W., Keebler, J.S., Miu, S., Nix, N.W., Smith, C.D. and Zacharia, Z.G. (2001) 'Defining Supply Chain Management'. *Journal of Business Logistics* 22 (2), 1-26

Meredith, J. and Vineyard, M. (1993) 'A Longitudinal Study of the Role of Manufacturing Technology in Business Strategy'. *International Journal of Operations & Production Management* 13 (12), 3-14

Mihelcic, J.R., Crittenden, J.C., Small, M.J., Shonnard, D.R., Hokanson, D.R., Zhang, Q., Chen, H., Sorby, S.A., James, V.U., Sutherland, J.W. and Schnoor, J.L. (2003) 'Sustainability Science and Engineering: The Emergence of a New Metadiscipline'. *Environmental Science & Technology* 37 (23), 5314-5324

Miles, M.B., Huberman, A.M. (1994) *Qualitative Data Analysis*. 2nd edn. London: SAGE Publications

Mintzberg, H. (1996) 'Managing Government, Governing Management'. *Harvard Business Review* 74 (3), 75-83

Mirchi, A., Haidan, S., Madani, K., Rouhani, O.M. and Rouhani, A.M. (2012) 'World Energy Balance Outlook and OPEC Production Capacity: Implications for Global Oil Security'. *Energies* 5 (8), 2626-2651

Mitchell, J., Marcel, V. and Mitchell, B. (2012) *What Next for the Oil & Gas Industry*. available from https://www.chathamhouse.org/sites/files/chathamhouse/public/Research/Energy,%20Environment%20and%20Development/1012pr_oilgas.pdf [13 June 2016]

Mitchell, J.V. and Mitchell, B. (2014) 'Structural Crisis in the Oil and Gas industry'. *Energy Policy* 64, 36-42

Mitchell, R.K., Agle, B.R. and Wood, D.J. (1997) 'Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts'. *Academy of Management Review* 22 (4), 853-886

MNN - Mother Nature Network (2014) *The 13 Largest Oil Spills in History* [online] available from http://www.mnn.com/earth-matters/wilderness-resources/stories/the-13-largest-oil-spills-in-history [20 May 2014]

Moffat, D., and Lindén, O. (1995) 'Perception and Reality: Assessing Priorities for Sustainable Development in the Niger River Delta'. *Ambio* 24 (7), 527-538

Mohite, S. (2013) Downstream Refining Challenges and Future Configuration. '*SPE Kuwait Oil and Gas Show and Conference*'. held 7-10 October 2013 at Mishref, Kuwait

Mohite, S. (2013) *Downstream Refining Challenges and Future Configuration*. 'SPE Kuwait Oil and Gas Show' held 7-10 October 2013 at Mishref, Kuwait.

Mohite, S.D. (2014) Downstream Refining and Petrochemicals Challenges – Future Configuration. '*SPE Biennial Energy Resources Conference'*. held 9-11 June at Port of Spain, Trinidad

Moneva, J.M., Archel, P. and Correa, C. (2006) 'GRI and the Camouflaging of Corporate Unsustainability'. *Accounting Forum* 30, 121-137

Moran, J.W and Brightman, B.K. (2000) "Organizational Change". *Journal of Workplace Learning: Employee Counselling Today* 12 (2), 66-74

Morgan, D.L. (1998) 'Practical Strategies for Combining Qualitative and Quantitative Methods: Applications to Health Research'. *Qualitative Health Research* 8 (3), 362-376

Morgan, G. and Smircich, L. (1980) 'The Case for Qualitative Research'. *Academy of Management Review* 5 (4), 491-500

Morse, J. (2000) 'Determining Sample Size'. *Qualitative Health Research* 10 (1), 3-5

Morse, J.M. (2017) *Essentials of Quality-Driven Mixed-Method Designs*. New York: Routledge

Morse, J.M. (1994) 'Designing Funded Qualitative Research' in Handbook of Qualitative Research. ed. by Denzin, N.K. and Lincoln, Y.S. United States of America: SAGE Publications

Murano, G. (2015) 'European Union Follow-Up: A View of the Industry'. 5th EU Refining Forum Brussels [online] available from < https://ec.europa.eu/energy/sites/ener/files/documents/Refining%20Forum%20150615%20Energy%20Union%20Follow%20up%20ExxonMobil_nn.pdf> [28 June 2016]

Murphy, P. and Manitsky, D. (2010) 'Improving Supply Chain Compliance in Developing Countries'. IndustryWeek 30 December [online] available from < http://www.industryweek.com/environment/improving-supply-chain-compliance-developing-countries> [18 January 2017]

Myers, M.D. (1997) 'Qualitative Research in Information Systems'. *Management Information Systems Quarterly* 21, 241-242

National Population Commission Nigeria (2014) *State Population* [online] available from < http://www.population.gov.ng/index.php/state-population> [18 July 2014]

Natural Resources Canada (2010) *The Importance of Crude Oil* [online] available from < http://www.nrcan.gc.ca/energy /publications/sources/crude/ issues-prices/1223> [19 July 2013]

NBS – National Bureau of Statistics (2010) *Annual Abstract of Statistics* [online] available from <http://nigerianstat.gov.ng/nbslibrary/nbs-annual-abstract-of-statistics/nbs-annual-abstract-of-statistics> [22 July 2014]

NDDC (2013) *The Niger Delta Regional Development Master-Plan – Niger Delta Region Land and People* [online] available from <http://www.nddc.gov.ng/NDRMP

20Chapter%201.pdf> [16 December 2013]

Neumayer, E. (2003) Weak versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms. Northampton: Edward Elgar Publishing

New, S., Green, K. and Morton, G. (2002) 'An Analysis of Private versus Public Sector Responses to the Environmental Challenges of the Supply Chain'. *Journal of Public Procurement* 2 (1), 93-105

NGO Committee on Education (1987) – *Report of the World Commission on Environment and Development: Our Common Future no A/42/427* [online] available from < http://www.un-documents.net/ocf-02.htm> [13 June 2013]

Nigerian National Petroleum Corporation (2010) *Oil Production* [online] available from <http://www.nnpcgroup.com/NNPCBusiness/IpstreamVentures/OilProduction.a
spx> [21 November 2013]

Niven, K. and McLeod, R. (2009) 'Offshore Industry: Management of Health Hazards in the Upstream Petroleum Industry'. *Occupational Medicine* 59, 304-309

Nkechi, A., Emeh Ikechukwu, E.J. and Okechukwu, U.F. (2015) 'Entrepreneurship Development and Employment Generation in Nigeria: Problems and Prospects'. *Universal Journal of Education and General Studies* 1 (4), 88-102

Nnadili, B.N. (2006) Supply and Demand Planning for Crude Oil Procurement in Refineries [online] MEng dissertation. Massachusetts Institute of Technology. < http://dspace.mit.edu/handle/1721.1/36140> [15 October 2013]

NNPC -Nigerian National Petroleum Corporation (2010) 'Product Distribution' [online] available from < http://www.nnpcgroup.com/NNPCBusiness/DownStream/ProductDistribution.aspx>
(9 June 2014]

NNPC – Nigerian National Petroleum Corporation (2010) *About NNPC* [online] available from www.nnpcgroup.com/AboutNNPC/CorporateInfo.aspx [16 January 2015]

NNPC – Nigerian National petroleum Corporation (2010) *NNPC Business* [online] available from < http://www.nnpcgroup.com/NNPCBusiness/Subsidiaries/WRPC.aspx> [16 July 2014]

NNPC Monthly Report (2016) *NNPC Financial and Operations Report* [online] available from < http://nnpcgroup.com/Portals/0/Monthly%20Financial%20and%20Operations%20Data/Full%20Reports/NNPC%20Monthly%20Financial%20and%20Operations%20Report%20for%20the%20month%20of%20January%202016.pdf> [3 March 2017]

Nodoushani, O., Stewart, C., Kaur, M. (2016) 'Recycling and Its Effect on the Environment'. Competition Forum 14 (10), 65

Noland, J. and Phillips, R. (2010) 'Stakeholder Management, Discourse Ethics and Strategic Management'. *International Journal of Management Reviews* 12 (1), 39-49

Norman, W and MacDonald, C. Getting to the Bottom of "Triple Bottom Line". *Business Ethics Quarterly* 14 (2), 243-262

Novick, G. (2008) 'Is There a Bias Against Telephone Interviews in Qualitative Research'. Res. Nursing Health 31 (4), 391-398

Noy, C. (2008) 'Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research'. *Journal of Social Research Methodology* 11 (4), 327-344

Nurain, H.I. and Allen, D. 'Information sharing and trust during major incidents: Findings from the oil industry'. *Journal of the American Society for Information Science and Technology* 63 (10), 1916-1928.

Nwabuozor, A. (2005) 'Corruption and Development: New Initiatives in Economic Openness and Strengthened Rule of Law'. *Journal of Business Ethics* 59 (1-2), 121-138

Nwilo, P. C., and Badejo, O.T. (2006) 'Impacts and Management of Oil Spill Pollution Along the Nigerian Coastal Areas'. *Administering Marine Spaces: International Issues* 119, 1-15.

O'Reilly, C. and Chatman, J. (1986) 'Organizational Commitment and Psychological Attachment: The Effects of Compliance, Identification and Internalization on Prosocial Behaviour'. *Journal of Applied Psychology* 71 (3), 492-499

O'Rouke, D. (2014) 'The Science of Sustainable Supply Chains'. *Science* 344 (6188), 1124-1127

O'Rouke, D. and Connolly, S. (2003) 'Just Oil? The Distribution of Environmental and Social Impacts of Oil Production and Consumption'. *Annual Review of Environment and Resources* 28, 587-617

Obi, C.I. (2007) *Oil and Development in Africa: Some Lessons from the Oil Factor in Nigeria for the Sudan* no. 8. Copenhagen: Danish Institute for International Studies

Odeyemi, O. and Ogunseitan, O.A. (1985) 'Petroleum Industry and its Pollution Potential in Nigeria'. *Oil and Petrochemical Pollution* 2 (3), 223-229

Odularu, G.O. (2007) 'Crude Oil and the Nigerian Economic Performance'. *Oil and Gas Business* 1-29

Odularu, G.O. (2008) 'Crude Oil and the Nigerian Economic Performance'. *Oil and Gas Business* 1-29

Odumugbo, C.A. (2010) 'Natural Gas Utilisation in Nigeria: Challenges and Opportunities'. *Journal of Natural Gas Science and Engineering* 2, 310-316

Office for National Statistics (2013) '*Population Estimates for UK, England and Wales, Scotland and Northern Ireland, Mid-2011 and Mid-2012*'. [online] available from < http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-uk--engl and-and-wales--scotland-and-northern-ireland/mid-2011-and-mid-2012/index.html> [16 December 2013]

Ogri, O.R. (2001) 'A Review of the Nigerian Petroleum Industry and the Associated Environmental Problems'. *The Environmentalist* 21, 11-21

Oh, T.H., Pang, S.Y. and Chua, S.C. (2010) 'Energy Policy and Alternative Energy in Malaysia: Issues and Challenges for Sustainable Growth'. *Renewable and Sustainable Energy Reviews* 14 (4), 1241-1252

Okonkwo, T. (2015) 'Carbon-Credit development: Is Nigeria Ready for International Trading'. *International Journal of Innovative Research & Development* 4 (13), 320-322

Okpaga, A., Ugwu, S.C. and Eme, O.I. (2012) 'Deregulation and Anti-Subsidy Removal Strikes in Nigeria'. *Arabian Journal of Business Management Review* 1 (7), 69-83

Olukoju, A. (2014) 'The Challenges of Sustainable Development in Nigeria'. International *Journal of Management Sciences and Humanities* 2 (2), 1-10

Omer, A. (2011) 'Energy, Environment, and Sustainable Development in Sudan'. *Special Issue on Environmental Management for Sustainable Development*. 2 (1), 31-44

Omodanisi, E.O., Eludoyin, A.O. and Salami, A.T. (2014) 'A Multi-perspective view of the Effects of a Pipeline Explosion in Nigeria'. *International Journal of Disaster Risk Reduction* 7, 68-77

Omodanisi, E.O., Eludoyin, A.O. and Salami, A.T. (2014) 'A Multi-perspective view of the Effects of a Pipeline Explosion in Nigeria'. *International Journal of Disaster Risk Reduction* 7, 68-77

Omodanisi, E.O., Eludoyin, A.O. and Salami, A.T. (2015) 'Ecological Effects and Perceptions of Victims of Pipeline Explosion'. *International Journal of Environmental Science & Technology* 12 (5), 1635-1646

Omofonwan, S.I. and Odia, L.O. (2009) 'Oil Exploitation and Conflict in the Niger-Delta Region of Nigeria'. *Journal of Human Ecology* 26 (1), 25-30

Omoniyi, B.A. and Oluwadare, O.I. (2013) "Environmental Pollution and Refinery Operations in an Oil Producing region of Nigeria: A Focus on Warri Petrochemical Company". *IOSR Journal of Environmental Science, Toxicology and Food Technology* 2 (6), 18-23

ONS –Office for National Statistics (2014) *UK Population* [online] available from < http://ons.gov.uk/ons/taxonomy/index.html?nscl=Population> [25 September 2014]

Onuoha, F. (2007) 'Poverty, Pipeline Vandalisation/Explosion and Human Security: Integrating Disaster Management into Poverty Reduction in Nigeria'. *African Security Studies* 16 (2), 94-108

Onuoha, F. (2008) 'Oil Pipeline Sabotage in Nigeria: Dimensions, Actors and Implications for National Security'. *African Security Studies* 17 (3), 99-115

Onuoha, F.C. (2008) 'Oil Pipeline sabotage in Nigeria: Dimensions, Actors and Implications for National Security'. *African Security Studies* 17.3, 99-115

Opdenakker, R. (2006) 'Advantages and Disadvantages of Four Interview Techniques in Qualitative Research'. *Forum Qualitative Sozialforschung/Forum: Qualitative Social research* 7 (4)

Opukri, C.O. and Ibaba, I.S. (2008) 'Oil Induced Environmental Degradation and Internal Population Displacement in the Nigeria's Niger Delta'. *Journal of Sustainable Development in Africa* 10 (1), 173-193

Osabiya, B.J. (2015) 'Ethnic Militancy and Internal Terrorism on Nigeria's National Security'. *International Journal of Development and Conflict* 5, 59-75

Osborne, J.W. (1990) 'Some Basic Existential-Phenomelogical Research Methodology for Counsellors'. *Canadian Journal of Counselling* 24 (2), 79-91

Osborne, J.W. (1990) 'Some Basic Existential-Phenomenological Research Methodology for Counsellors'. Canadian Journal of Counselling 24 (2), 79-91

OSHA - Occupational Safety and Health Administration (1999) '*OSHA Technical Manual- Section IV: Chapter 2 Petroleum Refining Processes United States Department of Labour*' [online] available from

<https://www.osha.gov/dts/osta/otm/otm_iv/otm_iv_1.html> [19 May 2014]

Ostlund, U., Kidd, L., Wengstrom, Y. and Rowar-Dewar, N. (2011) 'Combining Qualitative and Quantitative Research within Mixed-Method Research Designs: A Methodological Review'. *International Journal of Nursing Studies* 48 (3), 369-383

Oviasuyi, P.O. and Uwadiae, J. (2010) 'The Dilemma of Niger-Delta Region as Oil Producing States of Nigeria'. *Journal of Peace, Conflict and Development* 16, 110-126

Owoeye, T. and Adetoye, D. (2016) 'Political Economy of Downstream Oil Sector Deregulation in Nigeria'.

Paki, F.A.E. and Ebienfa, K.I. 2011 'Militant Oil Agitations in Nigeria's Niger Delta and the Economy'. *International Journal of Humanities and Social Sciences* 1 (5), 140-145

Palmer, B. and Culver, M. (2011) Oil Regulation 2011 [online] available from < http://www.cms-cmck.com/Hubbard.FileSystem/files/Publication/3853367f-6b8e-4df5-bdc9-128c149438b7/Presentation/PublicationAttachment/ffd4150> [16 March 2015]

Panagiotidis, T. and Rutledge, E. (2007) 'Oil and Gas Markets in the UK: Evidence from a Cointegrating Approach'. *Energy Economics* 29 (2), 329-347

Parente, S.L. and Prescott, E.C. (1994) "Barriers to Technology Adoption and Development". *Journal of Political Economy* 102 (2), 298-321

Patten, D.M. (1992) 'Intra-Industry Environmental Disclsures in Response to the Alaskan Oil Spill: A Note on Legitimacy Theory'. *Accounting, Organizations and Society* 17 (5), 471-475

Patton, M. Q. (1999) 'Enhancing the Quality and Credibility of Qualitative Research'. *HSR: Health Services Research* 34 (5), 1189-1208

Patton, M. Q. (2002) *Qualitative Research and Evaluation Methods*. 3rd edn. United States of America: SAGE Publications

Patton, M.Q. (1990) *Qualitative Evaluation and Research Methods*. 2nd Edn. Newbury Park, CA: SAGE Publications

Patton, M.Q. (2001*) Qualitative Research and Evaluation Methods*. 3rd edn. United States of America: SAGE Publications

Patton, M.Q. (2002) *Qualitative Research and Evaluation Methods*. 3rd edn. United States of America: SAGE Publications

Pearce, D. and Barbier, E. (2000) *Blueprint for a Sustainable Economy*. London: Earthscan

Pearce, D., Markandya, A. and Barbier, E.B. (1989) *Blueprint for a Green Economy*. London: Earthscan

Pearce, F. (2012) 'Hopes Fade for Cleanups In Nigeria's Oil-Rich Delta'. *Yale Environment* 360 [online] 16 April. available from

<http://e360.yale.edu/feature/hopes_fade_for_cleanup_in_nigerias_oil-rich_delta/2517/ >[16 October 2013]

Pedersen, E.R. (2006) 'Making Corporate Social Responsibility (CSR) Operable: How Companies Translate Stakeholder Dialogue into Practice'. *Business and Society Review* 111 (2), 137 – 163

Perry, M., Jacob, M., Jacob,Chase, M. and Von Laue, T. (2009) *Western Civilization: Ideas, Politics, and Society*. USA: Houghton Mifflin Harcourt Publishing Company

Perry, N. (2014) Beneath the Ukraine Crisis: Shale Gas [online] available from < http://www.globalresearch.ca/beneath-the-ukraine-crisis-shale-gas/5379228> [12 June 2014]

Petrini, M. and Pozzebon, M. (2010) 'Integrating Sustainability into Business Practices: Learning from Brazilian Firms'. *BAR – Brazilian Administration Review* 7 (4), 362-428

Petroleum Insights (2012) *World's Top 23 Proven Oil Reserves Holders, Jan1 2013* [online] available from < http://petroleuminsights.blogspot.co.il/2012/01/worlds-top-23-proven-oil-reserves.html> [13 December 2013]

Petros Sebhatu, S. and Enquist, B. (2007) "ISO 14001 as a Driving Force for Sustainable Development and Value Creation". *The TQM Magazine* 19 (5), 468-482

Pfeffer, J. (1995) 'Producing Sustainable Competitive Advantage Through the Effective Management of People'. *Academy of Management Executive* 9 (1), 55-73

Pfeffer, J. and Salancik, G. (1978) *The External Control of Organizations: A Resource Dependence Perspective*. New York: Harper and Row

Phillips 66 (2016) 'Sustainability in Operations' [online] available from http://www.phillips66.com/EN/susdev/operational/Pages/default.aspx [8 August 2016]

Pies, I., Von Winning, A., Sardison, M. and Girlich, K. (2010) 'Sustainability in the Petroleum Industry: Voluntary Self-Commitments'. *University of Wittenberg Business Ethics Study* [online] 2010-1, 1-112. available from

<http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1595943&download=yes>[5 August 2013]

Ploch, L. (2007) *A CRS Report for Congress; Nigeria: Current Issues*. Washington D.C.: Congressional Research Service

Podolak, K., Lowe, E., Wolny, S., Nickel, B. and Kelsey, R. (2017) 'Informing Watershed Planning and Policy in the Truckee River Basin Through Stakeholder Engagement, Scenario Development, and Impact Evaluation'. *Environmental Science & Policy* 69, 124-135

Pointer, G. (2005) '*The UK's Major Urban Areas'.* The Office for National Statistics [online] available from < http://www.ons.gov.uk/ons/search/index.html?pageSize=

50&sortBy=none&sortDirection=none&newquery=UK%27s+most+urban+cities+

Graham+Pointer> [16 December 2013]

Polkinghorne, D.E. (2005) 'Language and Meaning: Data Collection in Qualitative Research'. *Journal of Counselling Psychology* 52 (2), 137-145

Pomeranz, K. and Topik, S. (2015) *The World that Trade Created: Society, Culture, and the World Economy, 1400 to the Present.* London and New York: Routeledge

Poorman, P.B. (2007) 'Perceptions of Thriving By Women Who Have Experienced Abuse or Status-Related Oppression'. *Psychology of Women Quarterly* 26 (1), 51-62

Pope, C., Ziebland, S. and Mays, N. (2000) 'Analysing Qualitative Data'. *Qualitative Research in Health Care* 320, 114-116

Pope, C., Ziebland, S. and Mays, N. (2000) 'Analysing Qualitative Data'. *BMJ: British Medical Journal* 320 (7227), 114-116

Porter, M. and Van Der Linde, C. (1995) 'Toward a New Conception of the Environment-Competitiveness Relationship'. *Journal of Economic Perspectives* 9 (4), 97-118

Porter, M. and Van Der Linde, C. (1996) 'Green and Competitive: Ending the Stalement'. *Business and the Environment* 61-77

Porter, M.E. and Kramer, M.R. (2006) 'Strategy and Society: The Link between Competitive Advantage and Corporate Social Responsibility'. *Harvard Business Review* 78-93

Post, J., Preston, L. and Sachs, S. (2002) 'Managing the Extended Enterprise: The New Stakeholder View'. *California Management Review* 45 (1), 6-28

Post, J., Preston, L. and Sachs, S. (2002) 'Managing the Extended Enterprise: The New Stakeholder View'. *California Management Review* 45 (1), 6-28

Post, J.E. and Altman, B.W. (1994) "Managing the Environmental Change Process: Barriers and Opportunities". *Journal of Organizational Change Management* 7 (4), 64-81

Powell, T.C. (1995) 'Total Quality Management as Competitive Advantage: A Review and Empirical Study'. Strategic Management Journal 16 (1), 15-37 publications/downloads/wp27.pdf> [17 June 2013]

Pratima, B. and DesJardine, M.R. (2014) 'Business Sustainability: It is About Time'. *Strategic Organization* 12 (1), 70-78

Pulver, S. (2007) 'Making Sense of Corporate Environmentalism: An Environmental Contestation Approach to Analyzing the Causes and Consequences of the Climate Change Policy Split in the Oil Industry'. *Organization & Environment* 20 (1), 44-83

Purvin & Gertz (2013) *The Role and Future of the UK Refining Sector in the Supply of Petroleum Products* [online] available from <http://www.ukpia.com/docs/default-source/publication-files/therolefutureoftheukrefiningsector.pdf> [28 June 2016]

Purvin and Gertz (2013) 'The Role and Future of the UK Refining Sector in the Supply of {Petroleum Products and Its Value to the UK Economy'. UKPIA Statistical Review

Pyke, D.F., Farley, J. and Robb, D.J. (2000) 'Manufacturing and Supply Chain Management in China'. *European Management Journal* 18 (6), 577-589

Qadri, M.A., Haleem, A. and Arif, M. (2011) 'Identification of Drivers for Greening of Supply Chain'. International Journal of Construction Project Management 3 (3), 213-229

Qerimi, F.F. and Hajdari, M. (2017) 'Economic Sustainability As Regional Development Factor'. ResearchGate

sQSR International (2015) *NVivo the #1 Software for Qualitative Data Analysis* [online] available from www.qsrinternational.com/what-is-nvivo [11 November 2015]

Rabanal, L.I., Kuehl, H.S., Mundry, R., Robbins, M.M. and Boesch, C. (2010) 'Oil Prospecting and Its Impact on Large Rainforest Mammals in Loango National Park Gabon'. *Biological Conservation* 143 (4), 1017-1024

Rabe-Hesketh, S. and Everitt, B.S. (2004) Statistical Analyases Using Stata. 3rd edn. Boca Raton; London; New York; Washington DC: CRC Press Company

Rajasekar, S., Philominathan, P. and Chinnathambi, V. (2013) *Research Methodology* [online] available from <arxiv.org/pdf/physics/0601009.pdf> [26 April 2016]

Rametsteiner, E., Pulzi, H., Alkan-Olsson, J. and Frederiksen, P. (2011) 'Sustainability Indicator Development- Science or Political Negotiation?'. *Ecological Indicators* 11, 61-70

Ramus, C.A. (2001) "Organizational Support for Employees: Encouraging Creative Ideas for Environmental Sustainability". *California Management Review* 43 (3), 85-105

Rao, P. and Holt, D. (2005) 'Do Green Supply Chains Lead to Competitiveness and Economic Performance'. *International Journal of Operations and Production Management* 25 (9), 898-916

RatingsDirect (2014) Key Credit factors for the Oil Refining and Marketing Industry. [online] available from < http://static.ow.ly/docs/RatingsDirect_Commentary_958902_04_18_2012_12_11_15_Asi.pdf> [5 July 2016]

Raut, R.D., Narkhede, B. and Gardas, B.B. (2017) 'To Identify the Critical Success Factors of Sustainable Supply Chain Management Practices in the Context of Oil and Gas Industries: ISM Approach'. *Renewable and Sustainable Energy* Reviews 68, 33-47

Reed, M.S., Fraser, E.D.G. and Dougill, A.J. (2006) 'An Adaptive Learning Process for Developing and Applying Sustainability Indicators with Local Communities'. *Ecological Economics* 59, 406-418

Reijnders, L. (2000) 'A Normative Strategy for Sustainable Resource Choice and Recycling'. *Resources, Conservation and Recycling* 28, 121-133

Restrepo, C. E., Simonoff, J. S. and Zimmerman, R. 'Causes, Cost Consequences, and Risk Implications of Accidents in US Hazardous Liquid Pipeline Infrastructure'. *International Journal of Critical Infrastructure Protection* 2 (1), 38-50.

Rialp, A., Rialp, J., Urbano, D. and Vaillant, Y. (2005) 'The Born-Global Phenomenon: A Comparative Case Study Research'. *Journal of International Entrepreneurship* 3, 133-171

Rim-Rukeh, A. (2015) 'Oil Spill Management in Nigeria: SWOT Analysis of the Joint Investigation Visit (JIV) Process'. Journal of Environmental Protection 6, 259-271

Rinaldi, L., Unerman, J. and Tilt, C. (2014) 'The Role of Stakeholder Engagement and Dialogue within the Sustainability Accounting and Reporting Process'. *Sustainability Accounting and Accountability* 86-107

Ritchie, J. and Lewis, J. (2003) Qualitative Research Practice: A Guide for Social Science Students and Researchers. London, Thousand Oaks, New Delhi: SAGE Publications

Robinson, A. (2015) *The Evolution and History of Supply Chain Management* [online] available from <http://cerasis.com/2015/01/23/history-of-supply-chain-management/> [27 March 2017]

Robinson, C.J. and Malhotra, M.J. (2004) 'Defining the Concept of Supply Chain Quality Management and its Relevance to Academic and Industrial Practice'. *International Journal of Production Economics* 96 (3), 315-337

Robinson, J. (2004) 'Squaring the Circle? Some Thoughts on the Idea of Sustainable Development'. *Ecological Economics* 48. 369-384

Robinson, S., Marsland, L., Murrells, T., Hickey, G., Hardyman, R. and Tingle, A. (1998) 'Designing Questionnaires and Achieving High Response Rates in a Longitudinal Study of Nurse Diplomates' Careers'. *Nursing Times Research* 3 (3), 179-198

Rondinelli, D. and Vastag, G. (2000) "Panacea, Common Sense, or Just a Label? The Value of ISO 14001 Environmental Management Systems". *European Management Journal* 18 (5), 499-510

Rondinelli, D.A. and Berry, M.A. (2000) 'Environmental Citizenship in Multinational Corporations: Social Responsibility and Sustainable Development'. *European Management Journal* 18 (1), 70-84

Ross, M.L. (1999) 'The Political Economy of the Resource Curse'. *World Politics* 51 (2), 297-322

Ross, M.L. (2003) Nigeria's Oil Sector and the Poor. Position Paper for DFID-Nigeria, UCLA, Los Angeles

Rossman, G.B. and Wilson, B.L. (1985) 'Numbers and Words: Combining Quantitative and Qualitative Methods in a Single Large-Scale Evaluation Study'. *Evaluation Review* 9 (5), 627-643

Saha, M. and Darnton, G. (2005) 'Green Companies or Green Con-panies: Are Companies Really Green, Or Are They Pretending To Be?'. *Business and Society Review* 110 (2), 117-157

Sajjad, A., Eweje, G. and Tappinn, D. (2015) 'Sustainable Supply Chain Management: Motivators and Barriers'. *Business Strategy and the Environment* 24, 643-655

Sala-i-Martin, X., and Subramanian, A. (2003) 'Addressing the National Resource Curse: An Illustration from Nigeria'. *Journal of African Economies*, 22 (4), 570-615

Saldana, J. (2009) *An Introduction to Codes and Coding: The Coding Manual for Qualitative Researchers*. Los Angeles, CA: SAGE Publications, 1-31

Samaranayake, P. (2005) 'A Conceptual Framework for Supply Chain Management: A Structural Integration'. *Supply Chain Management: An International Journal* 10 (1), 47-59

Samson, D. and Terziovski, M. (1999) 'Relationship Between Total Quality Management Practices and Operational Performance'. *Journal of Operations Management* 17 (4), 393-409

Sancha, C., Longoni, A. and Gimenez, C. (2015) 'Sustainable Supplier Development Practices: Drivers and Enablers in a Global Context'. *Journal of Purchasing and Supply Management* 21 (2), 95-102

Sandelowski, M. (1991) 'Telling Stories: Narrative Approaches in Qualitative Research'. Image: The Journal of Nursing Scholarship 23 (3), 161-166

Sani, S.B. and Kouchy, R. (2014) 'Effect of the Deregulation of Downstream Oil Sector on the Gross Domestic Product (GDP) and Employment in Nigeria'. *The Macrotheme Review* 3 (3), 117-136

Santiteerakul, S., Sekhari, A., Bouras, A. and Sopadang, A. (2015) 'Sustainability Performance Measurement Framework for Supply Chain Management'. *International Journal of Product Development* 20 (3), 221-238

Sarkis, J. (2001) 'Manufacturing's Role in Corporate Environmental Sustainability'. *International Journal of Operations & Production Management*. 21 (5/6), 666-686

Sarkis, J., Gonzalez-Torre, P. and Adenso-Diaz, B. (2010) "Stakeholder Pressure and the Adoption of Environmental Practices: The Mediating Effect of Training". *Journal of Operations Management* 28 (2), 163-176

Saunders, M., Lewis, P. and Thornhill, A. (2012) *Research Methods for Business Students*. England: Pearson Education Limited

Saunders, M., Lewis, P. and Thornhill, A. (2012) *Research Methods for Business Students*. 6th edn. England Pearson Education Limited

Sax, L.J., Gilmartin, S.K. and Bryant, A.N. (2003) 'Assessing Response Rates and Non Response Bias in Web and Paper Surveys'. *Research in Higher Education* Vol 44 (4), 409-432

Scandura, T.A. and Williams, E.A. (2000) "Research Methodology in Management: Current Practices, Trends, and Implications for Future Research". *Academy of Management Journal* 43 (6), 1248- 1264

Schaltegger, S. and Burritt, R. (2014) 'Measuring and Managing Sustainability Performance of Supply Chains: Review and Sustainability Supply Chain Management Framework'. *Supply Chain Management: An International Journal* 20 (1), 42-55

Sear, T.N. (1993) 'Logistics Planning in the Downstream Oil Industry'. *Journal of the Operational Research Society* 44 (1), 9-17

Sebastian, M.S., Armstrong, B. and Stephens, C. (2002) 'Outcomes of Pregnancy Among Women Living in the Proximity of Oil Fields in the Amazon Basin of Ecuador'. *International Journal of Occupational Environmental Health* 8 (4), 312-319

Seidl, M.and Simak, L. (2012) 'Protection of Critical Infrastructure'. *Logistics and Transport* 14, 81-101

Selin, S.W., Schuett, M.A. and Carr, D. (2010) 'Modeling Stakeholder Perceptions of Collaborative Initiative Effectiveness'. Society & Natural Resources 13 (8), 734-745

Selznick, P. (1985) 'Focusing Organizational Research on Regulation'. *Regulatory Policy and Social Sciences* 363-367

Seuring, S. (2008) 'Assessing the Rigor of Case Study Research in Supply Chain Management'. *Supply Chain Management: An International Journal* 13 (2), 128-137

Seuring, S. and Muller, M. (2008) 'From a Literature Review to a Conceptual Framework for Sustainable Supply Chain'. *Journal of Cleaner Production* 16, 1699-1710

Seuring, S. and Muller, M. (2008) 'From a Literature Review to a Conceptual Framework for Sustainable Supply Chain'. *Journal of Cleaner Production* 16, 1699-1710

Seuring, S., Sarkis, J., Muller, M. and Rao, P.

Seuring, S.A. (2008) 'Assessing the Rigour of Case Study Research in Supply Chain Management'. *Supply Chain Management: An International Journal* 13 (2), 128-137

Seuring, S. (2013). 'A review of Modeling Approaches for Sustainable Supply Chain Management'. *Decision Support Systems* 54(4), 1513-1520.

Sharfman, M.P., Shaft, T.M. and Anex Jr., R.P. (2009) 'The Road to Cooperative Supply-Chain Environmental Management: Trust and Uncertainty Among Pro-Active Firms' *Business Strategy and the Environment* 18, 1-13

Sharma, A. (2015) 'Importance of Coins in Tracing Economic History'. International Journal of Multidisciplinary Educational Research 4 (3), 16-22

Sharma, S. and Henriques, I. (2005) 'Stakeholder Influences on Sustainability Practices in the Canadian Forest Products Industry'. *Strategic Management Journal* 26, 159-180

Sharma, S. and Starik, M. (2002) *Research in Corporate Sustainability: The Evolving Theory and Practice of Organizations in the Natural Environment*. UK, USA: Edward Elgar Publishing

Sharma, S. and Vredenburg, H. (1998) 'Proactive Corporate Environmental Strategy and the Development of Competitively valuable Organizational Capabilities'. *Strategic Management* 19, 729-753

Shrivastava, P. (1995) 'The Role of Corporations in Achieving Ecological Sustainability'. *Academy of Management Review* 20 (4), 936-960

Silvestre, B.S. (2015) 'Sustainable Supply Chain Management in Emerging Economies: Environmental Turbulence, Institutional Voids and Sustainability Trajectories'. *Int. J. Production Economics* 167, 156-169

Sinelnikov, S., Inouye, J. and Kerper, S, (2015) 'Using Lead Indicators to Measure Occupational Health and Safety Performance'. *Safety Science* 72, 240-248

Singh, R.K., Murty, H.R., Gupta, S.K. and Dikshit, A.K. (2009) 'An Overview of Sustainability Assessment Methodologies'. *Ecological Indicators* 9, 189-212

Singha, A.K., Aditya, H.K., Tiwari, M.K. and Chan, F.T.S. (2011) 'Agent Oriented Petroleum Supply Chain Coordination: Co-evolutionary Particle Swarm Optimization Based Approach'. *Expert Systems with Applications* 38 (5), 6132-6145

Skjærseth, J.B. and Skodvin, T. (2001) 'Climate Change and the Oil Industry: Common Problems, Different Strategies'. *Global Environmental Politics* 1 (4), 43-64

Slaper, T.F. and Hall, T.J. (2011) 'The Triple Bottom Line: What Is It and How Does It Work?'. *Indiana Business Review* 86(1), 4-8

So, S. and Sun, H. (2011) 'An Extension of IDT in Examining the Relationship Between Electronic-Enabled Supply Chain Integration and the Adoption of Lean Production'. *International Journal of Production Research* 49 (2), 447-466

So, S., Parker, D. and Xu, H. (2012) 'A Conceptual Framework for Adopting Sustainability in the Supply Chain'. in ANZAM Operations, Supply Chain and Services management Symposium 397-413

Soile, I.O., Tsaku, H. and Yar'Adua, B.M. (2014) 'The Impact of Gasoline Subsidy Removal on the Transportation Sector in Nigeria'. *American Journal of Energy* Research 2 (3), 60-66

Sorensen, H.T., Sabroe, S. and Olsen, J. (1996) 'A Framework for Evaluation of Secondary data Sources for Epidemiological Research'. International Journal of Epidemiology 25 (2), 425-433

Sørensen, H.T., Sabroe, S. and Olsen, J. (1996) 'A Framework for Evaluation of Secondary Data Sources for Epidemiological Research'. *International Journal of Epidemiology* 25 (2), 435-442

Sorrell, S., Speirs, J., Bentley. R., Brandt, A. and Miller, R. (2010) 'Global Oil Depletion: A Review of the Evidence'. *Energy Policy* 38 (9), 5290-5295

Spence, D.B. (2011) 'Corporate Social Responsibility in the Oil and Gas Industry: The Importance of Reputational Risk'. *Chicago-Kent Law Review* 86 (1), 59

Srivastava, S.K. (2007) 'Green Supply-Chain Management: A State-of-the-Art Literature Review'. *International Journal of Management Reviews* 9 (1), 53-80

Stadtler, H. (2004) 'Supply Chain Management and Advanced Planning – Basics, Overview and Challenges'. *European Journal of Operational Research* 163, 575- 588

Stambouli, A.B., Khizat, Z., Flazi, S. and Kitamura, Y. (2012) 'A review on the renewable energy development in Algeria: Current perspective, energy scenario and sustainability issues'. *Renewable and Sustainable Energy Reviews* 16 (7), 4445-4460

Stake, R.E. (2006) *Multiple Case Analysis*. New York: Guilford Press

Starks, H. (2007) 'Choose Your Method: A Comparison of Phenomenology, Discourse Analysis, and Grounded Theory'. *Qualitative Health Research* 17 (10), 1372-1380

Steckler, A., McLeroy, K.R., Goodman, R.M., Bird, S.T. and McCormick, L. (1992) 'Toward Integrating Qualitative and Quantitative Methods: An Introduction'. *Health Education Quarterly* 19 (1), 1-8

Stepping Stones Nigeria (2013) *About the Niger Delta* [online] available from < http://www.steppingstonesnigeria.org/about-the-niger-delta.html> [16 December 2013]

Stevens, G.C. (1989) 'Integrating Supply Chains'. *International Journal of Physical Distribution and Materials Management* 23 (8), 3-8

Stigka, E.K., Paravantis, J.A., Mihalakakou, G.K. (2014) 'Social Acceptance of Renewable Energy Sources: A Review of Contingent Valuation Applications'. *Renewable and Sustainable Energy Reviews* 32, 100-106

Stonham, P. (2000) 'BP Amoco: Integrating Competitive and Financial Strategy. Part One: Strategic Planning in the Oil Industry'. *European Management Journal* 18 (4), 411-419

Straub, S. (2008) 'Infrastructure and Growth in developing Countries: Recent Advances and Research Challenges'. *Policy Research Working Paper* 3-42

Strauss, A. and Corbin, J. (1999) *Basics of Qualitative Research; Techniques and Procedures for Developing Grounded Theory*. 2nd edn. California: SAGE Publications, 3-14

Strauss, A. and Corbin, J. (1994) 'Grounded Theory Methodology'. *Handbook of Qualitative Research* 273-285

Stuart, F.I. (1993) 'Supplier Partnerships: Influencing Factors and Strategic Benefits'. *International Journal of Purchasing and Materials Management* 29 (4), 22-28

Stuart, I., McCutcheon, D., Handfield, R. and McLachlin, R. (2002) 'Effective Case Research in Operations Management: A Process Perspective'. *Journal of Operations Management* 20 (5), 419-433

Sturges, J.E. and Harahan, K.J. (2004) 'Comparing telephone and Face-To-Face Interviewing: A Research Note'. *Qualitative Research* 4 (1), 107-118

Suchman, M. C. (1995) 'Managing Legitimacy: Strategic and Institutional Approaches'. *Academy of Management Review* 20 (3), 571-610.

Sukati, I., Hamid, A. B. A., Baharun, R., Alifiah, M. N., and Anuar, M. A. (2012) 'Competitive Advantage Through Supply Chain Responsiveness and Supply Chain Integration'. *International Journal of Business and Commerce (IJBC), 1* (7), 2402-2413

Suri, H. (2011) 'Purposeful Sampling in Qualitative Research Synthesis'. *Qualitative Research Journal* 11 (2), 63-75

Sustainable Measures and Performance Outcomes' *Int. J. Production Economics* 146 (2),

Svensson, D. (2007) 'Aspects of Sustainable Supply Chain Management (SSCM): Conceptual Framework and Empirical Example'. *Supply Chain Management: An International Journal* 12 (4), 262-266

Svensson, G. (2007) "Aspects of Sustainable Supply Chain Management (SSCM): Conceptual Framework and Empirical Example". *Supply Chain Management: An International Journal* 12 (4), 262-266

Sweet, L. (2002) 'Telephone Interviewing: Is It Compatible with Interpretive Phenomenological Research'. *Contemporary Nurse* 12 (1), 58-63

Szirmai, A and Verspagen, B. (2015) 'Manufacturing and Economic Growth in Developing Countries, 1950-2005'. *Structural Change and Economic Dynamic* 34, 46-59

Szklo, A. and Schaeffer, R. (2007) 'Fuel Specification, Energy Consumption and CO_2 Emission in Oil Refineries'. *Energy* 32 (7), 1075-1092

Tabachnick, B.G. and Fidell, L.S. (2007*) Using Multivariate Statistics*. Boston: Pearson Education Inc

Tachizawa, E.C. and Thomsen, C.G. (2007) 'Drivers and Sources of Supply Flexibility: An Exploratory Study'. *International Journal of Operations & Production Management* 27 (10), 1115-1136

Tang, C. (2006) 'Robust strategies for Mitigating Supply Chain Disruptions'. *International Journal of Logistics* 9 (1), 33-45

Tashakkori, A. and Teddlie, C. (1998) *Mixed Methodology: Combining Qualitative and Quantitative Approaches.* Thousand Oaks; London; New Delhi: SAGE Publications

Tate, W.L., Ellram, L.M. and Kirchoff, J.F. 'Corporate Social Responsibility Reports: A Thematic Analysis Related to Supply Chain Management'. *Journal of Supply Chain Management* 46 (1), 19-44

Tavakol, M. and Dennick, R. (2011) 'Making Sense of Cronbach's Alpha'. *Int. J. Med. Educ*. 2, 53-55

Taylor, C. and Gibbs, G.R. (2010) 'How and What to Code'. *Online QDA Web Site* [online] available from www.onlineqda.hud.ac.uk/Intro_QDA/how_what_to_code.php [12 November 2015]

Teddlie, C. and Yu, F. (2007) 'Mixed Methods Sampling: A Typology with Examples'. *Journal of Mixed Methods Research* 1 (1), 77-100

Tena, A.B.E., Llusar, J.C.B. and Puig, V.R. (2001) 'Measuring the Relationship between Total Quality Management and Sustainable Competitive Advantage: A Resource-Based View'. *Total Quality Management* 12 (7-8), 932-938

Tesch, R. (1990) *Qualitative Research: Analysis Types & Software Tools*. New York; London: The Falmer Press

Teuscher, P., Grueninger B., Ferdinand, N. (2006) 'Risk Management in Sustainable Supply Chain Management (SSCM): Lessons Learnt from the Case of GMO-Free Soyabeans'. *Corporate Social Responsibility and Environmental Management* 13, 1-10

Teuteberg, F. and Wittstruck, D. (2010) "A Systematic Review of Sustainable Supply Chain Management". *Multikonferenz Wirtschaftsinformatik*

Texaco (2016) *Pembroke Refinery* [online] available from <https://texaco.co.uk/about-us > [28 June 2016]

Texaco (2016) *Valero Refinery UK* [online] available from <https://texaco.co.uk/about-us> [28 June 2016]

Thomas, D.R. (2006) 'A General Inductive Approach for Analyzing Qualitative Evaluation Data'. *American Journal of Evaluation* 27 (2), 237-246

Thomson, J. (2013) Refineries and Associated Plant: Three Accident Case Studies [online] available from

<http://www.safetyinengineering.com/FileUploads/Refineries%20and%203%20accident%20case%20studies%20v2_1370770924_2.pdf> [21 May 2014]

Thorne, S. (2000) 'Data Analysis in Qualitative Research'. *Evidence-Based Nursing* 3 (2), 68-70

Todnem By, R. (2005) "Organizational Change Management: A Critical Review". *Journal of Change Management* 5 (4), 369-380

Toman, M. A. (1994) 'Economics and "Sustainability": Balancing Trade-Offs and Imperatives'. *Land Economics* 70 (4), 399-413

Tong, A., Sainsbury, P. and Craig, J. (2007) 'Consolidated Criteria for Reporting Qualitative Research (COREQ): A 32-Item Checklist for Interviews and Focus Groups'. *International Journal for Quality in Health Care* 19 (6), 349- 357

Tongco, M.D.A. (2007) 'Purposive Sampling as a Tool for Informant Selection'. *Ethnobotany Research & Applications* 5, 147-158

Torvik, R. (2009) 'Why Do Some Resource Abundant Countries Succeed While Others Do Not'. *Oxford Review of Economic Development* 25 (2), 241-256

Toscano, P. (2010) 'The World's Worst Oil Disasters'. *CNBC* [online] 29 April. available from < http://www.cnbc.com/id/36851250/page/1> [20 May 2014]

Total (2015) *Total in the UK* [online] available from www.total .uk/en/total-uk/total-uk [28 June 2016]

Touboulic, A. and Walker, K.L. (2015) 'Theories in Sustainable Supply Chain Management: A Structured Literature Review'. *International Journal of Physical Distribution & Logistics Management* 45 (1/2), 16-42

Tracy, S.J. (2013) *Qualitative Research Methods: Collecting Evidence, Crafting Analysis, Communicating Impact*. UK: John Wiley and Sons

Tuli, F. (2011) 'The Basis of Distinction between Qualitative and Quantitative Research in Social Sciences: Reflection on Ontological, Epistemological and Methodological Perspectives'. *Ethiopian Journal of Education and Sciences* 6 (1), 97-108

Tybout, J. (2000) 'Manufacturing Firms in Developing Countries: How Well Do They Do, and Why?'. *Journal of Economic Literature* 38 (1), 11-44

Ucha, C. (2010) "Poverty in Nigeria: Some Dimensions and Contributing Factors". *Global Majority E-Journal* 1 (1), 46-56

UNFCC - United Nations Framework Convention on Climate Change (2017) Climate Action [online] available from https://unfccc.int/climate-action/momentum-for-change [26 December 2017]

UKOOG (2013) *History of the Onshore Oil and Gas Industry in the UK* [online] available from <http://www.ukoog.org.uk/knowledge-base/history/what-is-the-history-of-the-onshore-oil-and-gas-industry-in-the-uk> [22 October 2014]

UKPIA (2011) 'Fuelling the UK's Future: The Role of Our Refining and Downstream Oil Industry'. [Online] available from http://www.ukpia.com/docs/default-source/publication-files/fuelling-the-uks-future.pdf?sfvrsn=0 [10 August 2016]

UKPIA (2011) 'Meeting Our Energy Needs: The Future of UK Oil Refining'. [online] available from <http://www.ukpia.com/docs/default-source/publication-files/ukpia-the-future-of-uk-oil-refining.pdf?sfvrsn=0> [10 August 2016]

UKPIA (2012) 'Our Downstream Oil Industry: A Global Challenge' [online] available from http://www.ukpia.com/docs/default-source/publication-files/summer-2012-news.pdf?sfvrsn=0 [10 August 2016]

UKPIA (2012) *Phillips 66 Humber Refinery* [online] available from <www.ukpia.com/industry_information/refining-and-uk-refineries/phillips66.aspx> [27 June 2016]

UKPIA (2012) *Refining and UK Refineries* [online] available from < http://ukpia.com/industry_information/refining-and-uk-refineries.aspx> [17 June 2016]

UKPIA (2012) *Total Lindsey Refinery* [online] available from www.ukpia.com/industry_information/refining-and-uk-refineries/total-lindsey-oil-refinery.aspx [27 June 2016]

UKPIA (2012) *Valero Pembroke Refinery* [online] available from <www.ukpia.com/industry_information/refining-and-uk-refineries/Valero-pembroke-refinery.aspx> [28 June 2016]

UKPIA (2015) *Statistical Review 2015* [online] available from < http://www.ukpia.com/docs/default-source/default-document-library/ukpia-2015-statistical-reviewf72b5c889f1367d7a07bff0000a71495.pdf?sfvrsn=0> [21 June 2016]

UKPIA Statistical Review 2016 (2016) *Refinery Emissions* [online] available from http://www.ukpia.com/docs/default-source/default-document-library/statistical-review-2016.pdf?sfvrsn=0 [30 March 2017]

United Nations (2006) *Johannesburg Summit 2002* [online] available from <www.johannesburgsummit.org/html/basic_info/unced.html> [21 July 2013]

United Nations (2007) *Indicators of Sustainable Development: Guidelines & Methodologie*s. New York: United Nations

United Nations (2008) *World Economic Situation and Prospects 2008* [online] available from < http://www.un.org/en/development/desa/policy/wesp/_archive/2008 wespupdate.pdf> [21 October 2013]

United States Environmental Protection Agency (2008) An Assessment of the Environmental Implications of Oil and Gas Production: A Regional Case Study. United States: SectorStrategies

University Library (2015) *STATA; Data Analysis and Statistical Software* [online] available from http://guides.library.illinois.edu/STATA [4 August 2016]

Uriz, G.H. (2003) 'The Application of the World Bank Standards to the Oil Industry: Can the World Bank group promote corporate responsibility' *J. Int'l. L*. 28, 77-122

Vachon, S. and Mao, Z. (2008) 'Linking Supply Chain Strength to Sustainable Development: A Country-Level Analysis'. *Journal of Cleaner Production* 16 (15), 1552-1560

Vachon, S. and Mao, Z. (2008) 'Linking Supply Chain Strength to Sustainable Development: A Country-Level Analysis'. *Journal of Cleaner Production* 16 (15), 1552-1560

Vaisey, S. (2009) 'Motivation and Justification: A Dual-Process Model of Culture in Action 1'. *American Journal of Sociology* 114 (6), 1675- 1715

Van den Hove, S., Le Menestrel, M. and De Bettignies, H. (2002) 'The Oil Industry and Climate Change: Strategies and Ethical Dilemmas'. Climate Policy 2, 3-18

Van den Hove, S., Le Menestrel, M., and De Bettignies, H. C. (2002) 'The Oil Industry and Climate Change: Strategies and Ethical Dilemmas'. *Climate Policy*, 2 (1), 3-18.

Van der Vaart, T. and Van Donk, D. P. (2008) 'A Critical Review of Survey-Based Research in Supply Chain Integration'. *International Journal of Production Economics* 111 (1), 42-55

Van Lakerveld, A. and Van Tulder, R. (2016) 'Managing the Transition to Sustainable Supply Chain Management Practices'. *EMIT Working Paper Series*

Vanguard (2016) 'NNPC to Set Up $300m Energy renewable Plant in Benue' Vanguard [online] 19 July. Available from < http://www.vanguardngr.com/2016/07/nnpc-set-energy-renewable-plant-benue/> [03 April 2017]

Vanguard (2016) Gasoline Importation in Nigeria. [online] available from < http://www.vanguardngr.com/2016/03/its-cheaper-to-import-petrol-than-refine-locally-kachikwu/> [7 July 2016]

Varma, S., Wadhwa, S. and Deshmukh, S.G. (2006) 'Implementing Supply Chain Management in a Firm: Issues and Remedies'. *Asian, Pacific Journal of Marketing and Logistics* 18 (3), 223-243

Veleva, V., Hart, M., Greiner, T. and Crumbley, C. (2000) 'Indicators of Sustainable Production'. *Journal of Cleaner Production* 9, 447-45

Vivian, E.L., Blamah, V.N. and Ezemokwe, I. (2012) "Socio-economic Impact of the Kaduna Refining and Petrochemical Company (KRPC) on the Rido Area of Kaduna Metropolis". *Journal of Environmental Management* and Safety 3 (5), 124-139

Vlek, C. and Steg, L. (2007) 'Human Behaviour and Environmental Sustainability: Problems, Driving Forces, and Research Topics'. *Journal of Social Issues* 63 (1), 1-19

Voss, C.A., Tsikriktsis, N., Frohlich, M. (2002) 'Case Research in Operations Management'. *International Journal of Operations & Production Management* 22 (2), 195-219

Walker, F.A. (1878) *Money*. US: Cornell University Library

Walker, H. and Jones, N. (2012) 'Sustainable Supply Chain Management Across the UK Private Sector'. *Supply Chain Management: An International Journal* 17 (1), 15-28

Walker, H., Di Sisto, L. and McBain, D. (2008) 'Drivers and Barriers to Environmental Supply Chain Management Practices: Lessons from the Public and Private Sectors'. *Journal of Purchasing & Supply Chain Management* 14, 69-85

Walker, H., Di Sisto, L. and McBain, D. (2008) 'Drivers and Barriers to Environmental Supply Chain Management Practices: Lessons from the Public and Private Sectors'. *Journal of Purchasing & Supply Chain Management* 14, 69-85

Walker, H., Di Sisto, L., and McBain, D. (2008) 'Drivers and Barriers to Environmental Supply Chain Management Practices: Lessons from the Public and Private Sectors'. *Journal of Purchasing and Supply Management 14*(1), 69-85.

Walker, H., Di Sisto, L., and McBain, D. (2008) 'Drivers and Barriers to Environmental Supply Chain Management Practices: Lessons from the Public and Private Sectors'. *Journal of Purchasing and Supply Management 14*(1), 69-85.

Walliman, N. (2006) *Social Research Methods*. Thousand Oaks: SAGE Publications Ltd

Wan Ahmad, W.N., Rezaei, J., Tavasszy, L.A. and De Brito, M.P. (2016) 'Commitment to and Preparedness for Sustainable Supply Chain Management in the Oil and gas Industry'. *Journal of Environmental Management* 180, (202-213)

Wan-Hussin, W.N. and Alazzani, A. (2013) 'Global Reporting Initiative's Environmental Reporting: A Study of Oil and Gas Companies'. Ecological Indicators 32, 19-24

Wanderley, L.S.O., Lucian, R., Farache, F. and Filho, J.M. (2008) 'CSR Information Disclosure on the Web: A Context-Based Approach Analysing the Influence of Country of Origin and Industry Sector'. *Journal of Business Ethics* 82, 369-378

Washington, H, (2015) 'Is 'Sustainability' the Same as 'Sustainable Development'?'. *Sustainability: Key issues* 359.

Wbscd Business Solutions for a Sustainable World (2013) Eco-efficience Learning Module [online] available from <http://www.wbcsd.org/pages/EDocument/EDocumentDetails.aspx?ID=13593&NoSearchContextKey=true> [16 October 2013]

WCED - World Commission on Environment and Development (1987) *Our Common Future* New York: Oxford University Press

Weitzman, E.A. (2000) 'Software and Qualitative Research'. in Handbook of Qualitative Research. ed. by Denzin, N.K. and Lincoln, Y.S. USA: SAGE Publications, 803-820

Weitzman, E.A. and Miles, M.B. (1995) A Software Sourcebook: Computer Programs for Qualitative Data Analysis. California: SAGE Publications

Welsh, E. (2002) 'Dealing with Data: Using NVivo in the Qualitative Data Analysis Process'. *Forum: Qualitative Social Research* 3 (2)

Wernerfelt, B. (1984) 'A Resource-Based View of the Firm'. *Strategic Management Journal* 5, 171-180

Whiting, L.S. (2008) 'Semi-Structured Interviews: Guidance for Novice Researchers'. *Nursing Standard* 22 (23), 36-41

WHO (2016) Legislation and Regulation [online] available from <www.who.int/heli/tools/legis_regul/en/> [18 January 2016]

Willett, W.C., Sampson, L., Browne, M.L., Stampfer, M.J., Rosner, B., Hennekens, C.H. and Speizer, F.E. (1988) 'The Use of Self-Administered Questionnaire to Assess Diet Four Years in the Past'. *American Journal of Epidemiology* 127 (1), 188-200

William, B., Onsman, A. and Brown, T. (2010) 'Exploratory factor Analysis: A Five-Step Guide for Novices'. Journal of Emergency Primary Health Care 8 (3), 1-13

Wilson, J.Q. (1989) *Bureaucracy: What Government Agencies Do and Why They Do It*. USA: Basic Books

Wilson, T.D. (2002) 'Alfred Schutz, Phenomenology and Research Methodology for Information Behaviour Research'. *The New Review of Information Behaviour Research* 3 (71), 1-15

Winkler, H., Howells, M. and Baumert,K. (2002) 'Sustainable Development Policies and Measures'.

Winter, M. and Knemeyer, A.M. (2013) 'Exploring the Integration of Sustainability and Supply Chain Management: Current State and Opportunities for Future Enquiry'. *International Journal of Physical Distribution and Logistics Management* 43 (1), 18-38

Withagen, C.A. (2009) 'Weak and Strong Sustainability'. Principles of Sustainable Development 3, 186-190

Wognum, P.M., Bremmers, H., Trienekens, J.H., Van der Vorst, J.G.A.J. and Bloemhof, J.M. (2011) 'Systems for Sustainability and Transparency Food Supply Chains – Current Status and Challenges'. *Advanced Engineering Informatics* 25, 65-76

Wolf, J. (2014) 'The Relationship between Sustainable Supply Chain Management, Stakeholder Pressure and Corporate Sustainability Performance'. *Journal of Business Ethics* 119(3), 317-328.

Wolf, J. (2011) 'Sustainable Supply Chain Management Integration: A Qualitative Analysis of the German Manufacturing Industry'. *Journal of Business Ethics* 102 (2), 221-235

Wolfe, R.A. and Putler, D.S. (2002) 'How Tight are the Ties that Bind Stakeholder Groups?'. *Organization Science* 13 (1), 64-80

Wood Mackenzie (2009) *UK Downstream Oil Infrastructure: Final Report by Wood Mackenzie* [online] available from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69757/1_20091214104502_e___ukdownstreamoilinfrastructurewoodmackenzie.pdf [30 March 2017]

Woodland, R. (1995) 'The Concept of Environmental Sustainability'. Annual *Review of Ecology and Systematics* 26, 1-24

World Bank (2010) Subsidies in the Energy Sector: An Overview [online] available from http://siteresources.worldbank.org/EXTESC/Resources/Subsidy_background_paper.pdf [12 June 2014]

World Bank Group (2007) The Petroleum Sector Value Chain [online] available from http://siteresources.worldbank.org/INTOGMC/Resources/noc_chapter_1.pdf [12 June 2016]

World Oil (2016) *Oil Drilling at Record Low Spells Doom for North Sea's Revival*. [online] available from < http://www.worldoil.com/news/2016/01/22/oil-drilling-at-record-low-spells-doom-for-north-sea-s-revival> [5 July 2016]

WRPC - Warri Refining and Petrochemical Company Limited (2014) *Production Processes* [online] available from < http://www.wrpcnnpcng.com/about3.htm> [16 July 2014]

Wu, J. (2013) 'Landscape Sustainability Science: Ecosystem Services and Human Well-Being in Changing Landscapes'. *Landscape Ecology* 8(6), 999-1023.

Wu, Z. and Pagell, M. (2011) 'Balancing Priorities: Decision-Making in Sustainable Supply Chain Management'. *Journal of Operations Management* 29 (6), 577-590

Xing, Y., Horner, R.M.W., El-Haram, M.A. and Bebbington, J. (2009) 'A Framework Model for Assessing Sustainability Impacts of Urban Development'. *Accounting Forum* 33, 209-224

Yaibuathet, K., Enkawa, T and Suzuki, S. (2008) 'Influences of Institutional Environment Toward the Development of Supply Chain Management'. *International Journal of Production* 115 (2), 262-271

Yap, B.W. and Sim, C.H. (2011) 'Comparisons of Various Types of Normality Tests**'.** *Journal of Statistical Computation & Simulation* 81 (12), 2141-2155

Yarwar, S.A. and Seuring, S. (2015) 'Management of Social Issues in Supply Chains: A Literature Review Exploring Social Issues, Actions and Performance Outcomes'. *Journal of Business Ethics* 1-23

Yin, R. (1994) *Case Study Research*. Sage Publications

Yin, R.K. (2009) *Case Study Research Design and Methods*. 4th edn. United States of America: SAGE Publications

Yusuf, Y. Y., Gunasekaran, A., Musa, A., Dauda, M., El-Berishy, N. M., and Cang, S. (2014) 'A Relational Study of Supply Chain Agility, Competitiveness and Business Performance in the Oil and Gas Industry'. *International Journal of Production Economics* 147, 531-543.

Yusuf, Y.Y., Gunasekaran, A., Musa, A., El-Berishy, N.M., Abubakar, T. and Ambursa, H.M. (2012) 'The UK Oil and Gas Supply Chains: An Empirical Analysis of Adoption of Sustainable Measures and Performance Outcomes' *Int. J. Production Economics* 146 (2), 501-514

Zailani, S., Jeyaraman, K., Vengadasan, G. and Premkumar, R. (2012) 'Sustainable Supply Chain Management in Malaysia: A Survey'. *International Journal of Production* 140 (1), 330-340

Zairi, M. (2002) 'Beyond TQM Implementation: The New Paradigm of TQM Sustainability'. *Total Quality Management* 13 (8), 1161-1172

Zhu, Q. and Sarkis, J. (2004) 'Relationships between Operational Practices and Performance Among early Adopters of Green Supply Chain Management Practices in Chinese Manufacturing Enterprises'. Journal of Operations Management 22 (3), 265-289

Zhu, Q., Sarkis, J. and Geng, Y. (2014) 'Green supply Chain Management in China: Pressures, Practices and Performance'. *International Journal of Operations & Production Management* 25 (5), 449-468

Zhu, Q., Sarkis, J. and Lai, K. (2013) 'Institutional-based Antecedents and Performance Outcomes of Internal and External Green Supply Chain Management'. *Journal of Purchasing and Supply Management* 19 (2), 106-117

Zorzini, M., Hendry, L., Stevenson, M. and Pozzetti, A. (2008) 'Customer Enquiry Management and Product Customization – An Empirical Multi-Case Study Analysis in the Italian capital Goods Sector'. *International Journal of Operations & Production Management* 28 (12), 1186-1218

APPENDICES

Appendix A – Informed Consent Form

Project Title: Sustainable Supply Chain Management in the Oil Industry

Name, position and contact address of Researcher: Temitope A Akinremi

Research Student

Coventry University

Please tick box

I confirm that I have read and understood the information leaflet for the above mentioned study.	☐
I confirm that I have had the opportunity to ask questions.	☐
I understand that my participation is voluntary and I can chose to withdraw from the study at any time, without giving reason.	☐
I understand that I can decide not to answer any specific question	☐
I agree to take part in the study	☐
I agree that data given by me in this study may be stored (after it has been anonymised) and may be used for future research	☐

Please tick box

	Yes	**No**
I agree to the interview being audio recorded	☐	☐
I agree to the use of anonymised quotes in publications	☐	☐

Name of Participant	Date	Signature
Name of Researcher	Date	Signature

Appendix B – Participant Information Leaflet

FACULTY OF ENGINEERING & COMPUTING
COVENTRY UNIVERSITY
RESEARCH STUDENT: Temitope A. Akinremi
Coventry University

TITLE OF RESEARCH PROJECT
Towards the Development of a Framework for the Enhancement of Sustainable Supply Chain Management in the Nigerian Oil Industry

You are being requested to participate in a research study. Before you choose to take part in this study, it is important for you to understand the reasons for this research and what it will entail. Please take time to read the following information carefully.

PURPOSE OF THE STUDY
The purpose of this study is to develop a framework that will examine the interaction between sustainability and the supply chain at the downstream interface for the refining and storage supply chain links. The target industry are the UK downstream oil industries, the Nigerian downstream oil sector, suppliers and local communities around downstream infrastructures. The study will last for a duration of three years and data will be collected in the 2nd year of the study.

DO I HAVE TO TAKE PART?
Participation in this study is completely voluntary. Therefore, it is entirely your choice to take part or not to take part in the study. If you however decide to take part, you will be given this information leaflet and be asked to complete and sign a consent form. You are also free to stop your participation at any time during the study without giving a reason.

PARTICIPATION IN THIS RESEARCH WILL INVOLVE
The methods of data collection for this research will include the use of questionnaires and semi-structured interviews. After completing and signing the consent form, you will be asked to complete a questionnaire which should take no longer than 20minutes. Many of the questions can be answered by ticking boxes or by simply giving your opinion on a rated scale. This may also require more detailed comments in available boxes.
You may also be asked to answer questions in a face-to-face interview. Your opinion will be sought on relevant sustainability issues, processes and supply chain matters as applicable to the oil industry and affected stakeholders.
Collected data will be stored and recorded appropriately in an anonymous manner and individual responses will not be identifiable.

POSSIBLE DISCOMFORT
There is a possibility that answering the questionnaire or participating in the interview may take some of your time. You may however choose to end your participation at any time during the study and information given will be destroyed appropriately and will not be used for the purpose of the study.

BENEFITS OF TAKING PART
Taking part in this study will give you the opportunity to influence positively the concept of sustainability and contribute to the sustainable development body of knowledge. Data obtained will provide the government, executives and managers within the petroleum industry with a better insight on how to

manage and implement sustainability in supply chains in order to improve business performance, society-industry relationship, and corporate reputation and ultimately, save the environment.

WHAT WILL HAPPEN TO COLLECTED DATA

All obtained information and data will be kept confidential and will not be made available to people not directly involved in the study. Your name and responses will be kept anonymous and will not be identifiable. Data obtained may be published in scientific work, but your name and identity will not be revealed. Questionnaires will be coded in order to maintain anonymity and safely stored. All electronic data will be stored in a password protected computer and all data will remain confidential and anonymous.

WHAT SHOULD I DO IF I WANT TO TAKE PART

Complete and sign the attached consent form and questionnaire. Indicate the appropriate time for an interview (if applicable).

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY

Results of the research study will form part of my assessment and will be used in writing up my final PhD Research Thesis. Results may also be published in journal and conference publications.

WHO IS ORGANISING THE RESEARCH

I am conducting the research as a student of Coventry University, Faculty of Engineering & Computing, and Department of Engineering Management.

WHO HAS REVIEWED THE STUDY

The research has been approved by the University Research Ethics Committee, Coventry University.

Appendix C - Interview Questions

Nigerian Downstream Oil Industry (Refining, Transportation and Storage Supply Chain Links)

For the purpose of this research, the downstream sector refers to the Refining, Transportation and Storage links of the downstream supply chain. This covers refinery operations to convert crude oil to gasoline and the conveyance of refined gasoline via pipelines to the storage terminals.

Sustainability is the development that meets the need of present generation without compromising the ability of future generations from doing the same. It is the design of humans and industrial systems to ensure that mankind's use of natural resources and cycles do not lead to diminished quality of life either due to losses in future economic opportunities or to adverse impacts on social conditions, human health and the environment. There are 3 dimensions of sustainability; **Environment**, **Economic development** and **Social development**.

SSCM stands for Sustainable Supply Chain Management.

SSCM is the management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements

Questions

1. Who is responsible for sustainability issues within your organization?
2. How would you describe your organization's attitude towards sustainable supply chain management?
3. What are the supply chain risks experienced by your organization and what are the possible effects these may have on sustainable development (from the perspective of revenue generation, environment and the society i.e. all 3 dimensions of sustainability)?
4. Who are your stakeholders and what are their weightings in your business?
5. How is your organization's SSCM performance measured?
6. Is it possible for your organization to operate and manage a supply chain that does not impact negatively on the three dimensions of sustainability (environment, social development and economic development)?
7. If yes, is it currently being achieved? If not, why is this?
8. What are the barriers to your organization's effort towards a sustainable supply chain?
9. Are these barriers specific to Nigeria being a developing country or general?
10. What are the factors driving your organization's SSCM position and practice?
11. How have these changed over time?

Socioeconomic Dimension

1. How would you describe the value added at a national level in terms of growth, development and revenue generation that can be attributed to the activities of your organization?

2. How would you describe your organization's investment in capital, and employee development?
3. How would you describe your organization's investment in pollution prevention and ensuring stakeholder safety in Nigeria? What are the trends in these areas?
4. Is it high compared to other countries (developed/developing countries)?

Environmental Dimension

1. What is your organization's strategic position with regards to environmental issues?
2. It is said that the benefits of the oil and gas industry's supply chain outweigh its impacts and associated problems (CO_2 emissions, oil spillage, depletion of the ozone layer, etc.) What do you think?
3. If you are able to comment, how do you see the trends associated with these problems and the industry's responses?
4. How does you organization deal with issues such as biodiversity loss, air emissions, energy use and toxicity levels in host communities?

5. Would you attribute these challenges to the level of development in Nigeria or are these general problems?
6. What are the issues being faced by your organization with regards to land use, management and remediation?
7. How are these kind of issues resolved with the appropriate stakeholders (local communities, contractors, etc.)?
8. What are the controls put in place by your organization to ensure that the environment is safe guarded and the operational impact on the environment is reduced if not completely mitigated?

Appendix D – Questionnaire

Questionnaire for Downstream Oil Industry Stakeholders (Communities Close to NNPC Downstream Facilities

Data Protection: All data collected in this survey will be held anonymously and securely. No personal data is asked for or retained.

Introduction

This questionnaire aims to identify the impact of downstream oil industry activities on local communities and households.

This **questionnaire** is part of a PhD research work titled "Towards the Development of a High Performance Supply Chain in the midstream and downstream oil industry". This questionnaire is aimed at identifying the factors that positively or negatively influence the adoption of a sustainable supply chain in the downstream oil industry.

You are now about to begin the questionnaire. Please endeavour to answer the questions to the best of your knowledge.

Thank you.

Questionnaire

1. What is your occupation? Please tick as appropriate

   Trader ☐ Professional ☐ Civil Servant ☐ Self-Employed ☐ Student ☐ Manual Worker/Labourer ☐

2. Which of these NNPC distribution depots do you live close to or do business close to? Please tick as appropriate
   a) Mosimi (Ejigbo, Ibadan, Ore, Ilorin,& Atlas Cove depot ☐
   b) Port-Harcourt (Aba, Enugu, Makurdi & Calabar depot ☐
   c) Warri (Warri & Benin depot) ☐
   d) Kaduna (Kaduna, Minna, Suleja, Kano & Gusau depot) ☐
   e) Gombe (Jos, Gombe & Yola depot) ☐

3. Which of these NNPC facility/infrastructure do you live close to or do business close to? *(select all that apply)*

   NNPC Pipelines ☐ NNPC Storage tanks ☐ NNPC Area Office ☐ NNPC Storage Terminals ☐

4. How do you view the contribution of NNPC to community development in your area?

   Very good ☐ Good ☐ Okay ☐ Poor ☐ Very poor ☐

5. What do you think are the benefits for having the NNPC facility close to your home or business? *(select all that apply)*
   a) Better road network ☐
   b) Better business opportunities ☐
   c) Better security ☐
   d) Easier access to domestic fuel (kerosene, petrol, etc.) ☐
   e) Increased number of NNPC sponsored community projects ☐
   f) Regular power supply ☐
   g) Better access to social amenities ☐
   h) No benefit ☐

6. How has the NNPC facility in your area affected you and your household?
   a) Very positively ☐
   b) Positively ☐
   c) Neither Positive nor Negative ☐
   d) Negatively ☐
   e) Very Negatively ☐

7. Do you think the NNPC management is doing all possible to ensure that their activities do not affect your area negatively?
   a) Strongly believe so ☐
   b) Believe so ☐
   c) Maybe ☐
   d) Do not believe so ☐
   e) Strongly do not believe so ☐

   Please give reasons for your answer…….
   …….

8. How do you view the effect of NNPC's activities in your area on the following;

Strongly positive	Positive	Neither Positive nor Negative	Negative	Strongly negative

a) Environment					
b) Social development					
c) Economic development					

9. I think managers in the NNPC facility in my area are doing their best to reduce the negative impact of their operations in my area

Strongly agree ☐ Agree ☐ Neither agree nor Disagree ☐ Disagree ☐ Strongly disagree ☐

10. The presence of the NNPC facility in my area has increased the occurrence of the following (please select as appropriate)

	Strongly agree	Agree	Neither Agree nor Disagree	Disagree	Strongly disagree
High frequency of oil spills					
Gaseous emissions					
Polluted environment					
Traffic problems					
Criminal activities					
Increased fire incidence					
Poor health					
Bad roads					
High number of social miscreants/Touts					
Poor power supply					
High number of school drop-outs					

11. I believe the NNPC officials in my area always conduct their business and operations in a safe way so as not to endanger the local people/residence

Strongly agree ☐ Agree ☐ Neither agree nor Disagree ☐ Disagree ☐ Strongly disagree ☐

12. I believe more should be done by the NNPC management in my area to safeguard the environment, ensure social development and reduce the negative impact of their activities

Strongly agree ☐ Agree ☐ Neither agree nor Disagree ☐ Disagree ☐ Strongly disagree ☐

If you selected "*Strongly agree*" or "*Agree*" in question 12, please identify in order of importance the top 3 areas you believe the NNPC management can do more in your area; (a)…….. (b)…… (c)……...

13. I believe some of the reasons the NNPC facility in my area is negatively affecting local residents/household are due to:

	Strongly agree	Agree	Neither Agree nor Disagree	Disagree	Strongly disagree
Nigeria's level of development					
Poor government policies					
Insufficient training of NNPC officials on safe practice					
Non-privatisation of the downstream oil sector					
Government participation in the oil sector					
Culture (corruption, poor management, etc.)					

14. Overall, I think the NNPC facility in my community has been of more benefits to the local residents/people

Strongly agree		Agree		Neither agree nor Disagree		Disagree		Strongly disagree	

End of Questionnaire

You have now come to the end of this research questionnaire. Thank you very much for the time you have spent in completing this questionnaire.

Appendix E – Framework Discussion Questions

Research Framework Discussion Questions; SSCM in the Nigerian Downstream Oil Industry

The discussion will be based on the framework, feedback and suggestions on the framework.

Due to the nature of this research and the expected final output; which is the framework, the developed framework is also subject to improvements and corrections based on industry opinion. This is to ensure that the design is not simply an academic exercise, but also captures its applicability in the Nigerian downstream oil industry which is the case-study industry. The framework in itself should be concise, clear and easy to understand.

In light of the fact that it is crucial that the framework is seen as a tool that can actually help managers identify and deliver appropriate elements of SSCM, that is, a useful tool that can form the basis of an effective and structured improvement programme, it is imperative that the discussion will capture the usefulness and the applicability of the framework to the NNPC downstream.

In light of this, please find below some questions that will be beneficial in steering the discussion towards the points highlighted above;

1. Did you find the framework understandable, clear and concise?

2. What is your opinion on the framework proposed changes; feasible/non-feasible.

3. To what extent is the framework immediately seen to be of value and why?

4. To what extent is the framework seen as relevant and complete?

5. What would you suggest should be added to the model so that it includes assessment and implementation stages as a step-by-step process and why?

Appendix F – Framework Feedback Sheet

Towards the Achievement of a High performance SSCM in the Nigerian Downstream Oil Industry

Please kindly complete the following questionnaire based on your perception of the framework and explanatory worksheet. Your feedback is crucial to the development of the final version of the framework as well as to the completion of this PhD research study and subsequent benefit to NNPC.
All responses are treated as anonymous.

Questionnaire

Please assess the framework, and for the content of each of the 3 sustainability improvement areas listed below, tick as appropriate and send back to the email address above by 10th December 2015**.**

Environmental Improvement Areas **I consider that :**	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The content is accurate					
The content is complete					
The necessary changes are feasible					
Implementation costs would be acceptable					
The use of appropriate performance measures is vital					

Key Comment……..
……..

Economic Improvement Areas **I consider that :**	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The content is accurate					
The content is complete					
The necessary changes are feasible					
Implementation costs would be acceptable					
The use of appropriate performance measures is vital					

Key Comment……..
……..

Social Improvement Areas **I consider that :**	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The content is accurate					
The content is complete					
The necessary changes are feasible					
Implementation costs would be acceptable					
The use of appropriate performance measures is vital					

Key Comment……..
……..

Your answers are very important and they will help guide the discussion at the telephone conference meeting.

Thank you once again for your help.

Temi Akinremi.

Appendix G - Case-Study Protocol

Study Title: Towards the Development of a High Performing Sustainable Supply Chain Management Framework for the Downstream Oil Industry

Study Summary: There is evidence that oil companies' sustainable supply chain management (SSCM) practices and efforts are in part, influenced by a country's level of development. Much work has been done on sustainability in the oil industry's supply chain, but many of these works have been focused on the upstream sector of the industry (Harris and Khare 2002, Hirsch 2006, Yusuf *et al*. 2012). The increasing focus of many researchers in SSCM field on the upstream activities and the seemingly generalization of the sectors of the industry under the upstream sector umbrella may be attributed to the catastrophic impact of incidences that upstream activities are notable for and the high number of stakeholders that on many occasions are affected.

As identified in the literature review, the downstream oil sector however is not without its own impact on the dimensions of sustainability (environment, social and economic development) as the activities of the downstream oil industry supply chain also largely contribute to global sustainability issues. This is because, the downstream oil industry similar to other sectors of the oil industry is also plagued by unsustainable practices. Refinery operations, transportation of refined products and the storage and distribution of petroleum products are all known contributors to environmental pollution, to social problems in local communities and serve as avenues for economic advancement or decline, driven by, for example, the effects of fluctuating prices of oil and petroleum products. These effects however seem to be more evident in developing oil producing countries as their developed counterparts seem to be transversing through a more sustainable path or at least have recognised and accepted that a negatively impacting supply chain is detrimental to all three dimensions of sustainability as well as to the industry as a whole. Reasons for these noticeable variations are somehow vague as even developing countries with huge presence of multinationals birthed or home-based in developed countries are not left out in this problem.

The aim of this study is to evaluate SSCM in the downstream oil industry and to identify the influence that a country's level of development has on the adoption and achievement of a high performance SSCM in terms of acting as a driver or a barrier to this performance. Identifying the influence of culture, GDP, government policies and political stability of an oil producing country on the downstream oil industry's will assist senior management oil industry decision makers to better realign their SSCM approach to suit the downstream sector as well as the developmental needs of their stakeholders.

An additional major output of this study is a measurement framework that will serve as a benchmark for sustainability improvements in the downstream sector of the oil industry that will assist the sector develop a comprehensive SSCM strategy that would ensure competitive advantage and well addressed stakeholder concerns which would ultimately translate to improved stakeholder relationships.

Case-Study Description: This case-study activity is designed to evaluate and analyse how a country's level of development, culture, and government policies influence the adoption and achievement of a high performance SSCM in the downstream oil industry. The case-study countries for this research work are Nigeria and the UK. These countries have been selected based on a number of factors, which include; both are oil producing countries, different developmental levels (UK and Nigeria are developed and developing oil producing countries respectively), political stability and oil production age amongst others. For the purpose of this study, supply chain links in the downstream oil sector focused upon are the refining, transportation and storage. The use of mixed-data collection technique will be employed in this study as well as secondary data from reliable sources. Senior managers in the supply chain links identified above and other stakeholders such as suppliers and local communities that may be impacted by the activities of these supply chain links will be interviewed and survey questionnaires will also be administered as well. Collectively, the data gathered during this case-study activity will support the delivery of the following five objectives;

Case-Study Objectives

- The investigation of variations and similarities in SSCM in the downstream oil sector in a developed and developing oil country with a specific emphasis on a product stream along the refining and distribution links of the supply chain.

- The identification of external and internal factors that influence the practice of SSCM in these countries and their impact on the overall supply chain
- The identification of drivers and barriers of SSCM practice in the downstream oil sector in a developed and developing oil producing country.
- The development of a measurement framework that will serve as a benchmark to evaluate and analyse the downstream oil sector's SSCM efforts in developing oil producing country. Also, the operational implications for the implementation of the framework will be investigated.
- Determining the application of the measurement framework in the downstream oil sector and the identification of the necessary costed changes to strategic and operational plans in the downstream oil sector.

Subjects to Study

The subjects of this research work are primarily senior managers in the downstream oil industry of the case-study countries and some of their stakeholders. Due to the vast number of stakeholders in the downstream oil industry, stakeholder selection was prioritized based on the works of Freeman and Reeds (1983), Clarkson (1995) and Mitchell, Agle and Wood (1997). For this research work, the maximum variation sampling method was adopted as described by Lincoln and Guba (1985). This technique involves the successive addition of knowledgeable participants by a previously interviewed participant in the study. Thus data collection will progress without prior knowledge of how many informants will be interviewed until theoretical saturation is attained. This is defined as the point where data replication and redundancy is reached as recent or supplementary information obtained from new sources does not introduce unfamiliar or fresh insight to the study. Hence, data collection from the downstream oil sector of the case-study countries will focus on information-rich senior managers in the refining, transportation, storage and distribution centres of the case study countries.

- **Nigeria**: The downstream sector is majorly controlled by the state owned Nigerian National Petroleum Corporation (NNPC). The NNPC own and operate the four refineries in the country and is also responsible for the transportation of refined products to the storage and distribution terminals. Since these are the areas of coverage of this research work, senior management of the NNPC working in the capacity of sustainability managers, HSE managers, supply chain managers, and distribution and logistics managers are the key informants for this study.

- **UK:** Unlike the management structure in Nigeria, the UK oil industry is privatised with and there are currently six operational refineries which are run by various multinationals. These six multinationals are; Essar Oil ExxonMobil, Petroineos, Phillips 66, Total and Valero Energy. Refined products from these six refineries are also conveyed via a network of pipelines owned by some of these multinationals and the British government. The storage of refined products from the refineries is also overseen by these six multinationals as they own and operate various storage and distribution terminals across the UK sometimes through joint venture agreements in order to increase efficiency and reduce costs.

  For the UK, representative secondary data that covers refining, transportation, storage and distribution supply chain links will be collected and utilized for the purpose of this comparative study. A detailed study will be conducted to ensure that these data replicates themes and collected impressions in the Nigerian part of the Case-study.

Stakeholders: Participants from government instituted downstream sector regulatory bodies in Nigeria and the UK will be interviewed. In Nigeria, the Department of Petroleum Resources is responsible for monitoring and supervising downstream operations to ensure that health, safety environment regulations conform to national and international standards. The department also serves as the eye of the government in the affairs of the oil industry in Nigeria as it plays a key role in the enactment of oil industry policies. For the purpose of data collection, senior ranking managers who are directly involved in the monitoring of the downstream HSE activities and enactment of regulations to guide the downstream oil sector towards a sustainable terrain will be interviewed.

In the UK, the government bodies responsible for environmental regulations in the downstream oil sector are DECC (Department for Energy and Climate Change), EA (Environment Agency), and SEPA (Scottish Environmental Protection Agency). These agencies monitor and control the activities of the downstream oil industry including refining, transportation, storage and distribution of refined petroleum products by enforcing set regulations and also via the issuance of licences and permits to downstream operators for the release of substances into the environment which include sea, land, or air (Palmer and Culver 2011). Also, the HSE (Health and Safety Executive) is in charge of regulating refined petroleum products in the UK downstream market. Jurisdictive legislations and monitoring of petroleum products and their associated hazards either by their various uses, storage or transportation all fall within the functional capacity of the HSE. In order to achieve a balanced comparison in policies and regulations in this study, various secondary resources detailing the operations, policy management and enforcement by these downstream sector regulatory bodies in the UK will be harnessed for this study.

Other important stakeholders to this study are leaders and residents of local communities situated close to the supply chain links being evaluated for this study. In order to obtain a rich description of the situation as it is from the perspective of the direct recipients of the impacts of the activities of the downstream sector, interviews and questionnaires administration will be employed for this purpose.

Inclusion/Exclusion Criteria: As stated earlier, participants in this category are majorly stakeholders in the downstream oil sector. Due to the expansive list of stakeholders in the industry, stakeholders for this study were selected based on stakeholder impact, level of impact, power and interest as described by Freeman and Reed (1983: 94), attribute (legitimacy, urgency and power) as stated by Mitchelle, Agle and Wood (1997: 874) and influence based on Clarkson (1995: . Based on these criteria, the downstream stakeholder list was prioritised and some stakeholders were exempted from the list of stakeholders that primary data would be collected from.

Table 1.0: Stakeholder Inclusion and Exclusion Criteria Based on Stakeholder Classification in the Data Collection Section

• Inclusion Criteria	• Exclusion Criteria
• Primary stakeholder(s) with all three stakeholder attributes (legitimacy, urgency and power). The only stakeholder in this category is the Nigerian Government.	• All secondary stakeholders are excluded from being participants in the data collection. Such stakeholders are; NGOs, Trade Unions, Militants & Pipeline Vandalizers, Marketers and Consumers.
• Primary stakeholders with two of the three attributes (legitimacy, urgency and power) and satisfies the other inclusion criteria listed below. Such stakeholders are; NNPC employees.	• All stakeholders with only one attribute are excluded from being participants in the data collection process. Such stakeholders are NGOs, Ex-NNPC staff and the Media
• Primary stakeholders with one or more forms of power (formal, economic and political) and also has at least a form of stake (equity, economic and influencer) in the downstream supply chain links under study. Such stakeholders are; DPR, Suppliers and Local Communities.	• All stakeholders who are not directly impacted by the activities and operations of the downstream supply chain links being investigated or vice-versa. Such stakeholders are; Trade Unions and NGOs.
• Stakeholders that can significantly impact the operations of the supply chain links under study or vice-versa. Such stakeholders are; NNPC employees, DPR, Suppliers and Local Communities.	• Stakeholders that cannot significantly impact the operations of the supply chain links under study or vice versa. NGOs fall under this category.
• Stakeholders whose activities can directly impact the operations of the downstream supply chain links under study or vice-versa. Such stakeholders are; NNPC employees, DPR, Suppliers and Local Communities.	•

Methodology: This study is adopting the use of the phenomenological paradigm. The reason for this approach is anchored on the need to understand the variations, similarities, and the influence of the level of development of a

host country alongside other country specific factors that may be acting as challenges drivers to the practice of SSCM. These type of information is better obtained from first-hand experiences of downstream oil industry experts that are direct participants and have the background knowledge of the SSCM practice phenomenon understudy. A strong argument for the use of the phenomenological research was put forward by Osborne (1990: 80), the author stated that "Phenomenological research is not intended to test an hypothesis, ……..the aim is to understand a phenomenon by allowing the data to speak for themselves, and by attempting to put aside one's preconceptions as best as one can". Phenomenology depicts the "meaning of the lived experiences for several individuals about a concept" (Creswell 1998: 51). It provides a researcher with a detailed picture of the phenomenon understudy based on the narrative or description of happenings as given by actors in the phenomenon. Thus, the phenomenological paradigm is considered pertinent for this study as it will illuminate SSCM field by providing an understanding of the current practice, the influence of a country's level of development, drivers and militating challenges being faced by downstream oil industry practitioners. It would also enhance a better understanding of the variations and similarities in SSCM in developed and developing economies.

The use of the case-study methodology for this research study is embedded in its unique features which makes it stand-out as an appropriate methodology for the investigation of the how and why questions in the practice and adoption of SSCM in the downstream oil industry. A part of this study seeks to understand why there are variations in SSCM practice in developed and developing countries; rather than seek to understand these variations based on a generalized large data set, a more detailed perspective on the variability in SSCM practice can be achieved via multiple meanings that can be derived from data obtained from multiple sources. For this study, interviews, surveys and secondary data from the oil and gas industry for the case-study countries under study and reliable government data-bases will be employed to give a deeper understanding and allow room for reliable conclusions to be drawn from the collected data. Thus, primary and secondary data will be employed.

Case-study research adopts the use of interviews, observations and archival records for data collection and data validity can further be enhanced through triangulation with multiple means of data collection (Voss, Tsikriktsis and Frohlich 2002). The use of multiple means of data collection with specific emphasis on both quantitative and qualitative data collection techniques is described as the mixed method. Primary data collection from Nigerian downstream supply chain managers and selected stakeholders will be achieved through semi-structured interviews and questionnaires.

Case study data for the UK will be restricted to secondary data from journals, reliable online sources, company reports, government reports and bibliographical references. The use of secondary data for research is particularly advantageous when high quality data required for a particular study can be accessed from already conducted qualitative or quantitative studies. Many at times, secondary data sets are of extremely high quality and are often representative as what would be collected by the researcher if he were to conduct the research himself. The reason for this benefit according to Bryman and Bell (2003) can be attributed to the fact that whilst many of the organizations responsible for these secondary data resource usually would also have experienced the common setbacks in primary data collection process, these setbacks are often overcome by putting in place structures and procedures for keeping such problems to the minimum by following up non-respondents and ensuring an overall rich data collection process. The use of secondary data is also of benefit with regard to reduction in resources required to access this available data compared to studies where the researcher has to conduct the data collection himself and such data are usually national samples that cuts across various regions (Bryman and Bell 2003).

Data Management: Data for the Nigerian downstream oil industry will be collected via telephone interviews. Conversations will be recorded whilst important themes will also be noted in an observational note. Data collected from conducted interviews will be transcribed from interview recordings into textual data. Transcription of recorded interviews will take place as new interviews are being conducted. This is aimed at identifying patterns and themes in participant's responses and to modify the interview questions to address developing themes and overlooked areas in the study. There are various software for analysing qualitative data and this include ATLAS.ti (Bowen 2008) and NVIVO (Miles, Huberman and Saldana 2014) to mention a few. For this work, NVIVO 10 for windows will be used for organizing, managing and analysing data collected from the interviews. NVIVO is an excellent platform for the management, analysis and reporting of unstructured or semi-structured data (Miles, Huberman and Saldana 2014 and Saunders, Lewis and Thornhill 2012)). It is a useful tool in qualitative data analysis for evaluating, interpreting and explaining social phenomena. Collected and transcribed interview data

using the NVIVO software will be explored to identify developing themes which would be coded on nodes and further queried to identify other respondents that spoke about the theme.

Sample Size Required for the Study: In order to collect useful data any research study, it is important to identify respondents or participants that are appropriate for the study as well as are in a position to provide useful insight to the phenomenon under study (Bowen 2008 and Creswell 1998). The research sample for this work will be drawn from the case-study population, which are the countries under study (Nigeria and the UK). According to Eisenhardt (1998: 537), population can be defined as "... the set of entities where the research sample will be drawn". Sample size number in qualitative research can range from single figures to large samples and involves a wide variety of sampling techniques such that most times, the number of respondents required for a study becomes obvious as the study progresses (Marshall 1996). Miles and Huberman (1994) identified 16 strategies for purposeful sampling and this includes the maximum variation strategy, snowball, typical case, criterion, combination or mixed and theory based sampling strategy. The maximum variation sampling strategy is a useful strategy for identifying diverse variations and common patterns in a study (Creswell 1998, Maykut and Morehouse 1994 and Patton 2002). For this study, the maximum variation sampling and snowball sampling strategies will be employed.

The population for this study is limited to downstream oil industry senior managers working in the capacity of supply chain mangers, logistics managers, sustainability managers, HSE managers and other managerial roles that are directly involved in sustainability and supply chain management along the refining, transportation and storage links of the downstream oil industry. Similar to the "rolling snowball" description given by Lincoln and Guba (1985), the respondents in the Nigerian downstream supply chain will be selected based on recommendations by previously interviewed respondent. This selection pattern will continue until theoretical saturation is attained. Theoretical saturation is the point where newly added or supplementary information is not being obtained from new respondents and this is characterised by data replication (Lincoln and Guba 1985). Thus, the number of respondents are not known beforehand but rather will be added on as data is being collected via interviews, evaluated and analysed.

Ethical Consideration: Researchers have an obligation to collect and use data to produce knowledge, products and procedures for the good of human society in a manner that ensures that subjects are protected and by following the principles of "respect-for-persons, justice and beneficence" (Brakewood and Poldrack 2013: 671). Blumberg (2011: 114) defines ethics as "…the study of the 'right behaviour' and addresses the question of how to conduct research in a moral and responsible way". Thus, ethical consideration does not only look at how the available methodology will be employed to answer research questions, it also evaluates how the methodology will be used in the right way.

To ensure that this research is conducted in manner that takes into consideration moral principles and standards of behaviour with focus on the rights of the research participants, three guidelines as proposed by Blumberg (2011) will be followed. Prior to commencement of the data collection exercise, firstly, a detailed explanation of the benefits of the study will be provided, this will be followed by a comprehensive explanation detailing the participant's rights and protection and lastly, informed consent will be obtained from the participant. The participant will also be notified of his right to pull out of the research despite having signed the informed consent form at any time during the study and permission will be sought from the participant before audiotaping any conversation.

Recruitment Plans: Participants in this study are specifically senior managers in the downstream oil industry working in refining, transportation and storage links in the oil supply chain and functioning in job roles ranging from supply and logistics manager, HSE managers, procurement managers, sustainability managers and production managers. Also, senior managers in oil industry regulatory organizations and first-tier suppliers to the supply chain links understudy are also prospective participants in this study. Recruitment of oil industry participants for the study will be based on recommendation by a previously interviewed participant as stated earlier. Also, stakeholders for this study will be selected based on the inclusion criteria discussed earlier. Local residents around downstream oil infrastructures and processing areas understudy will be randomly selected and requested to complete the survey questionnaires.

Risks, Benefits of the Study: On completion of this study, an executive summary of the findings will be forwarded to the organizations and participants. From a financial perspective, this would be beneficial in terms

of reducing the cost of managing conflicts and mitigating feud-related operational losses arising from issues with stakeholders, and also enhance competitive advantage. It is intended that the measurement framework from this work will be a useful tool for oil industry decision makers to strategically steer the downstream oil industry towards a more sustainable terrain, thus improving the sustainability performance and enhancing their competitive edge.

Appendix H – Sustainability Constructs and Theories

H.1.1 Triple Bottom Line (TBL)

This focuses on the three Ps (people, planet and profits). TBL as it is often referred to is defined as "… an accounting framework that incorporates three dimensions of performance: social, environmental and financial" (Slaper and Hall 2011: 4). Pioneered by John Elkington in 1994, TBL has gained global usage in corporate reporting and takes into cognizance environmental, social and economic concerns (Elkington 2004 and Wu 2013). It is widely used especially in sustainability discussions and advocates the harmonized consideration of the ecological, social and economic sustainability in order to achieve a basic level of all three forms of sustainability (Elkington 2004 and McKenzie 2004). The TBL agenda is designed to make organisations look further beyond the economic gains and value added via their business activities to the social and environmental values added or destroyed as the case maybe (Elkington 2004).

Figure H.1 Triple Bottom Line
Figure is an illustration of the sustainability definition based on the triple bottom line. It shows the incorporation of all three dimensions (economic, social and environmental) of sustainability.

With the increasing emphasis on sustainability, TBL has been adopted as a global theoretic standard for evaluating and furthering sustainable development (Wu 2013). The adoption of TBL in the corporate environment has been promoted by organisations such as the Global Reporting Initiative and Accountability to motivate organisations towards a system of social and environmental accountability (Norman and MacDonald 2003). The promotion of TBL is not restricted to the above mentioned organisations alone as even governments and their parastatal are amongst the many groups in the corporate world requesting and advocating TBL

principles (Norman and MacDonald 2003). In this era, businesses are expected to be the primary drivers of the concept as opposed to the past system which saw government and non-government organisations embracing and promoting its adoption in the business world (Elkington 2004).

Elkington (2004: 3) identified seven drivers for the adoption of TBL by organisations. These drivers are; Markets, Values, Transparency, Life-cycle technology, Partnerships, Time and Corporate governance. In recent times, organisations are driven by market competition as opposed to compliance, societal values as opposed to the old value position, and exposed to open scrutiny rather than the once before closed door policy even as they focus on product life cycles governed by a cradle-to-grave system whilst adopting supplier-partnership relationships designed to last over a considerable long period of time (see table F1).

Table H.1 Seven Sustainability Revolutions (Source: Elkington 2004: 3)

TBL Drivers	Old Paradigm	→	New Paradigm
• **Markets**	Compliance	→	Competition
• **Values**	Hard	→	Soft
• **Transparency**	Closed	→	Open
• **Life-cycle Technology**	Product	→	Function
• **Partnerships**	Subversion	→	Symbiosis
• **Time**	Wider	→	Longer
• **Corporate Governance**	Exclusive	→	Inclusive

Committing to the TBL agenda by the corporate world is however not without challenges. A major sustainability challenge based on the TBL principle is "… to understand and shape the relationship among the three dimensions, as well as the relationships among components within each dimension" (Wu 2013). Some other challenges as identified in the work of Slaper and Hall (2011) are; non-explicit measurement for the three aspects of the TBL (environment, social and economic) as they have differing units of measurement, difficulty in adequately estimating a project's sustainability contribution and difficulty in assessing the required data. Regardless of these limitations, TBL has presented businesses and government and non-

government organisations alike with a framework that "… allows organizations to evaluate the ramifications of their decisions from a truly long-run perspective" (Slaper and Hall 2011: 6).

H.1.2 Weak and Strong Sustainability

In order to move towards the goal of being sustainable whilst taking into cognizance the role and protection of the environment and the society, the economic dimension of sustainability also has to be given due priority. In the past, economic growth was seen as the way out of global poverty. However, in recent times, the possible and already existent negative effects of economic growth has been brought to limelight (Withagen 2009). In the process of harnessing natural capital such as naturally occurring oil and gas resources, there has been issues with the level of depletion of natural resources and problems with pollution, reduced production capacity/turnover, health and safety and also contamination of land and waterways (Withagen 2009). This can thus be regarded as a shift away from what sustainable development is. In the words of Neumayer (2003: 7), development is said to be sustainable if it does not lead to a decline in "… the capacity to provide non-declining per capita utility for infinity". Utility in this regard refers to human well-being and the capacity to ensure human well-being is captured under four forms of capital (natural, produced, human and social) under the economic dimension of sustainability (Dietz and Neumayer 2007). Natural capital comprises of both renewable resources such as biological species that are economically valuable and non-renewable resources such as minerals and fossil fuels (Gowdy and O'Hara 1997). Produced capital, also referred to as manufactured or man-made capital are machines, tools and other economically viable infrastructures made by humans. Human capital refers to knowledge, skills and abilities of people used in harnessing resources in order to improve and develop their quality of life and enhance other forms of capital. Social capital is required for a thriving eco-system and economy (Flora 2016). It is the link that hold together individuals, communities and organizations to effect a change and the achievement of certain objectives which may be positive or negative and may not be possible in its absence (Coleman 1988 and Kawachi *et. al* 1997). It is characterised by features such as civic participation, mutual trust, collective identity, cooperative effort and shared futuristic goal.

Based on assumptions of the neoclassical economic theory of growth and policy (Dietz and Neumayer 2007), weak sustainability follows the principle of universal substitution (Gowdy and O'Hara 1997) by "… permitting mutual substitutability between natural capital (e.g., ecosystems and mineral wealth) and human-made or manufactured capital (e.g., factories and urban infrastructure) to the extent that a system is considered sustainable as long as its total capital increases or remains the same" (Wu 2013: 1003). Thus, an economy is considered sustainable even when it utilises its "… stock of natural capital, provided it creates enough manufactured capital to compensate for the loss of natural capital" (Ayres, van den Berrgh and Gowdy 1998 and Gowdy and O'Hara 1997: 240). Under this notion therefore, sustainability is equated to "*non-decreasing total capital stock*" (Ayres, Van den Berrgh and Gowdy 1998 and Gutes 1996).

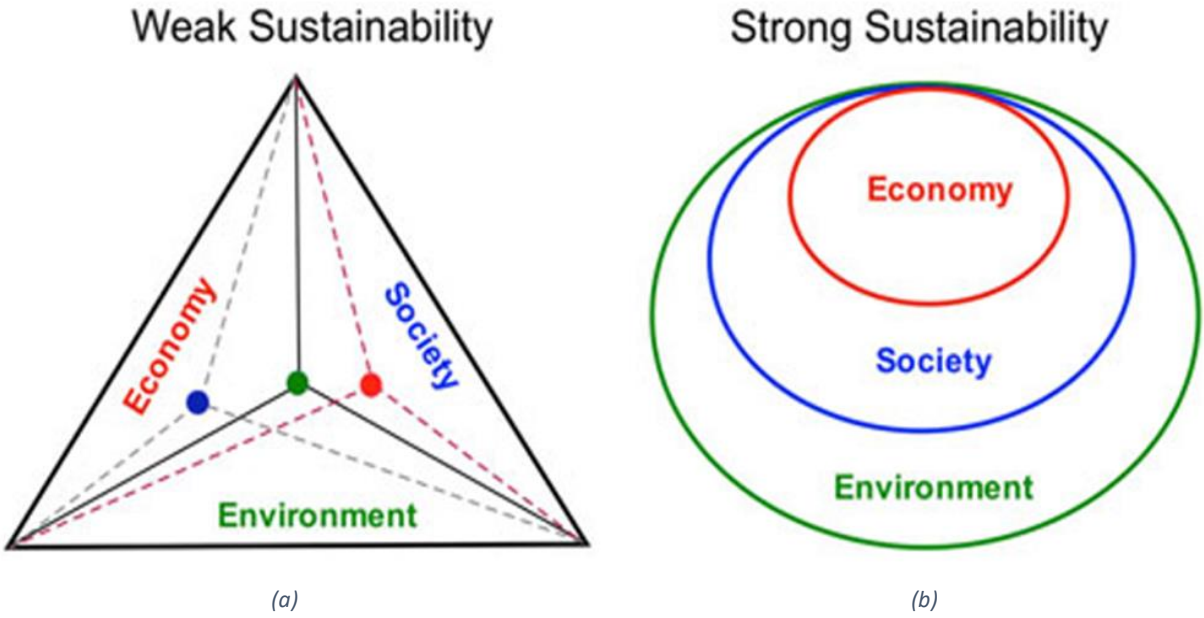


Figure H.2 Weak and Strong Sustainability (Source: Wu 2013: 1023)
Figure shows (a) weak sustainability and (b) strong sustainability. In weak sustainability, substitution of natural capital is permitted, thus the sum of environmental, economic and social capital does not decrease. In strong sustainability however, economic sustainability is attained when there is non-decreasing natural capital.

Strong sustainability on the other hand sees some functions of natural capital as un-substitutable. Thus the use of natural capital for making available produced or man-made capital for the goal of economic growth whilst depleting available stock is viewed as unsustainable (Dietz and Neumayer 2007 and Gutés 1996). In this context, an economy is considered sustainable as a result of non-decreasing natural capital. There are two schools of

thought in the strong sustainability camp (Neumayer 2003). One proposes that the total value of natural capital has to be retained. Thus, where non-renewable resources are being consumed, compensation equivalent to the value extracted or exploited must be made. For example, via renewable resources such as wind mills for electricity generation (Dietz and Neumayer 2007). This aspect of strong sustainability assumes limitless substitution possibilities between forms of natural capital. This assumption can be faulted as not all forms of natural capital can be substituted (Dietz and Neumayer 2007). The second conception under strong sustainability states that a sub-set of total natural capital must be conserved in physical terms such that its function is retained and remains unchanged. This class of capital is described as Critical Natural Capital (CNC) and this is defined as capital that cannot be substituted by any form of capital including other forms of natural capital (Dietz and Neumayer 2007).

H.1.3 Resource Based Sustainability

The Resource Based View (RBV) examine a firm's competitive advantage in the field of strategic management. With assumptions and predictions emerging from prior theoretical work like other theories (Barney and Arikan 2001), RBV takes "… the perspective that valuable, costly-to-copy firm resources and capabilities provide the key sources of sustainable competitive advantage" (Hart 1995: 986). RBV recognises that every firm has valuable resources available for it to gain competitive advantage over its competitors. A firm's resource are tangible and intangible assets which are owned by the company (Wernerfelt 1984). Tangible assets include plant and equipment, raw-materials, financial reporting systems while intangible assets can be trade secrets, customer relationships and so on.

Corporations have had to re-evaluate their value-adding activities as they play a key role in the actualisation of recommendations from the 1987 Brundtland report and its accompanying definition of sustainable development (Sharma and Vredenburg 1998). Many views have emerged in this respect and of notable mention is the proposition of Porter and Van der Linde (1995) centred on how strict environmental regulations can propel organisations towards gaining a competitive edge over their competitors. The growing need for corporations to engage in business activities that take into cognizance environmental protection whilst remaining competitive requires a system that facilitates "… properly designed environmental standards" which has the capability to "…trigger innovations that lower the total cost of a

product or improve its value" (Porter and Van Der Linde 1995: 61). Thus, environmental regulations and standards imposed on firms have the possibility of initiating innovations that have the possibility of reducing or completely offsetting the cost of compliance. This preposition as stated by Porter and van Der Linde (1995) has been criticised by Palmer, Oates and Portney (1995). According to the authors, whilst accepting that incentive based regulation is a preferred option compared to a command-and-control system and there is a likelihood of bias in upfront estimates of regulatory compliance cost, there is however disagreement on the point that the imposition of stringent laws and regulations on a firm will result in increased profit.

Whilst there is a need for "… relaxing the tradeoff between competitiveness and the environment rather that accepting it as a given" (Porter and Van Der Linde 1995: 98) as proposed by the traditional benefits-cost-analysis where a comparison between the benefits of the regulation has to be weighed against the cost for securing these benefits, thus initiating a trade-off system (Palmer, Oates and Portney 1995), the issue that remains pertinent is that all dimensions of sustainability and in the above argument, the economic and the environmental dimensions have to be treated as interconnected and not separate so as to avoid the encouragement of the "… technical fix approach" which "…focuses on pollution control, lower resource use and greenhouse gas trading rather than tackling the deeper issues or seeing the connections between society, economy and the environment" (Giddings, Hopwood and O'Brien 2002: 189).