Investigating the social, economic and environmental feasibility of extracting onshore oil and gas in the United Kingdom.

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Investigating The Social, Economic And Environmental Feasibility Of Extracting Onshore Oil And Gas In The United Kingdom.

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AUTHOR'S DECLARATION

I hereby declare that this thesis is entirely my own work, except where explicit acknowledgement is made to the contribution of others, and this thesis has not been submitted for any other degree at the Robert Gordon University or any other institution.

Benita O Ize-Iyamu
August 2022

DEDICATION

This is for you;

Late Chief D.O.D Ize-Iyamu
And
Late Chief (Mrs.) J.E. Ize-Iyamu

(You live forever in my heart)

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To God for being my all.

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My backbone my parents, your love, support and strength got me here.

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ABSTRACT

The United Kingdom Government has moved on from the unconventional oil and gas (UOG) development discourse since the moratorium in 2019. Shale gas was expected to be produced commercially and to act as a bridge fuel with arguable lower carbon emissions until renewable energy sources can be produced at a large scale, and become readily available, and accessible to all. The socio-economic, health, environmental, and policy implication of extracting these hydrocarbons using hydraulic fracturing *'fracking'* resulted to induced tremors, opposition, protest, and debates from the local communities, non-governmental organisations and other stakeholders, which eventually led to the moratorium in the North of England. This study was undertaken to understand the prevailing issues that affected the support for UOG in England. The study investigated the social, economic and environmental feasibility of extracting onshore oil and gas using hydraulic fracturing method in the UK. Limited research was conducted in the context of the impact of public engagement in the decision making process for unconventional oil and gas (UOG) in the UK. Therefore, guided by the interpretive paradigm and adopting a qualitative research method, the study analysed the UK's energy policy decision-making process and the National Planning Policy Framework (NPPF). A thematic analysis was conducted from government reports, licensing and local authority publications, industry guidance publications, political party manifestos, academic papers, and anti-fracking petitions to inform the data collection process. Using semi-structure interview technique, primary data was then collected from 20 participants (MPs, MSPs, oil and gas regulators, onshore oil and gas companies, scientists, non-governmental organisations, senior members of protest groups, civil servants, and journalist) to understand the participants' experiences and views on UOG development in the UK. Findings revealed the motives for facilitating UOG development, mechanisms hindering UOG development, reflections on the decision making process for UOG development and the prospects for transition towards renewable energy in the UK. Schrader Frechette's (20002) Principle of Prima Facie Political Equality (PPFPE) and the constructs in Reed et al (2018) theory were utilised to identify and provide an understanding of the prevailing discussions concerning UOG; understanding why the support for UOG development in UK was so low; and assessing the critical factors to be considered towards facilitating public engagement in policy decision-making process in the UK. This study recommends a review of the oil and gas regulatory framework, effective public engagement, good governance, awareness creation, research and development as critical success factors for UOG development in the UK. This study concludes by modifying Reed et al (2018) framework and suggests its application by the key stakeholders in the UK for future implementation of new technologies, innovations and policies.

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LIST OF ACRONYMS

ALARP	As Low As Reasonably Practicable
BEIS	Department for Business, Energy and Industrial Strategy (UK)
BGS	British Geological Survey
BRIA	Business Regulatory Impact Assessment
BREXIT	Withdrawal of the UK form EU or British Exit
COP	Convention of Paris
COP26	UN Climate Change Conference
COVID-19	Coronavirus disease 2019
CSG	Coal Seam Gas
CSR	Corporate Social Responsibility
DECC	Department of Energy and Climate Change (abolished 2016, many functions Folded into BEIS (UK)
DEWNR	Department for Environment and Water and Natural Resources
DMITRE	The former Department for Manufacturing, Innovation, Trade, Resources and Energy
DOH	Department of Health
DPTI	Department of Planning Transport and Infrastructure
DSD	Department of State Development
EC	European Commission
EA	Environment Agency
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act (US)
ESG	Environmental Social Governance
EU	European Union
GEL	Geothermal Energy Limited
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HGV	Heavy Good Vehicle
HIA	Health Impact Assessment
HVHF	High-Volume Hydraulic Fracturing
HRIA	Human Right Impact Assessment
IDHRS	Industrial Decarbonisation Hydrogen Revenue Support scheme
IEA	International Energy Agency
JCVI	Joint Committee on Vaccination and Immunisation
LCC	Lancashire County Council

LNG	Liquid Natural gas
NGO	Non Governmental Organisation
NPACSG	National Partnership Agreement for the Regulation of Coal seam Gas
OGA	Oil and Gas Authority
OPEC	Organisation of Petroleum Exporting Countries
OUGO	The Office for Unconventional Gas and Oil
PPFPE	Principle of Prima Facie Political Equality
PHIA	Public Health Impact Assessment
PPM	Parts Per Million
SAP	Social Actuarial Political Risk and Licensing model
SEA	Strategic Environmental Assessment
SEO	Socio-Economic Objective
SLO	Social License to Operate
TFEU	Treaty of the Functioning European Union
TLS	Traffic Light System
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
UKOOG	United Kingdom Onshore Oil and Gas
UN	United Nations
UOG	Unconventional Oil and Gas
US or USA	United States of America
US EIA	US Energy Information Administration

CHAPTER ONE
INTRODUCTION

1.0 Introduction

This chapter introduces the background and the rationale for the study. The research questions, aims, objectives and the scope of the research are presented in this chapter. The chapter further provides and insight into the research methodology, and finally, the overall structure of the thesis.

1.1 Research Background

The extraction of oil and gas from unconventional minerals such as coal seams or sandstone with high porosity but quite a low permeability is an important aspect of global energy and environmental policy. As a result of technological innovation in the United States of America (USA) towards horizontal slickwater hydraulic fracturing in the late 1990s, (a technique commonly referred to as "fraccing" in industry sources, and "fracking" in activist and media sources (Grubert, 2016), the cost of the extraction of unconventional fossil fuel in North America dropped drastically (Trembeth et al, 2012). Thus, leading other advanced economies (within the European Union, China and Australia) to seek to follow the economic successes of the USA. As global energy demand is projected to increase by 50% in 2050 (US EIA, 2019), while scientific evidence continues to show that use of fossil fuel contributes to climate change, thus a strong argument for the development of other forms of energy sources such as renewables in the UK (Johnsson et al., 2019; Wood and Roelich, 2019). These alternative sources of renewable energy are not at a large scale yet, thus, the continued dependence eon fossil fuel for energy consumption in the United Kingdom, although its sources are becoming depleted (Boak and Klienberg, 2020). The increase in the demand for energy resources like fossil fuel versus supply has become a problem in the UK energy industry as fossil fuel has become less available for extraction and production. This has resulted to the government and industry operators to look into alternative and additional sources of energy, through the application of controversial technology like hydraulic fracturing in the UK onshore oil and gas industry. Short et al (2015) explains that a technology like hydraulic fracturing (fracking) is unknown has the potential to pose severe risks to health and the environment. Mair et al (2012) also included that horizontal drilling combined with hydraulic fracturing will help open up potential new sources of energy supply which will enable the extraction and production of shale gas which has been seemingly unreachable due to it been embedded underground in tight geological rock formations. The United States has more detailed experience and commercial success with the combination of horizontal drilling and hydraulic fracturing in the extraction of shale gas.

While countries like the UK have expressed interest in emulating the oil boom in the United States by investing in unconventional oil and gas (UOG) development for arguable reasons such as a bridge fuel to renewable energy sources, economic growth, energy security, and job creation (de Groot et al., 2020; Williams and Sovacool, 2019; Hammond and O'Grady, 2017a). There have been reports and findings citing the severe risks to the environment, human health, animal health, biodiversity, climate change, social and community impacts (Howarth, 2019; Short and Szolucha, 2019; Meng, 2017; Sovacool, 2014). Residents of the local communities that have been selected as the extraction for UOG development will suffer from the potential impacts of hydraulic fracturing (fracking) (Zwickl, 2019).

Unconventional oil and gas development in the UK has been a controversial and contentious topic since 2011, when the first exploratory drilling began (Bradshaw and Waite, 2017). The UK national government at the national level has promoted and supported the development of UOG in both Yorkshire and Lancashire regions of the North of England, despite the local community and public opposition to hydraulic fracturing technology (Burbidge and Adams, 2020; Purvis et al., 2019; UK Government, 2014). In Lancashire, the planning and development infrastructure was at a more advanced stage, thus, it created a lot of media attention on the protests and oppositions from non-governmental organisations, protest groups and the local community residents (Rattle et al., 2020). Local communities like Lancashire around the UK have argued that the decision on the development of UOG was made by the national government without due consideration of local concerns and lack of a detailed environmental, economic and social assessments in regards to fracking in that region (Aczel and Makuch, 2018; Bradshaw and Waite, 2017; Szulucha, 2016). Lancashire, which is situated in Northern England lies within the scope of this research and the reason for investigating the social, economic and environmental feasibility of extracting oil and gas in the UK. Hydraulic fracturing operations were halted in its early stages due to induced seismicity at Blackpool in 2018 and only to be stopped again after episodes of seismicity that resulted to a moratorium ben enacted in England in 2019. The moratorium is presently still in place as at the time of this writing.

1.2 Research aim

This research aims to critically evaluate the planning procedures and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in England.

The researcher reviewed Shrader-Frechette's Principle of Prima Facie Political Equality (PPFPE) to understand how lack of informed consent and equality in the decision making planning process of UOG development in the UK appeared to undermine environmental justice as seen in the fracking discourse. Cotton (2017) emphasised that environmental justice concerns issues of procedures and the processes associated with the decision on fracking. This further explains how decisions were made, those involved, their responsibilities and the institutional structures that influenced the fracking decision making process.

The principle of environmental justice concerns achieving fair fracking by assessing the dualistic relationship below the procedural and distributive elements of UOG development. The procedural elements involves exploring the distributive implications since the local and central government institutions both influence the fair distribution of the environmental and economic risks and benefits associated with UOG development within the UK (Schlosberg, 2007). This is further discussed in Chapter 3.

PPFPE was selected to address the interrelationship between the procedural and distributive elements of environmental justice. PPFPE provides an ethical position that is grounded in Rawl's (1999) philosophy of justice as fairness and Dworkin's (1978, 1988) notion of political equality, where all citizens are given equal consideration and their views respected on decisions over distributive outcomes. PPFPE provide the justification that the imposition of environmental health burdens of developments on individuals, should rest with the developers and not the opponents of the development. Also, the UK governmental law asserts equal rights and that unequal treatment be compensated for through means such as economic redistribution of wealth/opportunities/incentives. Furthermore, stakeholders including the public must have access to information about the environmental impacts and harms associated with UOG development. Lastly, affected communities such as Lancashire and other stakeholder groups must have access to the engagement and participatory processes involved in environmental decisions making which should be free from coercion (Cotton, 2017).

The UK government halted all fracking related-activities due to the seismic events that occurred in 2019 in Lancashire until the developers could prove that the seismic environmental risks were minimised along the ALARP (as low as reasonably practicable) principles. Klinke and Reenn (2002) explained that risk evaluation involves a process where societal institutions like social groups, individuals, and agencies determine the acceptable level of risk. Fracking, which was seen as an unacceptable risk by some of the stakeholders will require adequate measures for risk reduction. Such a process will require reducing the

risks to a level that is deemed acceptable by the society to ensure that there is control, monitoring and public communication are all covered under the risk management practices associated with UOG development in the UK (Kolluru, 1995; Zimmerman, 1986).

Reed et al (2018) theory was also selected in order to further understand why there was so much opposition from the public and local communities in the policy decision making process on onshore oil and gas in the UK. Reed et al (2018) explains that a more participatory/engagement approach needs to be taken to tackle environmental challenges because it provides a better capacity to reduce conflict, facilitate learning and build trust amongst stakeholders and the public. This makes it more likely for them to support and implement decisions on the long run.

The researcher modified Reed et al (2018) theory to understand the critical success factors that are necessary to facilitate an effective public engagement process for an improvement in the decision making process before the implementation of new technologies in the UK. Therefore an understanding of institutional theory provided an insight for policy makers by guiding them to evaluate the societies they govern before making new polices and introducing innovations that are likely to be resisted by the society. The UK has led policy innovations that do not eventually get implemented such as the law and guidance for UOG planning approvals (Andrews-Speed, 2016). Unconventional oil and gas development in the UK met with both support and opposition from various stakeholders. An understanding of how UOG development would have been successfully implemented would require a proper understanding of how stakeholders can be effectively managed. Stakeholder theory suggests that we need to analyse the relationship between a business and the need for engaging the people who can effect decisions (Freeman, 1984) such as polices for the desired outcome, thus, resulting to an effective decision making process.

The United States, Australia and Poland were chosen for a comparative study as these countries have previous UOG history and are more experienced with the issues associated with the decision making process of fracking. A proper review of UOG literature of these three countries provided the author with a better understanding of the planning and procedural processes related to environmental, social and economic implications of fracking. Furthermore, the three countries were selected because of their governmental structure and approach to fracking regulations, geographical diversity, differing approaches to public participation, inclusion and protest, and it is expected that the lessons learned can be applied to the UK to provide a better understanding of the fracking discourse as seen in Chapter 2.

1.3 Research Objectives

i. To critically assess and discuss the constantly evolving policy landscape of oil and gas extraction in the United Kingdom.

Rationale

This aspect of the study would enhance the understanding of the debate on UOG development relating to local power and democracy in shaping policy in UK's decision-making process.

ii. To critically examine why public engagement or participation failed to gather support for onshore oil and gas extraction in Scotland.

Rationale

This will inform on the public engagement in the decision making process on the UOG development and the why/how Scotland decided to have a moratorium in place with regards to fracking after public consultation, assessment from professional experts and the Scottish parliament, thus explicating the coalition between local communities in decision-making processes relating to this subject.

iii. To critically evaluate the economic implications for onshore oil and gas extraction in the United Kingdom.

Rationale

This would aid the understanding of the economic impacts of UOG development in the United Kingdom.

iv. To critically consider the environmental impacts of onshore oil and gas extraction and consider the consequences for the United Kingdom's climate change target by 80% reduction in greenhouse gas emissions by 2050 in a cost-effective manner.

Rationale

This finding will aid in the understanding of UK policy of sustainable clean energy to meet its climate change target.

v. To make social, economic and environmental recommendations on the feasibility of onshore oil and gas extraction in the United Kingdom.

This finding would bridge theoretical gap by building on Cotton (2017) study which used Shrader-Frachette's Principle of Prima Facie Political Equality (PPFPE) as a yardstick for reviewing environmental injustice in the UK by promoting dialogue between the government and local stakeholders, thereby advocating the need to reshape the planning consent regime to ensure and also promote environmental justice and public engagement through the adoption of the modified Reed et al (2018) Theory to identify the critical success factors for new policy, technology and innovation implementation.

1.4 Research question

i. The storyline for UOG development appear to have shifted from a local level to the national level. How did it influence the decision-making process surrounding UOG development in the UK?
ii. The UK National Planning Policy Framework (NPPF) entails achieving a set of objectives to ensure sustainable development while taking into account the local circumstances. Did this affect the support and decisions for granting planning permits applications for UOG development?
iii. Does UOG development have a role to play towards the implementation of the UK's transition to Net Zero Strategy and its implications for meeting the climate change target of 2050?

1.5 Scope of study

The study considered Scotland's Onshore Oil and Gas extraction activities and the associated social, economic and environmental impacts, looking at the best practices in the United States extraction of UOG. The Scottish government decided not to exploit UOG after public consultation, assessment from professional experts, and much deliberation.

In England, the Conservative party (pro frackers) appear to be downplaying the narrative surrounding UOG development despite the protests at the fracking sites, in order to alleviate the fears of the public in relation to the environmental effects of fracking, the UK Government sought information from contracted Independent parties like KPMG, Royal Society and Royal Academy of Engineering etc, just to mention a few on the issue of the feasibility of extracting UOG in a bid to convince the public that they have their interest at heart with respect to how the risks associated with fracking would be managed (like policy change, adequate monitoring and tightened regulations for UOG). However, from the consultation, none of the reports from the contracted parties made a justified case for commercial fracking.

This research focused on revisiting the UK's government consultation process in order to understand why lack of public engagement in the energy policy decision making process in

England resulted to low support for onshore oil and gas, together with the lessons learnt from the Scottish consultation process on this subject and how it was managed successfully.

1.6 Overview of Research Methodology

The philosophical stance adopted an epistemological interpretivist stance to understand the meaning and purpose of actions, inactions and interrelationship between context and time (Sutrisna, 2009; Saunders et al, 2012; Campbell et al 2017). This was found to be suitable and was selected in evaluating the issues associated with unconventional oil and gas development in the UK.

A qualitative study was conducted based on the research study aim, which is to critically evaluate the institutional framework and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in UK. Adopting the qualitative research method, a thematic analysis was first carried out on the secondary data that consist of a total of 96 documents spanning from UK Government Report (20), Scottish Government Report (9), Licensing, local authority publications (4), Industry guidance publications (7), Political Party manifestos (11), Academic papers (42), and documented. anti-fracking petitions (3). Themes were identified which informed the design of the interview questionnaire for the primary data collection. An initial semi-structured interview pilot study was conducted with five participants. Following the feedback and new themes identified, the interview questionnaire was revised before undertaking the fieldwork with the twenty research participants who were interviewed with the application of semi-structured interview technique. The data collected was coded using NVivo and analysed using the inductive approach and theoretical thematic analysis to identify the key themes that facilitated the identification of the critical success factors for unconventional oil and gas development in the United Kingdom.

1.7 Structure of thesis

This section provides an overview of the chapters in this research study.

Chapter one is the introduction chapter to the study, and it details the background of the study, research aim, objectives, rationale, research question, scope of the study, and research methodology.

Chapter two examines the history of hydraulic fracturing and its process. It also explores the United Kingdom energy source, unconventional oil and gas in the UK. This chapter examines UOG in countries like Australia, Poland and United States, doing this by comparing the regulations and decision-making processes in these countries against that of the United Kingdoms', while also looking at the sustainability of UOG in the UK.

Chapter three details the literature review chapter, which focuses on the theoretical perspective of the study. The extended literature review identified the theories, models, frameworks that was applied in the study such as the social actuarial political risk and licensing (SAP) model, Shrader-Frechette's (2002) Principle of Prima Facie Political Equality (PPFPE), Institutional Theory, Stakeholder Theory and lastly Reed et al (2018) Theory. From a theoretical lens, the adoption of Shrader-Frechette's (2002) Principle of Prima Facie Political Equality (PPFPE), and Reed et al (2018) were best suited for the research study as they were applied in answering the research question in relation to environmental justice and public engagement in UOG policy decision making process.

Chapter four provides the philosophical and methodological method applied in the study. The philosophical reasoning was extensively discussed and engaged. The research methods selected and applied, sampling method, data collection method, the justification for the methods employed and the ethical consideration of the study.

Chapter five provides an extensive and detailed thematic analysis of the secondary data used to identify themes, which informed the primary data design and equipped the development of the interview questionnaires for the study.

Chapter six provides a detailed data presentation and findings of the semi-structure interview conducted. It explained the key mechanisms hindering UOG development in the UK, reflecting on the decision making process of UK and prospects for transition towards a renewable future.

Chapter seven is the discussion chapter, which detailed the key findings; gaps in the UK regulatory framework for UOG; issues with the change in the UK Trespass Law (Infrastructure Act of 2015), the concept of consent and the factors hindering UOG development in the UK.

Chapter eight provides a summary of the research findings; it addressed the research questions, made contribution to knowledge and practice, identified the limitation of the study and made recommendations for practice.

1.8 Chapter Summary

This chapter was the introductory chapter into the body of the work embarked on this study. It provided a foundation for the research study. The section began with a background of the study; research question, aim, objectives, rationale for the study and the structure of the thesis.

The next chapter contains existing literature on hydraulic fracking policy and regulations that are relevant for the study.

CHAPTER TWO
OVERVIEW OF HYDRAULIC FRACTURING POLICY AND REGULATIONS

2.0 Introduction

This chapter presents an overview of the technology of hydraulic fracturing in the onshore oil and gas industry in the countries of Australia, Poland, Unites States and the United Kingdom. It compares the regulations and energy policies amongst these four countries. Australia and the United States have been utilising this technology for commercial production of unconventional oil and gas for quite some time in comparison to the United Kingdom.

2.1 Hydraulic fracturing

Deep underground drilling combined with hydraulic fracturing is used in situations where the oil and gas resources in the deep underground are not easily accessible through conventional means of extraction as a result of the structure and geological location and formation of the hydrocarbon bedrocks (Liu, 2019; Kenomore et al., 2018; Bilgen and Sarikaya, 2016; De Silva et al., 2016; Estrada and Bhamidimarri, 2016; US EIA, 2011b). The sole purpose is to extract the shale embedded gas. Hauter and Gladstone (2020) explain that the technology of hydraulic fracturing when used in the extraction of oil and gas poses potential health and environmental risks. The process of extracting greenhouse gas methane in the embedded shale gas formation is known by various names as hydraulic fracturing or fracking, unconventional well stimulation or extraction, unconventional oil and gas, high volume hydraulic fracturing (HVHF) (Partridge et al., 2017). The term fracking is used as an industry nickname. Fracking is a two-week stage during the extraction of UOG operations when the shale rock is fractured using extremely high pressure in order to release the trapped hydrocarbons. Short et al (2015) includes that the process of fracking entails the full life cycle of the wells development, production and closure, that is, from the phase of exploring for hydrocarbons up until the extraction phase. Clarke et al (2015) suggested that the discussions surrounding the language to be used to describe the process affect the perception of the technology. Thus, as a proper understanding is vital in the development of the policy discourse as there is an argument that the term fracking should be avoided to prevent confusion and misinterpretation of its meaning (Evensen 2014).

In this thesis, the term fracking is used as short hand when describing the entire process of hydraulic fracturing in government reports, scholarly literature, independents reports, interviews and conversations etc. Looking at the communities directly affected by UOG development in the UK, the term fracking is usually used by them to describe the activities

that took place at those UOG exploratory sites (Short and Szolucha, 2019; Short et al., 2015).

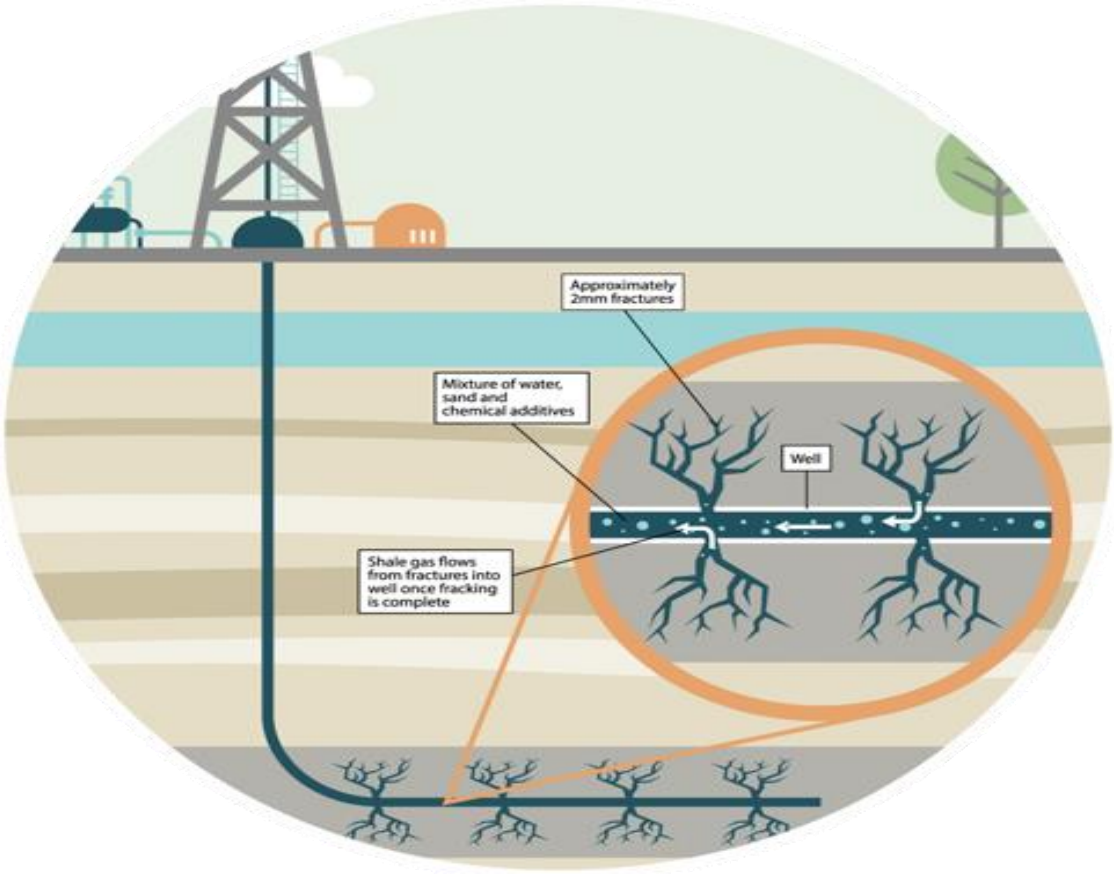
The hydrocarbons extraction sites offshore were no longer economically viable as a result of the decline in their productivity due to the deposits been sucked dry and the remaining deposits are found at very deep impermeable shale formations (Boak and Klienberg, 2020). With such depletion offshore using the conventional means, the government and oil and gas developers looked towards exploiting unconventional shale embedded resources, that would require method such as fracking which has been said to have arguable potential risks (Short and Szolucha, 2019).

2.2 Fracking Process

This section discusses a simplified explanation of the process of fracking without going in-depth into the technical analysis of the process, as this is beyond the scope of this study. Figure 1 shows the fracking process for onshore oil and gas.

The structure of shale rock is finely grained with low permeability, thus making it difficult to extract through conventional means (that is, where the hydrocarbons lie in close proximity to the surface and not in the rock layers). While the unconventional means involves opening the fractures in the rock artificially using high-pressure chemicals in order to release the hydrocarbons (Boak, 2020; Sovacool, 2014). The geology of the area determines the level of the shale rock that traps the gas but this can be measured sometimes in multiple kilometers (Jackson et al., 2015). Therefore, the risk in one area may vary from the risk at another location, thus the necessity for an extensive individual site-specific evaluation before permits are been granted for the exploratory activities.

Figure 1 Fracking process

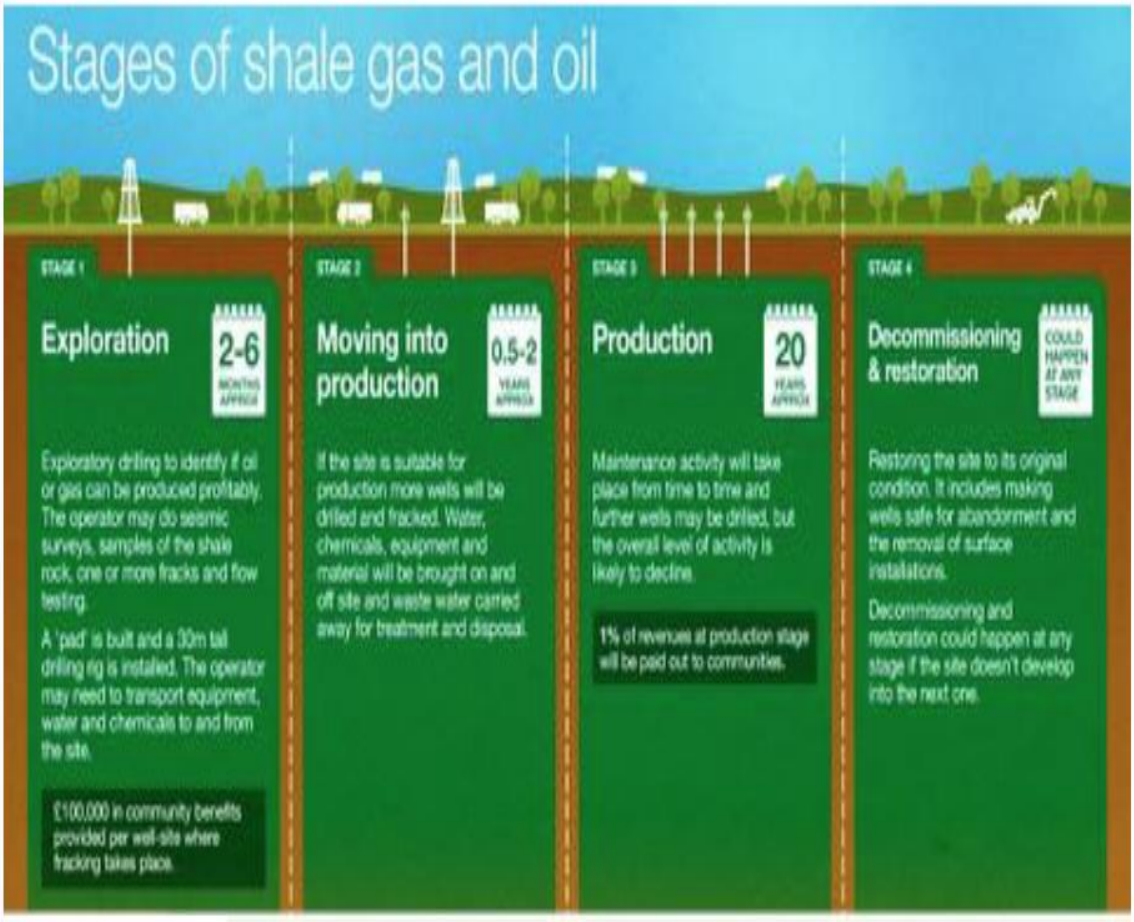


Source: UK BEIS, n.d.

Fracking activities on a site consist of four phases as seen in Figure 2 below, which summarises the processes as exploration, beginning production, production and decommissioning and restoration (UK BEIS, 2019). First is the preparation of the site and construction of the well pads to support the equipments. This involves multiples well pads built side by side in order to increase production efficiency. Following this is the installation of the drilling rig. These activities in such locations turns the site industrial, which would involve the movement of heavy-duty trucks for the movement of equipments and machineries required for the operations and also the construction of infrastructures for the development and operation of the wells (Goodman et al., 2016). Hammond and O'Grady (2017a) described the process as a procedure where in order to access the hydrocarbons, a bore hole is then vertically drilled up to the level where the gas deposits are located then parallel holes drilled horizontally at significant distances. With the hydrocarbons that are to be accessed located at several kilometers away from the original drilled hole (Robbins, 2013). The next activity is the actual hydraulic fracturing operation, where water is mixed

with fine-grained sand known as proppant and chemical additives usually a small quantity are then pumped into the well in high pressure in order to create vertical crack or fractures in the shale rock (Scotchman, 2016; Bazant et al, 2014; Sovacool, 2014). Elliot et al., (2016) study identified more than 1000 chemicals used in the various stages of hydraulic fracturing operations, thus making the assessment of any potential impacts difficult. In England, it is required that the onshore oil and gas developers under the Water Resources Act and regulations of the Environment Agency (EA), disclose all the chemical additives composition for all the fracking activities. While in places like the United States (US), the 1986 Emergency Planning and Community Right to Know Act (EPCRA) makes it mandatory for the disclosure of toxic or hazardous chemicals. Although in some states in the US, some additional reporting is required but the composition of the fracking fluid is exempted from this as a trade secret (Shrestha, et al, 2017; Konschnik and Dayalu, 2016; UK EA, 2015; UK BEIS 2013). The next phase is the release of pressure that was caused by the fracturing of the embedded rock to free the gas, which then flows to the surface going up the pipe for collection. The contaminated wastewater returns to the surface of the well, this could include contaminated radioactive particles that are usually found in deep underground levels. This wastewater is most times reinjected back into the underground basin (storage) through the same boreholes (Stringfellow and Camarillo, 2019). Lastly, after the installation of the necessary infrastructures that includes both the underground and surface infrastructures, a pipeline is connected to an existing pipe in order to carry the gas to designated production site. A wellhead along with tanks is then used for the extraction the gas until the well is no longer productive. When this happens, the well is either plugged or closed with cement and all the equipment removed from the site, while leaving behind the underground infrastructures most times (UK BEIS, 2019).

Figure 2 The four phases of the fracking process



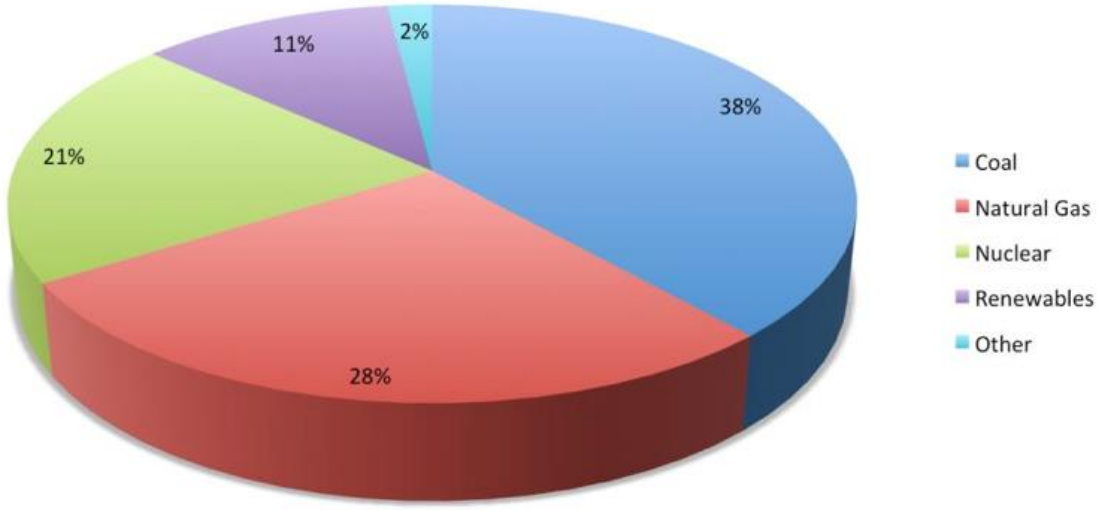
Source: UK BEIS, 2019

2.3 United Kingdom's energy source

The UK's source of energy is from these sources namely natural gas, oil, coal, nuclear and renewables and other sources (bioenergy, waste and net electricity import) (UK Government 2021). Thus from the chart, one can see that gas contributed over one third if UK's energy production. Although, recently, we have seen very positive developments in renewable energy, the electricity generated from renewables cannot be used extensively as 85% of households use gas heating and gas cookers. The UK also imports just under half of the gas we use. It is projected and predicted that by 2035; around 73% of the gas we consume will be met from imports. Thus, the diverse UK's energy imports supply was estimated not to be able to meet this demand securely back in 2018 (OGA, 2018). Investing and developing UOG as a homegrown source of energy supply, was projected to act as a bridge fuel in order to diversify the UK's energy sources and help support our energy security economically. It was however uncertain how much shale gas can be recovered in the UK. The British

Geographical Survey estimated that there is between 1300 trillion cubic feet of shale gas across Northern England and the Midland Valley of Scotland (UK Government, 2018). Despite this information, the amount of shale gas that can be extracted for commercial purpose is unknown and likely to be smaller. Which is the reason behind the UK government encouraging shale gas exploration, in order to ascertain how much of the shale can be commercially viable for UOG development to have a positive impact in the UK's economy and boost UK's energy security. The Figure 3 below displays the source UK's Energy:

Figure 3 United Kingdom's energy source



Source: UK Government, 2021.

The UK Prime Minister Boris Johnson announced a new Net Zero Strategy that is said to lead the world in the UK's contribution to climate change. Various parts of the UK's energy system were highlighted ranging from oil and gas, nuclear power, solar, wind, hydrogen and lastly demand. The net zero strategy includes new regulatory accelerator for the new oil and gas, planned new oil and gas licensing round with checkpoints and energy security, review on the science on UOG, clean electricity for the offshore platforms, CCUS clusters to future proof the North sea oil an gas, and phasing out reliance on Russian oil and gas imports by the end of 2022. For nuclear power, estimated productivity was set at 25% for UK electricity by 2050 at 24GW (that is reaching about 25% of the projected demand). Also, solar consultation for planning policy rules to strengthen the policy in favour of solar development. While also reviewing permitted developmental rights to support the process. For wind, thereby will be

planning and regulation time for new offshore wind projects and improving community benefits for areas with strategic network infrastructures. Although, the government will not change its planning regulations in regards to onshore wind farms in England which then makes approval impossible (barriers for onshore wind power). The ambition for hydrogen production is expected to double to 10GW production capacity which is at least 50% from electrolytic projects. Storage and business model is also expected have been designed by 2025. Looking at the aspect of demand, the UK government hopes to cut VAT for insulation and heat pumps, thereby facilitating low cost finance from retail lenders to speed up the green finance market. Encourage better labeling and product standards to enable consumers buy more efficient products. The government will also be considering various measures to support UK businesses including increasing the renewable obligation exemption to 100% (UK Government, 2021)

2.3.1 United Kingdom energy crisis

Prior to the energy crisis in 2021 and the new Net Zero Strategy, the UK Prime Minister Boris Johnson under the leadership of the present Conservative Party announced a £12billion Ten-point plan to facilitate a Green industrial revolution. The plan is said to mobilise £42billion private investment by 2030 with the sole purpose of reducing the UK's carbon emissions by 180million tonnes of carbon dioxide between 2023-2032 (UK Government, 2020). This led to fossil fuel businesses to look towards renewable energy sector. Some investors began investing in Environmental Social Governance (ESG) compliant projects. As a result of this, the oil and gas industry began to suffer as a result of insufficient capital to run their operations. Many sought out bailouts from the government but didn't get any help, as the COVID-19 pandemic was also hitting the UK economy hard. This further led to workers been made redundant or laid off including truck drivers. As at August 2021, the COVID-19 restrictions were lifted and energy usage went up. The depleting natural gas inventory meant that the excess demand and distribution of gas could not be met. The heavy good vehicle (HGV) drivers that help transport the gas to the distribution stations were in shortage in UK (Ozili and Ozen, 2021). As most European citizens working in the UK have returned to their home countries due to the UK leaving the European Union. This also affected the importation of cheap gas from neighboring European countries.

The UK still relies on oil and gas, thus, is exposed to the volatile energy prices since the UK's renewable industry is not wide spread yet but is still growing. The wholesale price of gas rose by 250 percent in January and 70 percent in August of the same year 2021 (Oil and Gas UK, 2021). This resulted to the government energy regulator (Office of gas and electricity markets) placing a cap on the price charged by the energy provider to the end users (Ofgem, 2021). This

led to a collapse of some energy companies such as Zog energy, Orbit energy, Neon energy, CNG energy etc (Ofgem, 2021). Discussions on whether the oil and gas companies will be given incentives or bailouts are still arguable. While energy prices continue to rise, will the energy regulator remove the cap on the energy providers in order to ensure consumers are not over charged by increase in the energy tariffs.

2.4 Unconventional oil and gas in the United Kingdom

The exploration and extraction of unconventional oil and gas for economic growth, job security and energy security was previously supported by the UK Government (Hays et al, 2015), despite the strong public opinions to the potential growth of the industry, and the utilisation of hydraulic fracturing technique to extract oil and gas. Two wells (PNR1 and PNR2) were drilled for exploratory purposes only at the early stages of UOG development discourse, which resulted to induced seismicity events that brought about the moratorium in England. Hays et al (2015) stated that, countries that are looking to develop and invest in the UOG would benefit from reflecting on the experiences in the United States. Indicating that the best practices or strong regulations do not guarantee safety, neither do they reassure a significant proportion of public opinion (Hays et al., 2015).

Public resistance, oppositions, local implications of exploration and the motivations of the industry have resulted into vocal opposition from numerous activist groups, non-governmental organisations and political parties on the development of UOG in the UK. Cairney et al (2015) specified that uncertainty lie in the heart of such development. In agreement, Cotton (2015) explained that the scientific uncertainty around fracking safety, based on the technical information is one of the major areas by which competing drivers of shale gas by stakeholder groups are aiming to manage UOG development. The other been the uncertainty surrounding decision making processes based on the political information, licensing, taxation, mineral rights and the planning and regulatory frameworks surrounding UOG growth (Cairney et al, 2015). Following these uncertainties, difficulties can be encountered amongst those attempting to influence the process as a result of the various divisions and parties responsible for the different stages of UOG development as highlighted below:

- *European Union- water quality*
- *UK Government- mineral rights, licensing, taxation*
- *Devolved Governments- Planning*
- *Local Authorities- Permission to pursue drilling at the selected sites.*

2.4.1 Ownership and regulation of unconventional oil and gas in the United Kingdom

The possibilities to explore and advocate for the benefits of UOG to the economy such as providing energy security, job creation for the host communities was found to be arguable and met with opposition from non-governmental organisations (NGOs) and most the residents of the proposed fracking locations. The two main regions of interest includes The Bolwand-Hodder gas play running across central England from Cheshire to Yorkshire and the second is the Liassic shale in then Weald Basin (Whitton et al., 2017). Cuadrilla conducted two tests in the Bowland area and it suggested that the gas in place in the area would be around 5.7tcm, with 15-20% of the resources technically redeemable in the area. One important question is "are the mineral rights in place for such exploratory activities". In the UK, the Crown Estate that represents the interests of the English monarchy holds all extraction rights. Thus, the English Crown owns all lands, unless otherwise proven with evidence to back ones ownership. The Crown Estate is governed by a board of Trustees that are responsible for maintaining and improving the management of all mineral resources. The governance of mineral rights extends out to the Unite Kingdom continental shelf (UKCS); an area comprising of those the sea bed and beneath the sea bed, beyond territorial waters (up to a 12mile limit), over which the United Kingdom exercises sovereign rights of exploration and exploitation of its natural mineral resources (BGS, 2016). The ownership of oil and gas rights within Great Britain was vested in the Crown by the Petroleum Production Act 1934, followed by The Continental shelf Act 1964 applying provisions of the 1934 Act to the UKCS outside territorial waters (BGS, 2016).

For any onshore exploration, a license would be required which grants exclusive rights to drill boreholes and then extract oil and gas onshore. The license granted does not include any right of access, and the licensees must obtain consent under legislation that would include the necessary planning permits from the appropriate local authorities. Despite the limits to the scale of production, the UK Government was going to go all out for the development of UOG. The Office for Unconventional Gas and Oil (OUGO) was also established. An industry body that a responsible for encouraging and managing energy development in the UK. The 2014-2015 Infrastructure Bill departs from the 2008 planning Act and the 2011 Localising Act that aims to involve local communities in the decision making processes that affects their communities (Whitton et al, 2017). Hence, the decision-making powers are returned to the Secretary of State in order for large-scale developments, particularly in the energy sector (Whitton et al, 2017). One of the major concerns for the local communities is in the fairness of allocation during negotiation of the negative social, environmental and economic impacts of UOG developmental projects, which are unevenly distributed governmentally and geographically (Cotton, 2014). Other authors have highlighted some unexpected outcomes that may result from UOG development which occur

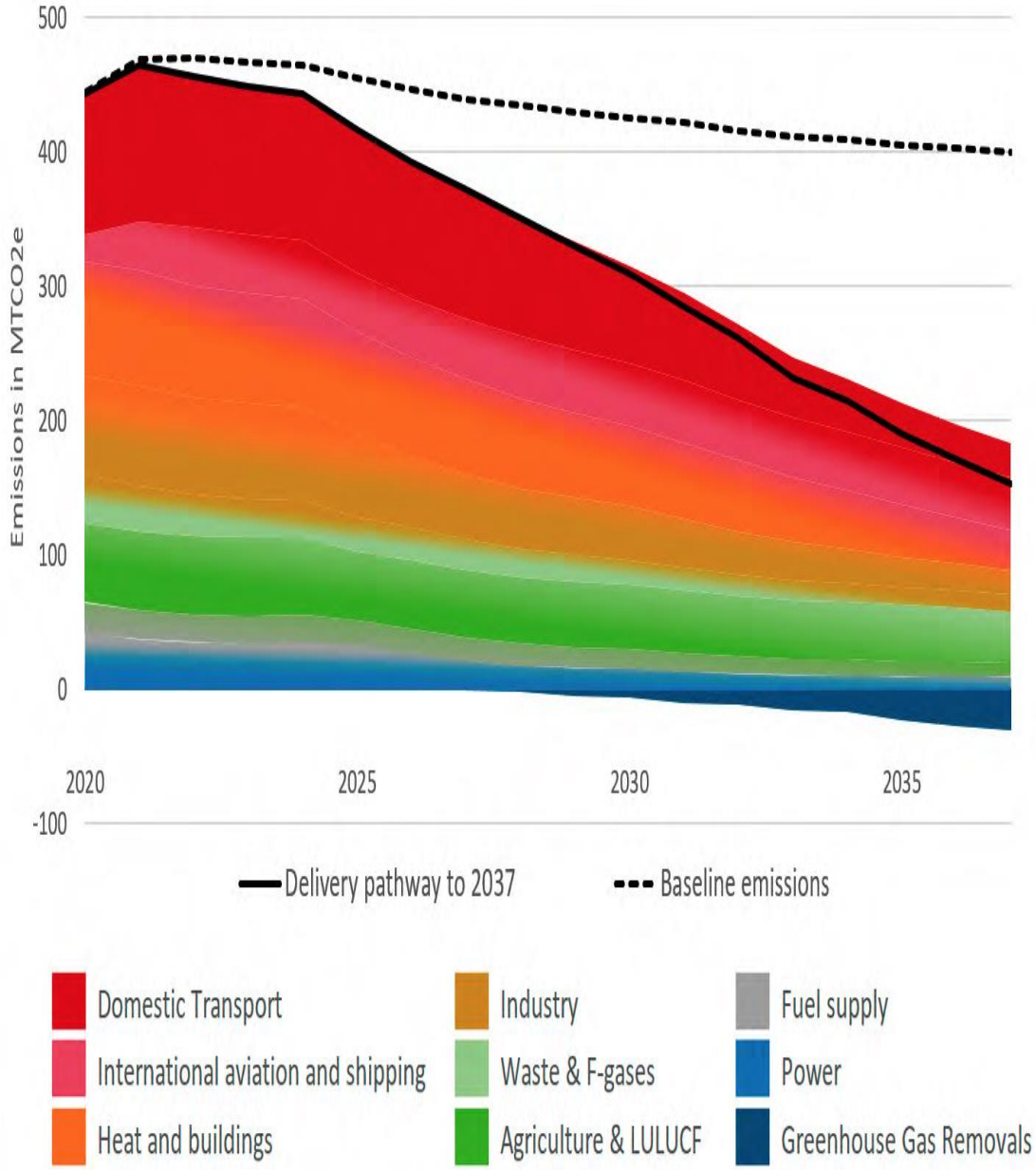
outside the influence of UK citizens and negatively affect them. Some of these include property and investment issues such the impacts on the availability of property insurance and mortgages of those properties located near the proposed fracking sites (Zanocco et al., 2018). Above ground factors are important in the extractive industry as what occurs below ground, which has immensely contributed to fracking becoming the focus of a growing body in social research (Goldthau, 2016). In other European counties like Netherland, researchers have considered hydraulic fracturing as a part of the country's energy transition, while also identifying the role of citizenship and the definitions of citizens to the state as part of this (Rasch et al., 2016). While Hanschel et al (2016) explored issues concerning property rights associated with fracking in countries like Germany and the United States. It was discovered that they both appear have contrasting regulatory systems that have led to UOG development progressing at different rates in both countries.

As stated earlier on, the land and underground mineral resources are owned by the Crown Estates and the processing of exploring and exploitation is governed by a system of national laws. There have been some changes in UK's Trespass Law; this enables oil and gas developers' access ground over 300m beneath an individual's property. All these have raised concerns and questions relating to fairness, democracy, inclusiveness, equality and accountability. Following this, a public consultation was carried out and it received an oppositional response from over 99% of those consulted (DECC, 2014). These arguments for the decision included the mitigation of lengthy delays to exploratory activities and the costly and time-consuming legal processes resulting form public opposition activities. DECC report stated that the Government proposes to give statutory right of access to geothermal energy and petroleum extracting companies, as it did for coal operators, to extract below the depth of 300m (DECC, 2014). In 2015, the UK Government set out regulations that fracking must take place at a depth below 1200m below protected areas such as National parks, areas of outstanding natural beauty, the Broads and World Heritage sites, justifying this by including that drinking water is not found below the depth of 400m (DECC, 2015). In contrast to Hanschel et al (2016) study, the regulatory provisions in Germany is different. The citizens in Germany expect their government to exercise extreme caution and control on matters relating to the environmental risks associated with UOG development. While in the United States, a response approach is applied when dealing with incidents and problems surrounding UOG and the process of compensation in the events of incidents instead of precautionary measures to avoid hazardous incidents in the first place (Hanschel et al., 2016). Germany applies a longer period for deliberation and consideration of UOG and its benefits unlike in the US, where the state legislation is quite supportive of UOG development and have encouraged and enabled the drilling and extraction to proceed.

UOG policies and regulations of countries like Australia, Poland and United States would be discussed briefly as an in-depth comparative analysis is not within the scope of this research.

Presently in the UK, after the Prime Minister Boris Johnson's Ten Point plan for a Green Industrial Revolution in in November 2020 as the moratorium on fracking remains in place and the energy industry is looking and investing towards energy sources that will further enhance decarbonisation and stop the burning of fossil fuel. The sum of £12billion was mobilized in order to pioneer the green industry by the decision to stop the sale of petrol and diesel cars by 2030 (UK BEIS, 2021). A new Net Zero Strategy was drawn up in October 2021 by the UK government. A delivery pathway showing how carbon emissions would be reduced across various industrial sectors in order to meet the climate change targets up to the sixth carbon budget of 2022-2037 can be seen in Figure 4 below**,** which shows the strategy plan for reducing emissions from each sector of the UK's economy (UK BEIS, 2021). Some key policies were also developed to include schemes like the Industrial Decarbonisation and Hydrogen Revenue Support scheme to fund Carbon capture business models and hydrogen. Which is to include £140million for the establishment of the scheme and £100million to be awarded as contracts of up to 250MW of electrolytic hydrogen producing capacity in 2023 and future allocations to be made in 2024 (UKBEIS, 2021). This can also change in future as new innovations and technologies are discovered each day. Such policy would also include climate compatibility checkpoints for the oil and gas sector in order to monitor and minimise carbon emissions. Such policies were developed as the UK is in its journey of transitioning from fossil fuel to other source of energy like renewables, biofuel, hydrogen etc (UK Government, 2021).

Figure 4 Indicative delivery pathways to 2037 by sector

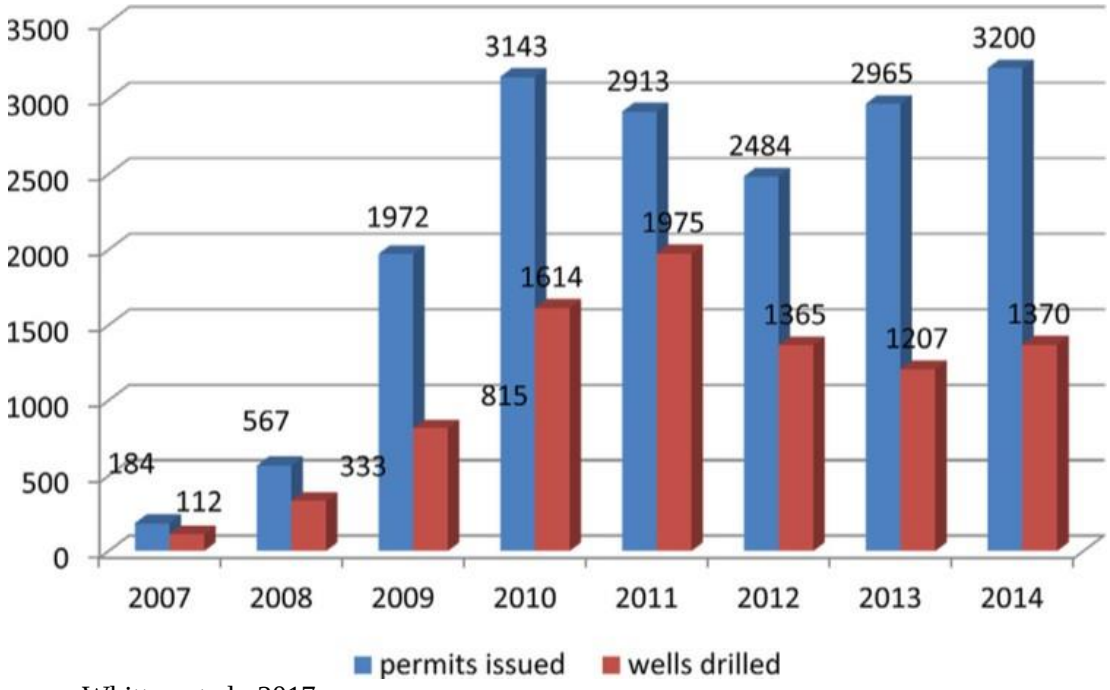


Source: UK BEIS Analysis, 2021.

2.5 Unconventional Oil and Gas in the United States (US)

Hydraulic fracturing has been incorporated in the extraction of shale gas in the US from areas like Barnett and Marcellus shale basins for over a long period of time, thereby altering the prices of natural gas and energy. New producing wells of about 146,000 have been established over the past 10 years which is one of the largest surges in energy production in US's history (Malin, 2014; Soeder, 2010). The US Energy Information Administration (EIA) has projected that shale-based natural gas production will grow from 0.75tcf per year as recorded in 2005 (4.1% of total production) to 19.8tcf per year by 2040 (53% of total production). From 2004 - 2015, 14,022 unconventional wells were drilled in the Appalachian Basin, including Ohio, Pennsylavnia and West Virginia (MCOR, 2014). From this figure, Pennsylvania had majority of 9590 wells drilled. At this rate, Appalachian basin would to become the most productive shale gas reserve in the US. The figures below shows the rapid growth of shale gas in Pennsylvania over the past decade. Such development of UOG has brought about a lot of concerns relating to the community, health, environment and the economic implications (Brasier and Filteau, 2015). Hydraulic fracturing appears to be well developed in US, but despite this, its popularity seems to be quite low in terms of public support (Boudet et al., 2014). Evensen and Stedman (2016) in agreement concur to the knowledge of shale gas somewhat low. Although it is high in states like Pennsylvania where extraction projects have been on going from the Marcellus basin for over a decade but relative low in states like New York where a ban has been in place since 2014 (Theodori et al., 2014). Figure 5 shows the number of permits and wells drilled in US 2007-2014.

Figure 5 Permits issued and wells drilled in the US



Source: Whitton et al., 2017

2.5.1 Ownership and regulations of Unconventional Oil and Gas in the United States (US)

The development of UOG in US adapts the regulatory framework that governs of conventional oil and gas (NETL, 2014), with a few updates to the framework. Public engagement is challenging, as the regulations are limited to public hearings for new programs and not the main framework. To this end, it is quite difficult for the public to know where to direct issues of concern due to the complex nature of UOG regulations in the US (NETL, 2014; Richardson et al., 2013). The framework includes the federal, regional, state, local and multiple agencies that govern the development of oil and gas. In the federal level, the Federal authority applies the exploration or extraction activity is designated on a federal owned land and also on activities associated with endangered species, air, water quality, worker safety, hazardous materials and their management. While at the state level, permits for drilling, hydraulic fracturing, wastewater management, well plugging and decommissioning are governed by the states.

2.6 Unconventional Oil and Gas in Australia

As a result of increased export demand and a recent demand for a cleaner source of energy rather than coal, and a decline in the availability of natural gas from conventional sources has resulted to an increase in the pressure to exploit oil and gas through unconventional means such as fracking. To this end, there has been an increase of opposition based on the environmental and social implications of fracking.

In Australia, the primary environmental regulators are the Territories and the States (Bubna-Litic, 2015). The government of New South Wales in December 2010 imposed a moratorium on hydraulics fracturing, although this was later lifted after a code of practice was introduced. Following this, in March 2014, there was an announcement by the government of New South Wales to freeze the exploration of coal seam gas for six months (BBC, 2014). Furthermore application fees increased from $1000 to $50,000. After a public consultation took place, the moratorium was extended to July 2015. The Victorian Auditor-General in August 2015 released a report detailing the inadequacy of the current regulatory regime and making a number of recommendations if the moratorium on hydraulic fracking is to be lifted (Victoria Auditor-General, 2015). The Tasmania government has a reputation for producing fresh, premium and safe produce, but in February 2015, it extended the moratorium for another fiver years in order to protect that reputation (ABC News, 2015). While in South Australia, the Energy Minister refused to grant a moratorium against hydraulic fracturing, stating its importance to the Southern Australian economy and that the moratorium would be against national interest. As a result of community concerns, the Southern Australian government announced that they would hold a public inquiry into fracking and its report due to be concluded and reported back by the end of 2015 (Australian Parliament, 2014). Australia has seen very little fracking, although its potential appears to be very large, as Australia has the largest volume of technically recoverable shale gas in the world, estimated at 437 trillion cubic feet (USEIA, 2013).

2.6.1 Regulatory framework in South Australia

The Australian federal government has limited regulatory authority under the constitution with most regulatory authority residing with the State governments. In March 2012, the National Partnership Agreement for the Regulation of Coal seam Gas (NPACSG), was created between the federal government and five State and Territory governments. The aim of NPACSG was to ensure the regulation of Coal Seam Gas (CSG) was informed by strong science. Thus the federal government established the Independent Expert Scientific

Committee on Coal Seam Gas (CSG) and Large Coal Mining Development (IESC) under the Environmental and Biodiversity Conservation Act 1999 (Cth) (EPBC Act). IESC role is to undertake bioregional assessments to gather information about the interrelationships between surface and ground water and surface water and fauna and flora. The Onshore petroleum exploration and development is regulated under the Petroleum and Geothermal Energy Act 2000 (SA) (PGE Act) and Petroleum and Geothermal Energy Regulations 2013 (SA) (PGE Regs).

The PGE Act was passed following a major review of the Petroleum Act 2000 (SA), which was initiated 1996 as a result of a change in community expectations on matters relating to the environment directed towards objective based regulation away from prescriptive regulations and competition policy reforms (Malavazos, 2001). The reason for government's intervention in the upstream sector in the oil and gas industry is where there is market failure. This only occurs in the absence of incentives for the oil and gas industry to voluntarily serve the publics interest (Malavazos, 2001). Negative impacts such as land degradation, pollution, and unsafe practices are most likely to be passed to other sectors of the community if incentives and regulations are not in place. Another intervention from the government is needed to provide security of property rights title and deal with competition of these rights. Furthermore the legislation was made based on six regulatory principles, which are: transparency, flexibility, openness, certainty, efficiency and practicability (DMITRE, 2001). The possibility of all six regulatory principles been put into practice is a huge challenge in the onshore industry when it comes to hydraulic fracturing. The level of regulatory scrutiny and monitoring needed to ensure compliance is totally based on each individual company's compliance capabilities and their expected outcomes (DMITRE, 2001). This legislation makes it obligational for all liabilities to be paid by the companies as a form of appropriate rent to the local communities that are negatively affected by the impacts by UOG development. Such impacts includes contamination of the soil, surface water, groundwater and air have been documented unlike the health impacts, seismic risks and methane leakages that have not been detailed. The health impacts were not also documented in South Australian PGE Act or PGE regulations as a result of the lack of health impact assessment requirements (Bubna-Litic, 2015). It was noted in the debate surrounding fracking that compensations was only limited to the affected land-users under the legislation which resulted to arguments for compensation for the wider community for the present and future unforeseen losses. Future unforeseen losses include community stress, which was not a theme or term recognised in the debate (DMITRE, 2001). The question of how these losses would be compensated for was unanswered. Another questionable point was under what circumstance are the regulators to stop or prevent the companies operations; was it to be done when the damage to the environment has occurred? As at 2015, the Department of

State Development (DSD) had this role, would it be more transparent if EPA had the power to enforce this (Bubna-Litic, 2015).

Southern Australia has a three-stage process for petroleum and geothermal licensing and these stages must be completed before any production can begin. The first of these stages is the approval stage for exploration. The license grants the licensee an exclusive right to an area to apply and undertake exploration activities only. The second stage involves environmental assessment and approval. Part 12 of the PGE Act deals with environmental protection are stated to:

- ensure that regulated activities that have (actually or potentially) adverse effects on the environment are properly managed to reduced environmental damage as far as reasonably practicable; and
- eliminate as far as reasonably practicable risk of significant long term environmental damage; and
- ensure that land adversely affected by regulated activities is properly rehabilitated (South Australia government, 2000).

It is at this stage that the development of Socio-Economic Objective (SEO), which community consultation takes place in the hope that the community would help set the objectives of the SEO. There were a lot of concerns from the local community in the south east of South Australia regarding proposed fracking projects and that the companies do not have license to operate. In order to enhance community trust in the process, public consultation was extensive. The former Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE), now Department of State Development (DSD), in consultation with Department of Planning Transport and Infrastructure (DPTI) and Department for Environment and Water and Natural Resources (DEWNR) published criteria and guidelines for the classification of the level of environmental impacts (DMITRE, 2013). Although there was no criteria used in the process, yet the SEO was created based on this classification. Thus the SEO was established based on the EIR, after the impacts had been classified as either low or medium, and after carrying out an environmental impact assessment under the Development Act, when it has been classified as having a high impact to the environment of the community. Just like in the United Kingdom, the criteria for any effective participation process should consist of the following processes below and the without these in practice (Karan, 2017), UOG development would face a lot of challenges and oppositions;

- *Transparency and trust in the process;*
- *Good science and understanding the technical information;*
- *Opportunity to participate and a safe environment to participate;*

- *Inclusion of all the stakeholders and recognizing stakeholders expertise;*
- *Access to information and adequate information made available;*
- *Timely feedback and ability to appeal decisions;*
- *Provision of monitoring;*
- *Evaluation of environmental, economic and social impacts.*

The South Australian government continues to push in order capitalise on UOG development in places like the Copper basin and southeast regions. With the same policy argument like in the United Kingdom of providing energy security and that it is a cleaner form of energy compared to coal. Also the Federal and State insist that there is a high export demand especially from places like Asia. In the past, the large tracts of old growth forests were turned into woodchips in order to order export dollars from Japan. Most of these forests are gone now and can never be replaced as a result of the shortsightedness of the government. Thus the development of UOG continues to pose a risk to the environment and community in Australia and many continue to fight against it around other places in the world as seen in lots of literatures (Bubna-Litic, 2015).

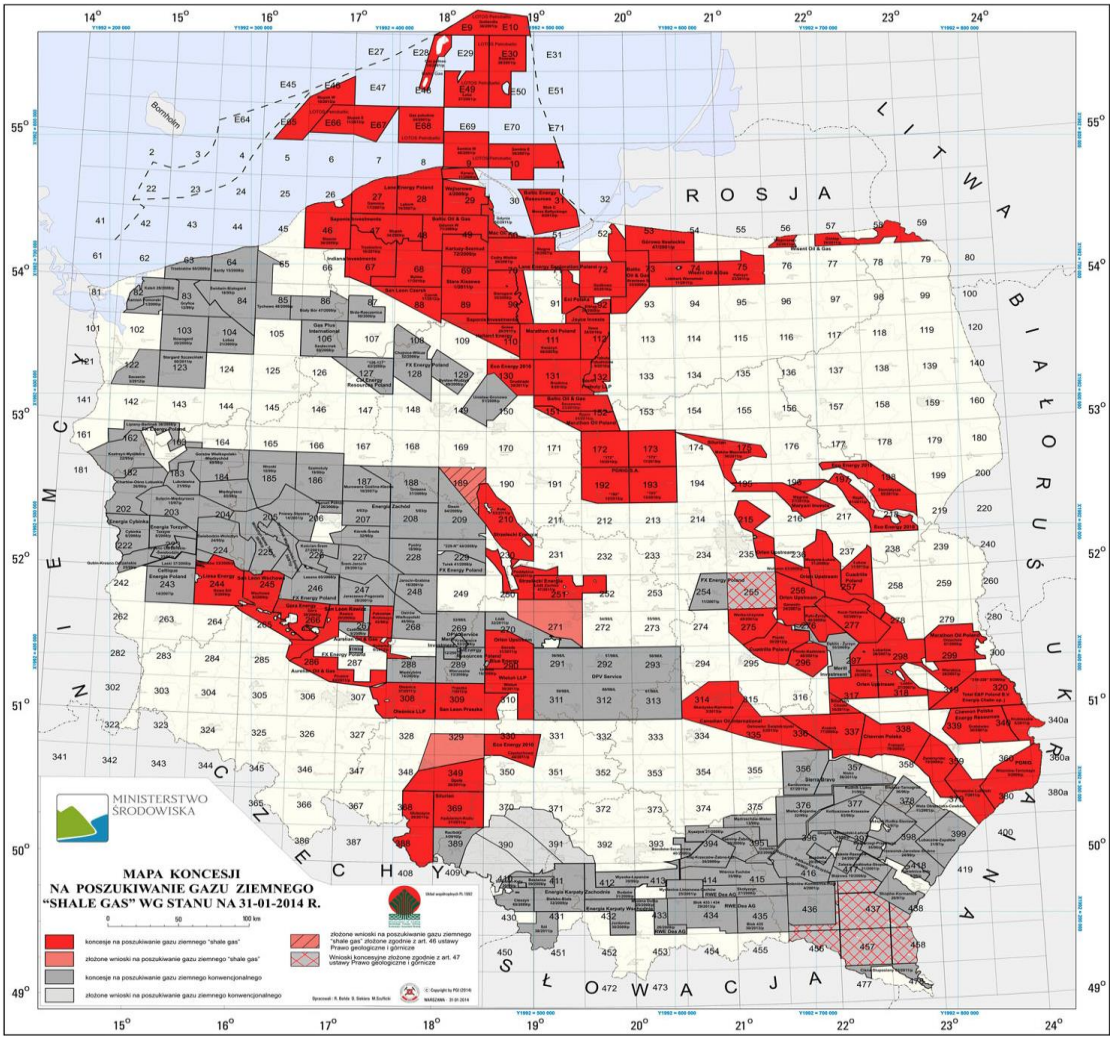
2.7 Unconventional Oil and Gas in Poland

American Energy Information Agency (EIA, 2015) once described Poland as having the biggest UOG reserves in Europe. Poland was the most advanced amongst European countries in the search of shale gas having completed 67 exploration drills at the end of October 2014. A number of licenses for were issued in 2007 and since 2010, the number of licenses issued then doubles from 51 to 113, which was later, reduced to 60 as at October 2014. The Ministry of Environment is responsible for granting Licenses, while the Ministry of Treasury and Ministry of Economy both have the responsibilities regarding the hydrocarbon sector. Over 23 Companies were able to obtain permits, which consisted of international companies, national and partially state owned companies. Polish state owned companies like PGNiG S.A possesses fifteen licenses, Lotos Petrobaltic S.A has eight licenses and Orlen Upstream Sp.z.o.o has nine licenses. While foreign companies own from one to five licenses each; ExxonMobil (one), Total (one), MarathonOil (four) and Chevron (four). These permits were issued for a five year life span, some of which expired and some of the licensee decided not to apply for an extension as a result of unfavorable geological conditions in some locality and poor financial standing of some of the companies (Lis, and Stankiewicz, 2017). Although no commercial production has started yet in the sites identified. The shale gas reserve was estimated to be 5.3 billion cubic metres by American Energy Information Agency (EIA, 2011). A year later, the Polish Geological Institute

estimate was 346-768 billion cubic metres (Rutkowski, 2015). Olkuski (2013) included that from the reports published by Rynstad Energy, Advance Research Institute or Wood Mackenzie calculated shale deposits to be up to 1-3 billion cubic metres. While Rutkowski (2015) argued prior to the completion of exploration phase, it would be a challenge to assess the commercial available shale gas.

Unconventional Oil and gas deposits spreads from the southeast to the northern part of Poland. As seen in Figure 6 below, the Lubelskie region in southeastern and Pomeranian region in the north at the coast of the Baltic Sea which are highlighted in red colour. According to the license obligations, the operators were to conduct 333 exploration drills, out of which, they are obligated to 123 and 210 were made optional (Pliszczynska et al, 2013).

Figure 6 Shale gas drillings on the map of licenses for exploration of hydrocarbons deposits



Source: Poland Ministry of Environment, 2014.

The public support for UOG development was on the high with 59% in areas where exploration activities were to take place and 78% countrywide (CBOS, 2013). In January 2013, 88% of inhabitants in the Lubelskie region (Mieszkancy 2013) and 76% of the Pomerania inhabitants (Jackman and Sterczynska, 2013) were in support of UOG exploitation. Despite this, there were local protests relating to lack of information, seismic activity, health and environmental impacts of fracking. Complaints of lack of communication sparked continuous protests as at 2010, which led to the creation of regional and local protest organisations and committees (Lis, and Stankiewicz, 2017). All these resulted to the instigation of protests in other local communities as well. Other anti-fracking organisations from national and international environmental organisations such as Food &water Europe and No Fracking France supported the ongoing protests (Lis, and Stankiewicz,, 2017). Blockades were made at the Chevron site in Zurawlow (Lubelskie

region) with support from local farmers in Poland and exploration activities were stopped for more than a year.

2.7.1 Regulations and issues with fracking in Poland

A report that was commissioned in January 2012 by the European Commission appears to boost the Polish governments ambition as it was reported that the regulatory framework was appropriate for the exploration of UOG (Philippe & Partners Law firm, 2011). Although the study did not illustrate under what conditions the development of UOG would be commercially viable. In the current regulatory framework, some important issues were not addressed such as the prevention of contamination of ground and surface water or how fracking fluids would be disposed or managed. Furthermore, the European Union did not have measures on how to manage these issues were also not in place as at the time.

Theoretically, Poland's market has been open since 2007, although some obstacles exist, the Polish government would have to meet the obligations that have been laid down by the European Union legislation for the internal market of oil and gas (European Union, 2009). PGNiG, was a state owned company and was responsible for both UOG sales and its distribution networks in the country and represents 97.5% of the gas sales in the whole country. Thus, competition was quite low in the market. Under the Treaty of Functioning of the European Union, the European Commission is responsible for overseeing the proper implementation of European Law of its Member States and can start proceedings if there is any non-compliance. From history, it can be seen that the Commission sometimes struggles to convince Member States to implement European Law, despite possessing the authority to do so. Such examples are cases that involve non-compliance of a large number of Member states. One typical case was in the partial implementation of the unbundling regulations by Germany and France or the delayed implementation of biofuels regulations in almost all Member States of the European Union. Poland appeared to be isolated regarding UOG development in Brussels with its officials alone propagandizing for its exploitation, while other Member States representatives are opposing it. Thus, the EU Commission was expected to have quite a leverage to motivate the Polish government to implement the necessary legislation promptly.

Energy security policy agendas have been rooted in the combination of both energy supplies and national security with a belief that the main function of a foreign and national policy is to ensure affordable and reliable access to energy supply (Yergin, 2006). The issue of energy security is mostly context dependent. Looking at the United States experience, with nearly over forty years of government policy, it is still influenced by the oil and gas embargoes of 1970s, while the current EU policy focuses on affordability, sustainability and

stability (European Union, 2007). The Polish energy security propaganda is filled with distrust of Russia and other fellow EU member states. This is not surprising given the history of war, subjugation etc. It is well known that Russia has been the main supplier of crude oil and natural gas to Poland for many years. In January 2009, during the oil and gas price downturn, dispute arouse between Ukraine and Russia and this resulted to disruptions in the supply line to European consumers and other parts of Southern Europe had to without gas for several days, Gazprom company had to double shipments to Europe through Yamal pipeline (crosses from Belarus to Poland), in order for the consumers in Poland and Germany not to bear the interruptions (Le Coq and Paltseva, 2012).

Discussions and debates around Poland's energy policy stand in contrast to those in other parts of Europe like Germany, that treat energy as economic considerations and not strategic ones (Umbach, 2010). Poland joined the EU in 2004 and since then, it had a strong voice in bringing energy to the front of discussions of European external relations despite the perception of Central and Eastern Europe that energy policy in the EU before 2004 enlargement did not sufficiently address the overdependence on energy imports in Europe (Roth, 2011). In 2016, the geological forecasts for UOG in Poland demonstrates that the present estimated supply will only be sufficient for a few years assuming oil and gas was substituted for imports, which is all dependent on the market price.

In summary, the Table 1 below shows a brief comparison between the three discussed countries in relation to UOG:

Table 1 Summary of UOG development in US, Australia and Poland

	UNITED STATES	**AUSTRALIA**	**POLAND**
REGULATORY FRAMEWORK	Governed by Federal, Regional, State and Local and multiple agencies	Governed by the Territories and States but most the States	European Union and the Polish government
UNCONVENTIONAL OIL AND GAS LIFE CYCLE STAGES	Exploration Appraisal Development Production Decommissioning	Exploration Appraisal Development	Exploration phase
CONSULTATION PROCESS	Limited to public hearings for the new technology and not the regulatory framework	Community consultation within the States	Consultation with regulatory bodies
NATURAL RESOURCE OWNERSHIP	Private individuals, Corporations, Federal, State Local, Tribal governments, can own both land and mineral resources found below the surface of the ground	The Crown owns all the petroleum and minerals resources under privately owned	Owned by the State Treasury

Sources: Author, 2021.

When comparing these three countries one can deduce from the table above that in the USA, private individuals can also own the mineral resources located within their residential grounds just like the various tiers of the government. Since the early 2000s, fracking has been used for exploiting UOG in the US, thereby providing new source of energy and revenue for the country and its mineral rights holders. The boom in production and the energy price decline resulted to households and companies benefitting from it. Consequentially, the associated localized costs and benefits was disproportional in the farming areas as farmland accounted for about 48% of the land and an estimated 67% of onshore oil and gas production as at 2014 (Hitaj et al., 2018). Therefore, only farmland owners who own lands where mineral are found below their ground can receive royalties generated by oil and gas production. This is also common in areas with a history of energy production like parts of Texas and North Dakota. Owners of farmland who do not own oil and gas rights will likely encounter additional problems as they cannot negotiate the terms of oil and gas production. Such owners will not be compensated for any harm that the drilling causes. Such losses from being uncompensated arise from removing the land from agricultural purposes to serve as well pads for UOG production (which could cause air, water, soil contamination from spills). Determining adequate compensation is hard because clean air, good health are difficult to valuate, as they do not have a market price. In oil and gas producing states, oil and gas payments to farm operators amounted to 11% of their net cash farm income. In places like Texas, Oklahoma and Pennsylvania, such payments reached almost 30% of net cash farm income (Hitaj et al., 2018).

These payments have helped the financial health of landowners who signed leases to the developers since early 2000s, while almost 27% of operators who have leased rights in 2014 have less drilling activities since the controversial debate on fracking continued to rise. It is plausible that leasing, production and royalty payments might continue to increase in the coming decade in the US. It is projected that UOG production will increase by 23% from 2016-2025 (US EIA, 2019).

2.8 The impacts of energy policy on onshore oil and gas industry in the United Kingdom

Despite the expansion in social research on the issues relating to UOG development, there appears to be little information about environmental justice of fracking policies and how decisions concerning fracking are developed. Cotton (2017) argued that fracking related planning policy development links to greater problems of both consent and participative related injustice that is associated with the ongoing planning reform processes (the Planning Act 2008, Localism Act 2011 and Infrastructure Act 2015) which shorten times across

multiple planning consent regimes. Powers have been taken away from the local authorities and shifted to the national level. This can be seen as environmental injustice in relation to other energy related subjects such as the nuclear waste management following Cumbria County Council's decision to disengage with the volunteer site selection processes (Mackerron 2015). The decision-making mechanism in the local communities, it appears to be quite complex. The Conservative Government aimed at empowering the local communities to make/take decisions that affect them directly/indirectly on the surface, but in reality, the government has abolished the regional tiers of spatial planning, thus shifting the decision making away from the local authorities towards direct engagement between the communities and the developers. While doing this, the Government as a result of a reduction in public spending, capital funding to local authorities has been reduced, thus the local authorities' hands are tied as this curtails their power to block applications for UOG development and accept council incentives through business rate returns on the proposed fracking investments (Cotton, 2017). The outcry by the public was ignored by the UK government, with local councils' decisions being overruled by ministerial authorities at the national level rather than locally protecting the environmental rights of the local communities. Instead, the power of communities to halt environmental harm has weakened at the various levels of environmental governance decision-making process, leading to the ongoing protests and activism at the sites where exploratory activities took place**.** Cotton (2017) suggested that there needs to be a rethink towards reviewing the UK's planning policy by reconfiguring the planning consent regimes to be promote inclusiveness and public engagement/participation in the development of UOG.

Shrader-Frechette (2012) explained that it is appropriate for government and industry to fulfill both participative and distributive justice requirements for the purpose of providing ethical legitimacy to a decision making process for environmentally damaging industrial projects. This is required for any adaptive and fast moving transition in the decision making process of any new policy. In addition, Cotton (2017) argues that there is a contradictory picture of political equality in hydraulic fracturing related environmental justice. The UK government placed a moratorium on fracking in November 2019. Despite the moratorium in place till date, and protests from non-governmental organisations like Greenpeace, Friends of the Earth, WWF, Frack off, there are still members of the UK government who still supports UOG development citing the relevance of UOG in the UK's energy transition towards renewables.

2.9 Sustainability of Unconventional Oil and Gas the United Kingdom

The sustainability of any proposed new technology for growth or development is another key factor to be considered on the subject of UOG development in the UK.

Burndtland (1987) described factors like economic, social and environmental factors as the three pillars of any sustainable development in any country. Hence, for any sustainable growth to be successful, all three pillars have to be aligned. Which is usually not the case as can be seen in UOG development in UK.

2.9.1 Environmental Factor

In 2011, hydraulic fracturing of shale gas was paused by the Department of Energy and Climate Change (DECC) now called the Department of Business, Energy and Industrial Strategy as a result of two tremors that occurred in the Blackpool area thereby an assessment had to be carried out by independent consultants and experts for an informative review. Following this incident, in 2012, DECC introduced measures for the control of tremors. In which case, before any fracking operation, potential Operators would have to assess the proposed location whereby running tests to detect any seismic risks. In the event of any disruptions or tremors, all operation must be stopped immediately as regards to the DECC guidelines (DECC 2013). A global alert was issued by the United Nations Environment Programme (UNEP, 2012) on the issue of fracking expansion relating to its risks to the soil, air and water. A further associated risk includes damage to the natural habitat, ecosystem, biodiversity impacts, and leakages that would result in gas emission (Short et al., 2015).

A lot of controversies have been bred worldwide leading to protests from various governmental and non-governmental groups.

This is both nationally and internationally about the environmental concerns related to contamination of water resources, carbon emissions, induced earth tremor, community disempowerment, industralisation of the community and insufficient regulated corporate power (De Rijke, 2013; Steger and Milicevic, 2014; Wynveen, 2011).

2.9.2 Economic Factor

The promise of economic growth, job creations, profit-realisation and energy security has been the main notion of most pro-shale factions in the UK. This group includes the former Prime Minister David Cameron, the Treasury, Oil and Gas companies (such as IGas and Cuadrilla). In agreement the UK Chancellor stressed: ‘we don’t want British families and businesses to be left behind as prices tumble on the other side of the Atlantic”(quoted in the Economist, 8 Dec 2012).

The shale reserves in the United Kingdom has not been accurately estimated as a result of the lack of inexperience in the geological understanding, technology and cost estimation for its production (DECC, 2013a). Hydraulic fracturing has been said to assist in the generation of new forms of energy supplies and security, increased economic growth, and lastly also to provide an alternative source of power by transitioning away from a coal-based energy, carbon-intensive (House of Lords Economic Affairs Committee, 2014). David Cameron (2013) also stated about the benefits of the extraction UOG "Without it, we could lose ground in the tough global race." In agreement, George Osborne also stated: "I want Britain to be a leader of the shale gas revolution – because it has the potential to create thousands of jobs and keep energy bills low for millions of people", (Macalister and Harvey, 2013). Although the exploitation of UOG would create an avenue for job creation, the public acceptance of this venture is another issue, as the public support for the growth of UOG production is becoming a tactical concern for not just the UK but also European policymakers (Obama, 2014).

Some of the economical estimated benefits if UOG is invested on in Scotland to 2062 can be seen in the Table 2 below from KPMG's scenario based Assessment Report for the Scottish government (KPMG, 2016).

Table 2 Economic benefits of UOG development

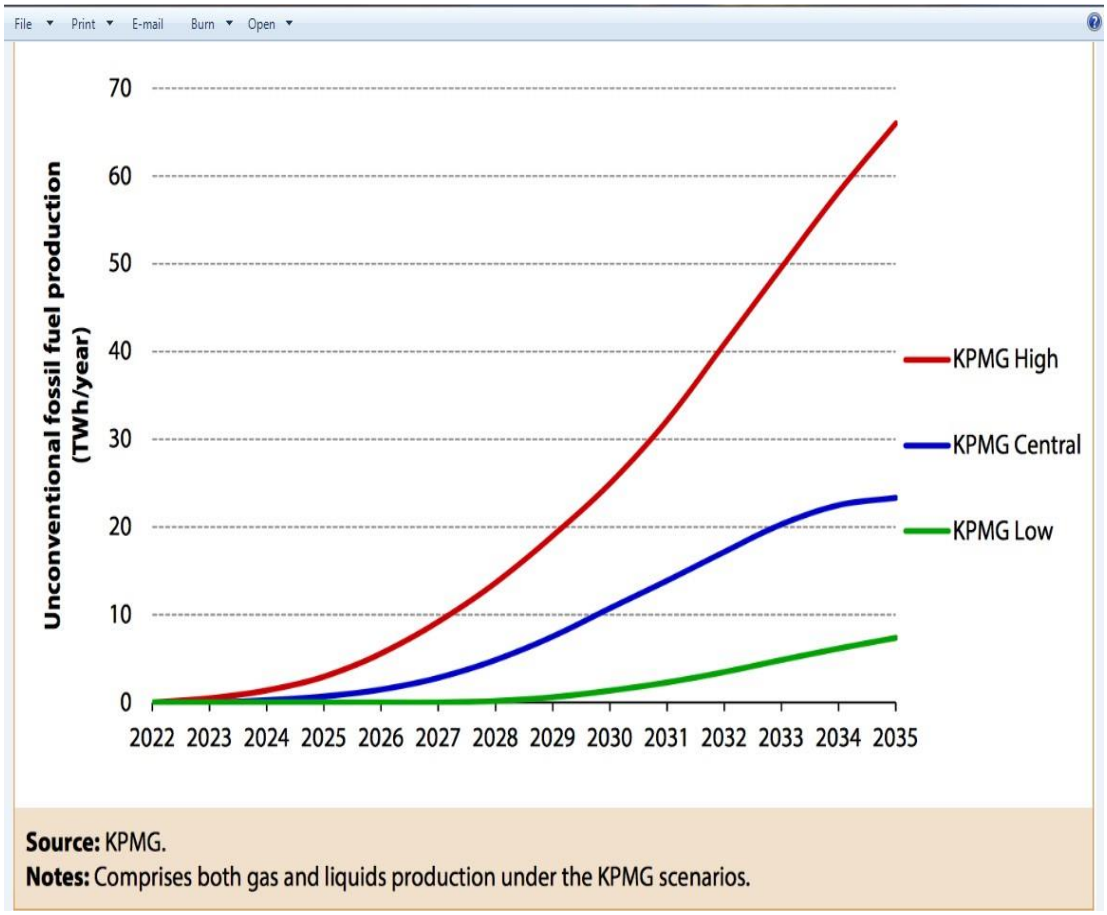
	Central scenario	**High scenario**	**Low scenario**
Total Spend (£bn)	4.4	10.8	1.5
Spend in Scotland (£bn)	2.2	6.5	0.5
Total additional economic impact of the UOG spend in Scotland (£bn)	1.2	4.6	0.1
Additional jobs created	1,400	3,100	470
Additional tax receipts in UK (£bn)	1.4	3.9	0.5

Adapted from: KPMG, 2016.

- Central scenario is based on midpoint/average estimates of potential production
- High scenario is when there is a significant development in the next decade or so
- Low scenario is when the development is initially slow and there is a limited growth in production

In terms of the Productivity rate, KPMG also produced three scenarios that showed the productivity levels of the wells versus the timing (2022-2035) of production if extraction of UOG is invested upon in Scotland. This can be seen in Figure 7 below:

Figure 7 KPMG scenarios for unconventional oil and gas production



Adapted from: KPMG, 2016.

In terms of decommissioning and aftercare, Scotland has a well-grounded regulatory system in place for offshore activities just like the UK. When it comes to onshore drilling operations

in Scotland, which is another story entirely in comparison to the UK. It is mandatory by law for every operator to have an approved plan for the disposal of the well facility after it has reached its end of life. The Oil and Gas Authority (OGA) controls the licensing powers. Therefore, the Scottish Government has the authority to fine-tune the licensing system and strengthen any regulations to suit the needs of Scotland's oil and gas industry. Thus, all prospective licensed UOG operators would have to be financially capable of financing its decommissioning, financial aftercare costs and the treatment of business liabilities as the case may be. Below is a table detailing the issues, uncertainties and options available for the management of the decommissioning obligations as by AECOM (2016) for the Scottish Government:

Figure 8 Issues, uncertainties and options for decommissioning

Key Issue	Uncertainties	Options
Management of Risks		
Well Integrity	How can the risks of emission be managed?	The well abandonment plans should approved by an independent well examiner. All post decommissioning should continue as required by the regulatory body.
Nera Surface contamination	How can this be minimised?	Operators of UOG to provide environmental liability insurance.
Surface restoration	How can this be minimised?	This should be through a legal agreement that includes a restoration plan and should be enforced.
Regulatory System		
Licensing	A comparison of the Scottish oil and gas licensing compares to those of other countries?	It is good in comparison and opportunities for further improvement and strengthening should be in place.
Planning System	Is it suitable to handle all decommissioning and restoration activities?	If there is the development of UOG, the authority should have a robust plan to manage this.
Management of Financial Liabilities		
During licensing	How is the risk of UOG operators abandoning well sites before decommissioning?	Financial bonds through a detailed agreement can be used to mitigate this risk.
Post licensing (not orphaned)	If the operator is still in existence, how can this be managed?	An operator's Environment Impairment insurance can be used a mitigation strategy if this occurs.
Post licensing (orphaned)	If the operator is no longer in existence, how ca this risk be mitigated	The licensing authority can manage a mutual fund which can help relieve this issue arises.

Adapted from: AECOM, 2016.

2.9.3 Social factor

The process of extracting UOG, using hydraulic fracturing (fracking), is a controversial subject in the United Kingdom. The various activities associated with the development of UOG include: exploration; site clearance, road construction; drilling the well; hydraulic fracturing and the completion of the well (Macey et al., 2014). When the site is being developed, the health effects are mostly like those seen during road constructions (McCawley, 2015). This would include the emission of hazardous gases like nitrogen oxides (NO_x), non-methane volatile organic compounds like benzene, xylene, propane and butane (NMVOCs), and particulate matter with concentrations $PM_{2.5}$ and PM_{10} (Moore et al., 2014), while during drilling (horizontal and vertical) hydrocarbons (low toxicity) are released. These hydrocarbons include methane, butane, ethane and propane (McCawley, 2015). Esswein et al., (2013) also stated that some volatile organic compounds emitted include benzene, ethyl benzene, naphthalene etc. In the hydraulic fracturing phase, water that contains suspended proppant like silica-containing sand, with some chemicals is forced downward at high pressure, and exposure might occur during extraction, and transportation (McCawley, 2015). Another possible exposure is during production after the purification of natural gas for commercial distribution, emissions like carbon monoxide (CO_x), carbon dioxide (CO_2), sulphur dioxide (SO_2) occur from the natural gas-powered engines, trucks, generators and drill pumps (Goetz et al., 2015). One of the major concerns of the public was the health impact associated with the flow back of the water that has been used for fracking. Consequently, the Scottish Government requested assessments by Health Protection Scotland (HPS) on the potential impacts of extraction of UOG on the health and safety of the public.

The HPS report was to assess a broad range of health-related issues starting from the development of UOG to its production phase to help the Scottish Government understand the health impacts and its relation to the development of UOG policy (HPS, 2016). HPS formed a working group with the required expertise in risks and hazard analysis, supported by other technical advisers from the public sector and regulatory bodies. This team of individuals utilised a Health Impact Assessment (HIA) channeled towards views from the community, industry- professional stakeholders, peer-reviewed literature, and environmental groups. There has not been much information linked to the public perception of the hazards and risks related to the extraction of UOG in England. The response from England compared to Scotland's from a survey that was carried out 2013 and 2015 by YouGov (YouGov, 2013; 2015) with a specific question "Do you think Britain should or should not start extracting shale gas" can be seen below:

In 2013:

- 36% of respondents in Scotland responded that extraction should progress (compared to 41% of all respondents in the UK);
- 37% responded, "should not" (compared to 33% in the UK).

In 2015:

- 24% of respondents in Scotland agreed that extraction should start (compared to 32% in the UK);
- 60% responded, "should not" (compared to the 43% in the UK).

The Health Protection Scotland (HPS) assessment provided some answers to the questions posed by the Scottish Government through the health impact assessment as stated above. It depicted a sufficient evidence of some waterborne and airborne environmental hazards likely to occur if there is a development of UOG in Scotland. Also, there was limited evidence to show that aromatic hydrocarbons happened at levels that could be risky to human health. While factors like noise pollution, light and odour were termed as 'inadequate' enough to pose a risk to physical health (HPS, 2016). Lastly, there was inadequate evidence from the assessment resulting to cancer, reproductive, cardiovascular and dermatological health effects associated with UOG development in Scotland (HPS, 2016). Thibaut and Walker (1975) believed that procedures are highly important to citizens because procedures produce fair outcomes (MacCoun, 2005). Projects are unpredictable and can produce undesired outcomes that would impact society that would raise concerns about social justice. Hence, notions of procedural justice and procedural fairness in decision-making processes associated with UOG developments tend to be vital in the context of this study. Gross (2007) establishes that meeting procedural justice by project developer's ideals with transparent decision-making as a prerequisite for avoiding conflict with the host community. Furthermore, when there is an evidence of justice and fairness, during decision-making processes, it aids public support from the local community. Rootes (2006) also shows how procedural justice, if absent, can cause imbalance amongst the stakeholders, thus bringing about ethical implications in national projects. Lebel et al., (2006) states that the principal goal of good governance is social justice, while Fung (2015) describes social justice as a predominant value for democratic governance. Whitton et al., (2017) argues that good governance is necessary in order to achieve any sense of energy justice in UOG development. The Sovereign Wealth Fund (SWF) consultation aims to bring about perception on how the government can ensure that the proposed region of UOG

development would experience significant benefits (HM Treasury, 2016).

The north of England has been identified as the region with quantifiable volume for UOG development. Hence the government proposes that in addition to the funding framework proposed by the Office for Unconventional Oil and Gas (OUOG), the local communities should receive financial payments accumulated from tax revenues in the UOG industry. UKOOG (2016) Community engagement Charter shows that operators are committed to £100,000 per well site where exploratory fracking takes place. Furthermore, if the site progresses to the next phase that is production phase, 1% of the total revenue would be made available to provide remunerations to the local community. Ad additional proposal detailing funding from the Shale Wealth Fund (SWF) would be made available at initial stage of commercial production of UOG to the sites that are more profitable and this is dependent on the degree of commercial productivity in the region. At the onset, the UK government proposed a maximum threshold funding of £10million per site for the duration of 25years (HM, Treasury, 2016). In the SWF consultation documents, household would be allocated funds in the local setting context (per household payment). Thus, ensuring scale of economic benefits is reduced beyond the community scale, thus, a envisaging the governance of economic benefits on a more individual-by-individual basis.

2.10 Factors affecting fracking in the UK

There are various factors that affected the use of fracking for UOG development in the UK. These include governance, public engagement/participation, change, resistance, conflict, adaptability, resilience, risk and uncertainty just to mention a few. Further in this thesis in Chapter 7, the mechanisms that hindered UOG development in the UK would be discussed elaborately.

2.10.1 Governance

The question arising is on the availability of a well-structured governance system in place to manage the risks of UOG development in both Scotland and the UK. Another premise is that to what extent is the level of participation or engagement of the public in the system (IRGC, 2013). Sovacool and Cooper (2013) described governance in energy context in three ways

- *Governance can be referred as the interaction between of social organisations and technologies utilised in mega projects.*
- *Governance can be referred to the economics and politics of a system*
- *Governance can be referred to the internal operation and management of a*

mega project.

For the purpose of this research, governance would be considered in the context of public engagement and social justice as regards to UOG in Scotland and UK. Best practice in the US would be used in comparison to that of UK as a ban is in place on the development of UOG in Scotland. The comparison would be based on how energy system can be governed in a way that would seem just and transparent. Unconventional oil and gas is well established and developed in the US but it adheres to the set structured governing system and practices of conventional oil and gas. The right to explore or extract UOG is set by the state. In this case, it involves a private transaction between the intended company and the landowner. The right to extract is governed by federal, regional, state, and local laws. In this case, the public or community has little or no level of participation. At most, the route for engagement by the public is during public hearings for regulatory changes and public comments periods. Consequentially, individuals are told to contact the relevant agencies directly or legislators if there are issues of concerns. This is a challenging goal as due to the bureaucracy involved in getting information from one department or agency to another. A typical example is the case of the Marcellus shale Advisory Commission that was created through an Executive Order by the Pennsylvania Governor in 2011. The responsibility of this body was to develop a comprehensive recommendation for the development of UOG in the Commonwealth. At one of such sittings for deliberation, the Commission held 21 public meetings and sent out emails and letters to general public. This resulted to the formation of Act 13, which was passed in 2012 and helped in updating the State's Oil and Gas Act in a number of ways. The Act 13 included two main themes which was meant to increase transparency and boroughs are to be informed of all permit applications and also for companies to disclose the fracking chemicals through a *FracFocus.org* website.

2.10.2 Public engagement/participation

United Kingdom practices the process of public consultation in development of any new policy or legislation. The feedback received connotes the Governments decision-making process, which could lead to a policy review or change. An example was the UK Spending Round 2013, where significant incentives (tax breaks, new regulatory framework) were granted to the oil and gas industry and business rate cuts and benefits for the onshore oil and gas communities (HM Treasury, 2013). The Sovereign Wealth Fund (SWF) consultation document details that there should be room for participation by the local community relating to issues that affect the communities. This means the government believes in empowering the public and wants to see more engagement of locals on matters that concern them (HM

Treasury, 2016). The SWF is publicised as a fund that could yield up to £1billion of funding from UOG extraction in UK. A part of this consultation document shows that a fragment of the funding would go to the local communities. Thus, benefits and profits of UOG development in the host communities would be shared. This potential benefits of UOG in the host communities and the involvement of the locals in decision- making raises a lot of doubt associated with social, economic and political questions related to governance. Cotton (2016) confirms this by arguing that when looking at decision-making control of local communities, one can see complexity in its politics. Whitton et al. (2017) argues that an alternative way of understanding the complexity in a appropriate sense is a step-wise dialogue with the host community individuals to boost procedural justice for more community engagement and decision making processes.

In the US the formal procedure for public engagement includes public comments period or hearings for proposed regulatory changes. The Marcellus shale Advisory Commission as discussed earlier in the literature is one of the avenues to promote public engagement in UOG development in the US. Another example is the development of task forces. The purpose of task force includes providing educational opportunities for the local inhabitants (staff, officials), providing resources and information for economic growth and enhancing communication between the industries representatives within the location. The appointment of the task force members is mainly by appointment from the local authority (County commissioners). The task force acts as advisory bodies (Whitton et al., 2017). Consequentially, apart from this formal authorities set up, citizens partner with local government research institutes to monitor impacts of UOG development. There are cases organisations collect data to populate a database created for public access to information containing UOG activities. For those anti- frackers, the creation of opposition groups, fracking bans, and local moratoria are another avenue for engaging the public. Whitton et al., (2017) establishes that a relative new development is in the creation of third party certification process, where information is made available to inhabitants about the processes and practice of the affiliated oil and gas companies. This would boost transparency and accountability. There are two potential questions that need to be explored:

- How and where can the public engage more on issues relating to UOG development in UK?
- What was the level of engagement from the public resulting to the Scottish Government's decision to ban fracking in Scotland?

2.10.3 Change

In order for any transition to take place, proper planning and contingencies have to be in place as it affects decision-making processes. It is in the human nature to be spontaneous. Therefore when confronted with anything new, the choice of going with it or not arises. Any decision made in this instant is unconsciously made as in whether to accept or to resist. There is a simultaneous reaction when individuals are confronted with change, whether knowledgeable or not and this response could be positive or negative in nature. When positive, it could mean adaptability but when it tends towards negativity it could result to resistance or resisting a change. Halton (1994) cited in Obobholzer and Zalgier Roberts (1994) emphasized that this responsiveness is an unconscious process whereby individuals feel threatened by change. When there is a resistance to a change, it could be profitable resulting in consideration for negotiation for it to be acceptable. On the other hand, when the change process results to grievance, a negative unproductive, conflict effect generates. Therefore, there is a parallelism between both terms of conflict and resistance. One might say, "Conflict is an escalated resistance which is not properly managed. This can therefore be dependent on how receptive the process is or the perception of the individual(s) involved.

The UK government in its bid for energy security, and increase in revenue from the oil and gas industry are encouraging the development of the onshore oil and gas industry. This change doesn't not seem acceptable to the general public and thus affects the public perception on the benefits of this venture. There is presently a moratorium in place in the North of England.

2.10.4 Resistance

Coghlan (1993), described change as an on-going process that involves moving from the known (e.g. a process) to the unknown. Hence individuals experience change in different ways and their willingness or resistance is both behavioral and psychological. Furthermore, stakeholders should lean towards understanding the symptoms of resistance and the causes behind such resistance to change amongst the public.

Furthermore, stakeholders should lean towards understanding the symptoms of resistance and the causes behind such resistance to change amongst the public. Some authors argue that resistance could be of an advantage and disadvantage. So it depends on its application and reception. Further in the literature is the proper illustration of how it could be of an advantage and disadvantage in its application.

Advantages of Resistance

- *Piderit (2000) suggested that the reaction of individuals to the implementation*

of a change process is a critical success factor for any change transition. Therefore, when individuals show resistance, it creates an avenue for their voices to be heard whereby the leaders have to communicate, educate and convince the group or individuals the consequences and profitability of the change transition.

- *Also it can lead to encouragement from the leadership. Whereby individuals are encouraged participate in the change planning and implementation processes thereby enhancing the change process (Sagie and Koslowski, 1996).*

Disadvantages of Resistance

- *It can reduce productivity and output. For example, if an individual is transferred to a new job, it could result to feeling resentful hence a decline in the willingness to work in a new environment.*
- *Can bring about distrust, disloyalty and result to low-quality relationships between stakeholders, government and the public.*
- *Looking at the oil and gas sector, health and safety precautions relating to how hydraulic fracturing waste would be managed and transported should be adhered to. Failure to abide to procedural rules and guidelines of the fracking waste disposal would result to health hazards if not properly monitored and controlled.*

2.10.5 Conflict

Conflict can be described as a disagreement between one or two individuals or a group of individuals (Oxford 2014). Hence, when resistance is agitated and moves towards grievances and negativity it brings about conflict of interest most times. This can also be as a result of misinformation, variation in ideas, misunderstanding and lack of trust. Conflict can also arise due to low- quality relationships between individuals. Some authors argue that conflict could be beneficial and not just all about negativity as is the normal notion. Schulz et al. (2002) mentioned that when conflict is absent, groups or teams might not realise the inefficiencies within them. Also, better decisions are arrived at when pre-discussion preferences were in dissimilarity rather than similarity. Simultaneously, a research embarked upon on the team decision making by Hollenbeck et al (1995, 1998), suggested, that teams whose members recommendations are unrelated results in a better conclusion and vice versa.

Similarities & differences between resistance and conflict

Resistance and conflict are both psychological and behavioral. Both terms are characterised by a pattern of emotions or feelings generated by the reaction of transiting from the known to the unknown. Resistance can be easily monitored and controlled in comparison to conflict, but if not properly managed, it could be escalated thereby resulting to conflict.

Who resists?

Resistance can be from individuals from all works of life. Even children show one form of resistance or the other to parents and vice versa in our everyday life. In some cultures, just by showing resistance could mean disobedience or ignorance of authority.

Why do individuals resist?

Resistance can just be as simple as saying "NO instead of YES". Resistance could be psychological and behavioral in nature, but realistically it is a defensive mechanism, which is just a reflex action arising from the fear of the unknown. When it is described as behavioral, it is defined as a physical action which can be seen and heard and involves a mental activity that cannot be heard or seen (Matlin, 1995, p. 2). Resistance can occur as a result of lack of adaptability, acceptability, recognition, technology, better quality (of life, working environment), uncertainties, lack of confidence and cultural diversification/beliefs.

2.10.6 Adapatability

The nature of every living organism is to strive to survive in its habitat or environment. This could be anatomical, behavioral or psychological in nature (BBC Nature, 2014). This applies in our every-day survival that enables individuals coexist irrespective of the circumstance or situation they find themselves in. Looking at the human anatomy, biologically our physical features enable us as humans to adapt or not to our environment (working, living). Behaviourally, this could mean something learnt during our life span (skills, use of equipment, tools, and languages) or some behavioral traits inherited from family members or parents. In terms of psychological traits in the adaption process, this could mean some features exhibited by humans. For example, living in the sub- Sahara region and relocating to the Arctic as a result of job satisfaction. The human body (mind) subconsciously makes the body temperature is regulated to the temperature of its environment in order to survive.

The process of adaptability occurs in our everyday life including the various working environments we find ourselves in. This brings into its correlation to the change process. As earlier explained, the nature of the mind is to cognitively rationalise whether a change is to be accepted, adaptable or resisted. Adaptability does not necessarily mean complete acceptance,

hence in order to prevent resistance totally, individuals would rather hang in the balance and just go with the decision to accept the change process in this context the UK government decision to exploit UOG and therefore find a way to blend with its implementation process. One way or the other, individuals are anatomically, behaviorally and psychologically exhibiting various levels of adaptability. Sometimes, the level of adaptability can be related to an individual's survival instinct. That is, the will to coexist in an environment.

2.10.7 Resilience

Resilience can be described as the ability to effectively adapt to variances and changes whereby the psychological well-being is maintained (U.S. Dept. of State 2014). In an organisational context it can be accrued to the ability for an organisation to successfully bounce back or recover from any difficult experience. Therefore it is an action that can be practiced and developed. Furthermore, it could be interrelated with been adaptable to a certain condition at a point in time. It is an attribute if when put in practice continually can become a strength. Many organisations are not aware of this strength until they are put into the test of an economic downtime or disaster, then such strengths are exhibited depending on the ability of the organisation to regain or recover from a loss. Most times, organisations with the resilient capacity are able to thrive higher with better practices after been faced with challenges and have maintained a positive adjustment by its flexibility as suggested by Sutcliffe and Vogus (2003), cited in Cameron et al (2003). An example is the ability of an organisation to change direction and re-plan at a low cost. Also, the ability to be resilient consists of elements like flexibility, agility and adaptability. Flexibility was described as the ability of been able to change at a short notice with low cost (Ghemawat. and Del Sol, 1998). While the ability to spontaneously respond and develop a dynamic competitive move is known as agility (McCann, 2004). Furthermore, Chakravarthy (1982) suggested that adaptability means the ability to re-establish fit internally and externally in an environment. Consequently, resilience could be triggered systematically by an unexpected event or sudden change.

2.10.8 Risk and Uncertainty

Law and policy makers by necessity have to make significant decisions in the face of uncertainty. On matters relating to risk and reward, no amount of information is ever enough. Policy makers tend to decide who and what information to trust when making decision. This is also associated to the level of risk that is acceptable pending the

conceivable reward. As policy making is a political process, quite a number of political actors debate on the acceptable risks in relation to its pending rewards. Thus, policymakers weigh the risks of their decisions or acts in regards to the policy problem and the resulting effect of the decision to be made. This can be described as evidence-based policy making (EBPM). It is political process that involves the competition on what to decide as evidence, how it is to be evaluated, and what policymakers would utilise it (Cairney, 2014). There are various ways to understanding and dealing with an issue. A typical trend when setting an agenda is to encourage people to think about the negative and positive impacts or as suggested the potential for events, media, and powerful actors to shift to one side at the expense of the others, to determine how governments primarily seek to solve problems at a particular time (Cairney 2012). In this case, the issue is the method of hydraulic fracturing, the process of persuasion and framing plays out between its potential risks and reward. Its reward is associated primarily with the relevance of energy security. That is, when there is little reliance on energy imported from other countries, less fuel is imported, more investment and employment, regeneration in areas with low economic activity and finally lower energy bills for the public. Tosun and Lang (2016) included that there is a potential environmental gain if the goal of exploiting UOG is in the reduction on the dependency on imported fossil fuels. A primarily risk is in relation to environmental effects, methane gas leakage, groundwater pollution, risks to fracking liquid affecting water supply, earthquakes, air and nose pollution (Bradshaw, 2014; White et al, 2014; Jones et al, 2013; Friends of the Earth, 2013). Jones et al (2014a) also included that the above-mentioned risks might affect the quality of life and property value of the locality. A most imperative issue is in governance, how the government consults with the public in decision-making process (Icaro, 2014). It is the conduct of private companies and the ways in which they consult with local communities, and manage public opposition, when seeking permission to drill (Jones et al, 2013). Risk and reward entails the need to make choices that influence issues like:

- *The opportunity costs involved in the encouragement of hydraulic fracturing, including the alternative uses for water and waste treatment resources, the money lost to tax breaks to fracking companies and consequent reductions in comparable investment in renewable energy.*
- *Uncertainty about the effectiveness of the regulatory regime.*
- *Ethical questions about which areas to drill, particularly if there appears to be a North/South divide and it is cheaper to exploit the avenue of UOG in the North of England.*

2.11 Chapter Summary

In summary, on the subject of hydraulic fracturing, the UK Government (also a stakeholder) seeks to downplay the uncertainty to oppose fracking. To this end, the UK Government sought information from contracted parties on the issue of the feasibility of extracting UOG in order to reduce the appearance of uncertainty and help frame issues. This can be seen in some aspects of the literature above. However, from the consultation, none of the reports from the contracted parties makes a justified case for commercial fracking as the UK Government has been trying to reduce its carbon footprint in its transition to net zero carbon emission. A ten-point plan and a new net zero strategy has been drawn prior to the COP26 Climate Change conference in Glasgow 2021. The new net zero strategy will further imply that UOG development would likely not be revisited in the nearest future as more investments and schemes are targeted towards greener forms of energy.

CHAPTER THREE
LITERATURE REVIEW

3.0 Introduction

The literature in Chapter 2 highlights the definition of hydraulic fracturing, citing the regulations and policies of countries like Australia, Poland and United States with previous history and experience of the technology of their countries onshore oil and gas industry in a brief comparison with the United Kingdom. The chapter also highlights that governance, public engagement/participation, change, resistance, conflict, adaptability, resilience, risk and uncertainty as some of the factors that affects unconventional oil and gas development in the UK.

Oil and gas has served the world for more than 200 decades and further empowered the industrial revolution back in 1700s to 1800s (Ozili and Ozen, 2021). The use of fossil fuel has been linked to greenhouse gas emission and thus global warming (Karmaker et al., 2020; Martins et al., 2018; Reijnders and Huijbregts, 2007). Most countries are taking steps to reduce their carbon footprint and investing in renewable energy resources as a result of the climate emergency (Leonard et al., 2020; Lazarus and van Asselt, 2018). As a result of this, several new innovations and policies are been developed with the primary purpose of growing the greener industry while reducing and later abandoning the resilience on oil and gas. On the transitioning journey and the development of new technologies for a greener future, the need for public engagement and environmental justice is necessary when making energy related policies in order not to have a repetition of the UOG development opposition discourse.

3.1 Theoretical perspective of the study

This Chapter 3 provides a theoretical understanding of how lack of effective public engagement has resulted in opposition in the implementation of new technologies and policies.

The chapter examined models and frameworks that have been utilised by other authors in addressing UOG development issues in the UK. Reed et al. (2018) theory was identified, selected and examined and modified to understand how engagement constructs can be explored and utilised to fit public engagement processes in order to produce a desired outcome. This chapter also examined how unequal distribution of environmental risks and benefits undermines effective UOG decision-making process. Using Shrader-Frechette's (2002) Principle of Prima Facie Equality (PPFPE) as a yardstick for evaluating the UK's fracking policy. Which includes factors (like environmental harm justification, economic redistribution schemes, information access, public engagement and informed consent) that underpin PPFPE.

Institutional theory was explored to understand how institutional change has been incremental and is very liable to continuously change especially when discussing planning approvals in relation to UOG and how it has undergone adjustments in order to encourage public engagement in planning decision making processes. Lastly, stakeholder theory was examined in order to understand how effective stakeholder management is necessary for the implementation of new policies and innovations.

3.1.1 The social actuarial political risk and licensing (SAP) model

Bradshaw and Waite (2017) examined the shale gas conflict in Lancashire from the social licence to operate (SLO) perspective using the SAP model social-actuarial-political risk and licensing model. Smith and Richards (2015) defines SLO as "a tool whereby communities manage socio-political risk by conforming to a set of implicit rules imposed by their stakeholders… [a SLO] derives from communities' perception of a company and its operations, comprised of a company's ongoing acceptance and approval from stakeholder." Looking at a SLO as something that a company has to acquire through its engagement with the local communities associated with fracking. Bice (2014), Moffat and Zhang (2014) suggest that it is very unclear to known what constitutes a SLO and the process involved despite the widespread of SLO. Social legitimacy, credibility and engagement were classified as the three major element of a SLO (Thomson and Boutilier, 2011). Emphasising that companies endeavours to maintain legitimacy by community engagement and aware, then gains credibility while sticking to the communities social norms and cultures which will secure trust amongst the local residents. A social licence to operate cannot be viewed as a national level kind of agreement as it cannot be used by an industry to obtain a SLO at a national level of decision-making even though it uses a set of industry wide principles for its acquisition unlike an environmental impact assessment (EIA) which is a regulatory requirement at the start of a project (Hall et al., 2015). A typical example of such principle is the IEA (2012) Golden rules for a golden age of gas even though the social aspect of it is absent from the recommendations for UOG development in the European commission (European Commission, 2014).

Bradshaw and Waite (2017) argued that from reviewing the SLO for UOG in England, the issue of fracking should be looked at from a more robust political and legal context using the SAP model (Bice et al, 2017). This is because the SLO can be easily ignored once a company has acquired it, therefore a more detailed framework would be better to ensure the onshore oil and gas developers maintain interactions and responsibilities with the local communities. The SAP model was built from the modification of Morrison's (2012) approach of linking social licenses, political, legal and Haines (2011) risk framework. The model has all the stakeholders in paly but

says little about the interrelation or interactions between these stakeholders as seen in Figure 3-1 below.

Figure 9 The SAP Model

Source: Bradshaw and Waite (2017) reproduced with permission from Bice et al (2017).

The SAP model would have been ideal for the study as it has the public interest as its core and all the stakeholders are involved as it operates at the nation level and the communities are also stakeholder but the model consist of three critical elements political, social and legal. The legal element is beyond the scope of this study. Thus, to better understand the reason for the strong opposition to UOG development in the UK, as the arguable benefits are more national (energy security, economic boost etc) while the local communities and the world (climate change) bear the risk, other theories and principles was adopted. Shrader-Frachette PPFPE (2002) best answers the research questions related to the environment and social elements of the study. While the modified Reed's et al (2018) theory answers the political and social questions of the study while also providing a robust overview of the critical success factors in the implementation of new technologies, deducing that public engagement is a key factor in policy decision-making process.

3.1.2 The Principle of Prima Facie Political Equality (PPFPE)

Cotton (2017) established that there appears to be little information in literatures on the environmental justice of UOG policy and practice. Using Cotton's study that utilised Shrader-Frechette's (2002) Principle of Prima Facie Equality (PPFPE) to evaluate the discussion on the implications of UK fracking policy, planning and development as a yardstick to further revise an ethical framework for the UK policy. Early UK fracking policy protected local communities from environmental harm in the wake of seismic risk induced event but these were replaced with planning and pro-industry economic legislation that restricted community powers in the fracking debate decision making process thereby transferring the local authority's power to the national level. Thereby increasing environmental risks to the host communities (Cotton, 2017). PPFPE addresses the interrelationship between procedural and distributive elements of environmental justice (Shrader-Frechette, 2002). Shrader-Frechette's deduced that informed consent and threats to equality are two factors that disrupt environmental justice. PPFPE is a response to this pressing concern, seen as an ethical position grounded in Rawls (1999) philosophy by looking at justice-as-fairness and Dworkin's (1978, 1988) notion of political equality, where equal considerations is given to all citizens in respect to issues that concerns them.

Zanetti (2021) describes equality as a plural notion of practices aimed at removing circumstances of discrimination and unfairness. Furthermore, the difference between the formal and substantive interpretation of equality is that the formal conception has to do with procedural justice, while the substantive conception has to do with distributive justice. Equality can also be described as an envy free distribution of resources (Dworkin, 1981). While other egalitarians (those that believe in equality or supports equality) explains that justice in any society would require a society whose community members relate on a footing of equality. To this end, such a society would require participation from all its members especially in decision-making processes (Arnold, 2017). It is mandatory that all stakeholders in UOG development be informed about the environmental risks and benefits associated with fracking in these local communities. Thereby making it obligational that the justification of environmental risks lies with the stakeholders proposing potential projects or technologies that are damaging to the environment and not the stakeholders that oppose it. Unequal treatment requires justification as indicated in PPFPE, thus, "equality of treatment under the law" is a key component, and it is "proportional to the strength of one's clam to it" (Cotton, 2017). In reality, this varies according to circumstances relating to the how society provides incentives for certain kinds of events/programs. If environmental harm occurs from any fracking activity, equality should be ensured through an economic redistribution or the provision of equal economic return to those affected. To this end, those impacted by UOG should be duly compensated. This further reiterates the need for the application of distributive justice element of environmental justice.

It is necessary to examine UOG governance by looking beyond the narrative of demand and supply of oil and gas as energy security but rather to also look at the positive and negative effects it has to the environment and the socio-economic effects to the local communities and its stakeholders. The grass root activism and academic analysis of environmental rights, the fair distribution of risks weighed against the socio-economic benefits, together with the protection of the sociocultural, community voice and political identities of a community can be viewed as environmental justice (Schlosberg 2007; Agyeman, 2005). Environmental justice can also be described as how the decisions concerning environmental related issues are made. This will require assessing the relationship between the two elements of environmental justice (distributive and procedural elements) (Cotton, 2017).

Distributive justice is defined as " morally apportionment of benefits and burdens" (Shrader-Frechette, 2002). The sharing of the risks and benefits of UOG development by all the stakeholders involved will promote the need for equal participation of all the stakeholders in the decision making process for policies that affect the their interest, thus, resulting to the need for participative justice. This involves "institutional and procedural norms that guarantees all people equal opportunity for consideration in decision making", requiring all "stakeholders and experts be given equal weight" and all citizens affected be assigned "the same rights to consent, due process, and compensation that medical patients have" (Shrader-Frechette, 2002).

While the procedural justice element of environmental justice involves institutional processes that ensures equal opportunity for participation for all stakeholders in a decision making process. Environmental justice suggests that it is unethical to expose people to environmental risks without first seeking their informed consent and their ability to have access and understand the information concerning the risks and harm posed by a technology like fracking to the people (Shrader-Frechette, 2002).

In 2018, it was revealed that the UK councils were investing more than £9bn of public money in fracking companies through pension funds, Although, quite a number of councils have indeed voted against UOG developments, they have failed to pull back their investment funds from the UOG industry. In places like Northern Ireland, Scotland and Wales, where UOG development has been effectively halted, the councils in these places still oversee pension funds, where they investing heavily in UOG companies. At Preston road, where Cuadrilla was set to begin to drill but was halted by the council in Lancashire, the Secretary Sajid Javid back then overturned the Councils decision. The government is attempting to ensure that councils lose any oversight of where UOG developments are to be exploited. Such a change of the law by the Governments would enable fracking companies to drill at will, thus removing or skipping the need for UOG

developers to apply for planning permits through the local councils to drill in a site. This further undermines PPFPE because participative justice allows for equal opportunity for all stakeholders in decision-making processes even at the council level. The residents in Lancashire are constantly fighting the government's propositions, arguing the need for fracking applications and decisions remain and stay local. With all this in play and constant protest, Lancashire Pension Fund continues to fund the UOG development of about £187m (Lancashire County, 2018). Some people suggest that such funds should be invested in renewable energy such as wind farm in order to provide a safe future for the local communities and a good payback for the community members. Furthermore, the issue of Lancashire councils investing in companies who are not on the list of UOG developers of the proposed drilling site. Companies like Shell, BP and ConocoPhillips are examples of such companies who top the list. Such oil and gas top companies are wise enough to avoid public relation controversies of fracking in the UK but instead concentrate their drilling and fracking exploitations in countries like Canada, Argentina and Australia. Even the BP CEO Bob Dudley in 2014, said that BP doesn't frack because the company thinks it would attract negative attention and publicity (BBC, 2014). However this did not stop BP from boasting about its invention of fracking and the exploitation of fracking sites outside the UK, e.g., the site in Vaca Muerta mega project in Pantagonia, Argentina, where BP (through pan American Energy), Shell and Exxon all have stakes in the drilling operations taking place on these sites. The said site is home to 39 Mapuche indigenous communities, known as the biggest shale formation outside North America. At Preston council, the community has made the most of their financial resources by across the local public sector in order to encourage the buying of goods and service s locally. A wise move by the Council that has stopped about 22% of their collective procurement budget that used to be spent outside Lancashire. Thereby advocating that through the councils pension fund, local constituents can create and generate income for their local populace and economy that is a factor that underpins PPFPE (Brown, 2018). Factors like environmental harm justification, economic redistribution schemes, information access, and lastly public engagement and informed consent in the decision-making processes that affects the communities and its citizens underpins PPFPE (Cotton, 2017).

i. Environmental harm justification

The all out for UOG development plan was originated from the former Liberal Democrats and Conservative Government that initiated specific policy mechanisms to foster tax breaks for local councils and industry in order for local communities to benefit from profit-sharing measures and compensations in order to push for planning reforms on the subject of fracking. It can be seen from PPFPE perspective, that the UK Government has since been trying to provide communities with the assurance that UOG development and its related

environmental harm in the UK would be different from what was experienced in places like the United States. Even the former UK Prime Minister stated that:

> *"What I say is recovering unconventional gas will only go ahead with stringent environmental safeguards….I hope that reassures people there is no danger of some dash into technology without the safeguards in place and real payback for local people, in terms of the Community Payback Scheme" (Blackpool Gazett, 2015).*

In order to drill or explore UOG in the UK, the licensing authority is responsible for granting permit to developers. Until recently, permission from the local planning authority was required, although the developers must still ensure the necessary environmental documentation such as permits obtained from either the Environment Agency in England, Natural Resources Wales in Wales, Scottish Environmental Protection Agency in Scotland, and the Department of Environment in Northern Ireland depending on the where the site is located. Additional permits are required if hydraulic fracturing is to be utilised, compared to the conventional extraction that occurs onshore (DECC, 2015) according to the policy guidance. All extraction activities are developer-led but lies within a framework of permits designed to regulate water, air, and land contamination. Also including drilling safety and waste disposal management. The UK Government argues that this justifies the need for the development for UOG industry as the risks involve is low. However there is a flaw (McGuinness et al., 2018; Turney, 2013) when it comes to policy under the National Planning Policy Framework (NPPF) as there are contradictory and complex environmental protection components with the policy guidance due to the various levels of consent/permissions that are involved. Which includes:

- National licenses for extractions,
- Healthy and safety checks,
- Landowners permission,
- Local authority planning permission
- Environmental permits

There appears to be a gap in guidance as there is not enough clarity on the different types of regulatory authority involved at the different stage (exploration-appraisal-production-decommissioning-restoration as the case may be) of UOG development (OGA, 2016). These

notably gaps in policy guidance, creates room for difference in opinions as a result of lack of accountability and scrutiny of regulatory authorities. Organisations like Friends of the Earth have called for a more robust regulatory regime to overcome institutional complex structure (Friends of the Earth, 2014), in order to reassure the public and ensure confidence of the public in their government on issues relating to environmental protection and trust the developers who are coming into their local communities for UOG development. The issues associated with environmental harm and the lack of consent by the local community from UOG development and the UK Governments justification of its minimal risks undermine PPFPE thereby hindering the expansion and growth of the intended UOG industry development.

ii. Economic redistribution schemes

The Spending Round Budget of 2013 was created when the all out for shale policy platform began (HM Treasury 2013b). It was promised that a 100% business recovery from fracking operations for the affected authorities with an estimate of £1.7million yearly for the intended fracking sites (Prime Minister's Office 2014). Furthermore, tax revenues generated from fracking would be used to create a Sovereign Wealth Fund (SWF) for further investments in the North of England. With an increase of 7% in the level of employment that is supported by the UK oil and gas industry (Rural Community Policy Unit, 2014). The benefits proposed is documented in the UKOOG voluntary charter- it details redistributive community payback schemes at the different stage of UOG development and that all conventional and unconventional onshore oil and gas exploration companies are obligated to the guidance in the charter (DECC, 2014). This includes £100,000 payment to the local community, plus 1% of its future revenues divided between the local authority and the local community (DECC, 2013). In the UKOOG charter, it was documented that as part of the community engagement charter, that 2/3rd would be allocated to the local community and 1/3rd to the council with a total estimation of the payments between £3million and £12million. The former Energy and Climate Change Minister Micheal Fallon declared that:

"We already know that the development of shale gas could bring growth, jobs and energy security to the country, and know local councils and people will benefit from millions of pounds of additional investments" (Prime Ministers Office, 2014).

There are a number of factors to be considered surrounding the ambiguity of the

redistributive claims by the Government and the developers. The benefits did not connote exploration activities but only at the stages of production and returns. Furthermore, there is not enough clarity on the payment mechanism on a long-term basis. Lastly, would the landowners receive direct payments in a form of royalty as seen in the United States?

Some aspects of the redistributive scheme falls in line with PPFPE- as revenues would be divided to the community as an entity instead of individually. These are dependent on how we define a community. Unequal redistribution may still occur if we define community in terms of its close proximity to the well pads (payment/compensation based on this factor) (Cotton, 2017). Areas such as South and Central Scotland, the Midlands, South Wales, South and North Yorkshire, Cheshire and Lancashire will be mostly affected by development of UOG as a result of the geographical location of unconventional resources (BGS, 2016).

Inequality in the distribution of payback payments and compensations schemes can exist in communities where the socially mobile, politically active, affluent citizens have more power within the local negotiation settings. Thus, those individuals that have a stronger political affluence with vested interest may not publicly welcome fracking into their community (acting like they care about the needs of others but secretly, deploy capital to lobby for higher percentage of the payback scheme payments. If they fail in their bid, it is very easy for them to relocate to other unaffected areas compared to the many that do not have the financial resources to relocate to another region. Which suggests the need for ethical fracking payback scheme as noted in PPFPE (Shrader-Frechette's, 2002), but none of such mechanisms exist within the UKOOG charter of or BIS policy Guidance (DECC 2014).

iii. Information access

Under the current Planning Practice Guidance (PPG), fracking developers are encouraged to carry out pre application engagement with the local communities, although this is only mandatory for onshore wind developers (Hilson, 2015). Under the UKOOG community engagement charter, the fracking developers must abide by the reference made to the engagement promised in the charter at each stage of the fracking operation. The major aim of the charter is to generate a "Greater understanding and involvement by communities in unblocking the UK's energy potential". By promising to "Engage with local communities, residents, and other stakeholders at each of the three stages of operations" (OGA, 2016). In other energy related projects, developers use mediums like online/telephone surveys, public exhibitions and comment periods as a method of information sharing in order to bypass community decision-making processes or any input from the communities (Cotton and

Devine-Wright 2012). While in the UKOOG charter, there appears to be no documented engagement practices listed that the UOG developers are to follow. Hence the developers will only meet the statutory requirements for involving the public; hence communities cannot question the fracking activities. Also, a key factor that was realised at the later stage of the UOG discourse was that the UK government suppressed some evidence such the report generated by the Climate Change committee that was not initially released (Johnstone et al., 2017; CCC, 2016). This can be seen as violating the access of information on matters that affects the residents of the local communities where the fracking operations would take place from the PPFPE perspective.

iv. Public engagement and informed consent

In the national policy, the planning reform for fracking is the Infrastructure Bill, which later became the Infrastructure Act 2015 on the 12th of February 2015. This policy agenda began under the former Labour Government with the Planning Act 2008, and continued under the Liberal-Conservative Democrats coalition Government with Localism Act 2011. All of these policies were made despite the backlash and public inquiries that delayed a number of infrastructural projects like the Lackenby-Picton-Shipton and Beauly-Denny electricity lines transmission lines and Heathrow Terminal 5 (Cotton, 2011). To foster the urgent need to meet Carbon dioxide emission reduction targets (Johnstone, 2010). For this to be possible, the planning powers was rescaled so that the state has control over site planning development for those projects that appeared to be fit for national purposes (Marshall 2013, Cotton 2014), indicating a top-bottom planning system of organised political-administrative structures (Johnstone, 2014).

The aim of the Infrastructure Act 2015, build more buildings and construct high-speed rail network. This alters the Town and Country Planning Act 1990 with the intention of speeding up the development by putting an end to delays on projects that already had planning permissions. For UOG development, the act made specific changes to the planning consent regime with the provision of allowing the developers to drill and explore the land below 300m or lower for exploitation of UOK and fossil fuels. Thus, private householders would not be able to object to any fracking operations within their locality, on the basis of legal infringement relating to the Trespass Law (in Sections 43-48) of the Act, contrary to the 2010 Bocardo SA versus Star Energy UKSC case in 2010. In this instance, the Supreme Court's upheld its decision that if it is established that a landowner owns everything below the surface, and has possession of it, it can sue for any damages for as a result of any subterranean trespass. This was overturned by the Infrastructure Acts 2015 in case law,

changing the rights of citizens by prioritising the interests of the industry as against that of its citizens. Developers can therefore use these lands and leave the deep level land in a different condition than it met it prior to the right of extraction been implemented (Cotton, 2017).

In the UK's National Planning Policy Framework (NPPF), the Mineral Planning Authority is responsible the mineral planning policy and the determination of applications for UOG, decisions would be taken in accordance with the local plans. With the current advocating of fossil fuels been a potential catalyst for climate change risks, in NPPF terms, all permitted planning relating to UOG must be sustainable. Therefore, conflicting with the UK's onshore policy platform providing opportunities for the rescaling of the fracking policy to the national policy. The opportunities for public involvement and engagement in decision-making process is further constrained by such recent policy developments, as the all out for shale political strategy is been prioritised over environmental safety. As a bid to fast track fracking decision, the former Communities Minister Greg Clark drafted a new planning guidance for the planning authorities, enabling the shift of planning powers back to the central government. The reason been that the local authorities were rejecting planning applications made by the developers especially in areas like Lancashire (Lancashire County, 2018). The UK Government portrays the planning process as a form of bureaucratic inefficiency, in turn, fostering the justification for removing local authorities from decision making despite protests and rally's for more inclusiveness in the policy making process. Compared to renewable planning rules, there is inconsistency in the fracking planning policy in the areas of public's participation and consent in the decision making process.

In Greater Manchester 2019, Ministers were faced with a fresh confrontation with local councils over the controversial plans to expand fracking. Greater Manchester is made up of 10 local authorities and they put up planning measures to create a presumption against fracking as part of its effort to become carbon neutral by 2038. In other places like Hull, Wakefield, Leeds and York, their local authorities also expressed opposition to hydraulic fracking. Thus, leading experts to believe such a decision by Manchester and also London would embolden other councils to rethink their decision on onshore oil and gas development.

Quite a number of Tory-run local council authorities including Nottinghamshire, Dorset and Derby are anti-frackers and are against a change in planning proposals that would allow companies drill test sites without even applying for planning permissions. The governments plans to fast-track UOG development appears to overlook and override local democracy by disregarding the wishes of local communities by denying the people the opportunity to have a say and participate on issues relating to their lives and environment (Shrader-Frechette,

2002) emphasised that in order to combat injustice, a principle of participative justice is needed to ensure that procedural and institutional norms that ensures all individuals have the equal opportunity during decision making processes. Contrarily, victims of unequal opportunities for participation are most likely to be powerless, violent, marginalized and exploited. In order to ensure participative justice, one has to follow PPFPE on environmental related decision-making process in regards to giving equal weight to all the stakeholders or expert during deliberations. The National Research council (NRC) report of 1996 articulated that there needs to be such a balance in order to offset all the private interests associated with environmental related matters (National Research Council, 1996). In order to achieve participative justice and promote public engagement in environmental decision-making process, "scientific proceduralism" is required. That is, a methodological, legal and procedural reforms that would encourage negotiation, debates about environmental policy controversies, stakeholder funding, and experts assessments. This would guarantee all the stakeholders equal decision-making voice with experts on issues relating to consents and compensation (Shrader-Frechette, 2002).

In the US, the ideal notion of environmental justice will mean equal distribution of the risks and benefits of UOG within the local communities. This way, those who bear the greatest health and environmental risks will receive higher financial compensations. The ideal participatory element of environmental justice will mean having the decision-making power as to who and how UOG development shall be proportionate to the health and environmental risks (Fry et al, 2015). That is, those bearing the higher risks of fracking impacts will get a higher share of the compensation and those facing the greater risks should have a fair say in the decision making process. For example in the city of Denton in the US, its distributive and participatory elements are in line with environmental justice principles. The non-local mineral owners are the primary beneficiaries of UOG and they comprise of 61.4% of all mineral owners, they receive at least 68% of the value and due to their distance from the fracking sites receive none of the fracking-associated risks. While those with Denton's mailing addresses and homeowners benefit from mineral rights and receive 6.3% of the total value possessed by the mineral owners (1% of the total value including operator shares).

In contrast, the non-mineral owning residents in Denton receive no direct financial benefits and are exposed to all the potentially fracking related risks due to their close proximity of the fracking sites. Given such inequalities in its distribution of fracking risks and benefits, the government of the city is faced with challenge of trying to empower the non-mineral owners who are supposed to have a say in the decision making process, but this is not always the case due to the limited power of the city government, unlike in Texas where the

State has more detailed history of promoting very powerful oil and gas industry (Fry et al, 2015). The local authority in Denton city benefitted financially from UOG development and as such its gains are distributed as forms of compensation to those affected or harmed by UOG development. However, the city's investments are not targeted to those residents who live in close proximity (<0.5miles) to the fracking sites who are exposed to greater environmental and health risks. Therefore reestablishing a fund that redistributes the revenues directly to non-mineral owning residents living within close proximity to the fracking site was one potential policy implications for UOG development in Denton that will underpin the principles of PPFPE (Briggle, 2014). There is presently a fracking ban in Denton and as such the Texas Oil and Gas Association and Texas General land Office sued the city of Denton. Their argument was that the city of Denton did not have the jurisdictional authority to ban fracking that is supposedly regulated at the State level (Heinkel-Wolfe, 2014). This is because in the US, the State authority possesses the deciding powers over local authorities. This is why local authority should be given more deciding power in order to ensure both distributive and procedural elements of environmental justice are achieved according to PPFPE.

3.1.3 Institutional theory and UOG development in the UK

A low carbon energy transition appears to be some kind of socio-technical transition and involves profound changes in the government institutions and its energy policy. Energy security is always a national issue, thus those with vested and powerful interest are involved in how decisions and policy relating to the subject are embedded in different parts of the society and institutions (Andrews-Speed, 2016). To further explain this, by using institutionalism to understand the process involved in a low carbon transition such as UOG development. A technology such as fracking has socio-technical implications, as it cannot be separated from societal issues such as policy decision-making process. Hence it can be stressed that a society can make decisions concerning new technologies and a new technology can determine/ alter the behaviour of societies (Kemp et al., 1998). Therefore both are interdependent. Societies can be resistant to change especially when institutionalism becomes self-reinforcing and produces returns. As a result, changes in system are not easily reversed and once it takes root, institutional change becomes limited (Pierson, 2004). This is because institutional changes are expected to be incremental and a change in one part of an institution would require changes in other connected institutions (Campbell, 2010). North (1990) and Williamson (1996) suggested that institutions have been conceptualized as both informal and formal rules or self-sustaining expectations and beliefs that may be or may not be represented by guidelines (Aoki, 2001). Aoki (2007)

added that institutions allows players to make decisions with little information and they become gradually reinforced by making decisions, as long as the players find that the validity of their actions and decisions are confirmed.

There are five approaches to institutional theory: Normative institutionalism, rational choice institutionalism, historical institutionalism, international institutionalism and societal institutionalism (Peters, 2018).

Normative institutionalism involves using institutional norms as a means of shaping and understanding the behavior of individuals and how they function (March and Olsen, 1984). That is, utilising the "logic of appropriateness" to shape the behavior of individuals within institutions (March and Olsen, 1989; 1995).

Alternatively, in rational choice institutionalism, Weingast (1996) suggests that academias within this framework argue that behaviors are a function of procedures and inducements. To this end, institutions exist as a set of systemised rules to individual's actions where they try to maximise their utilities, thereby answering the question on how to attain equilibrium amongst a set of rational self-seeker. Knight (1992, p.94) argues that such framework sees society as a system of interrelated components that work together in harmony to maintain equilibrium as a whole and institutions do materialize to meet social and economic necessities.

The third approach, which is historical institutionalism in governance, connotes the decisions made way back in the history of any policy or government guidelines. Such decisions on policies and institutional commitments affect subsequent choices made now. Hence the underpinning motive here is to understand the first selection of a system; else it becomes difficult to understand the logic behind the development of such a policy. Skocpol (2004) argued that policies are directional, and as such direction is dependent. When an administration has taken a specific course, it will continue in that design until a significant change or force intervenes to reestablish its path. Another approach to institutional theory is international institutionalism. Here, ideal places assigned to configurations used in explaining the behaviors of individuals and states. An example is the international regime theory that adopts the existence of structured interactions within state-level institutions (Rittberger, 1993).

Lastly**,** societal institutionalism entails the structuring of interactions between society and state. The European perception of such relations includes corporatism (Schmitter, 1974) and corporate pluralism (Rokkan, 1966); signifying a more organised connection between official and unofficial stakeholders in the policy process. Interactions that are significant can be extended to include relationships between government and society as well as within the government itself (Sorenson and Torfing, 2002).

Jackson (2010) also added that institutions could enable and constrain change that could empower individuals to learn or experiment. There are three aspects of institutionalism that are rational choice institutionalism (economic gains), historical institutionalism (power asymmetries) and sociological institution (organisational institutionalism) (Hall and Taylor, 1996). Schmidt (2010) also emphasised on a fourth type of institutionalism that is discursive institutionalism (ideas and discourse). Williamson (1996) explains that rational institutionalism builds on the assumption that actors are rational. However, the rationality of the actors is bounded and institutions provide guidelines that a vital in lowering transition costs and creating order. Even though rational choice institutionalism has its roots in economics, and it has also been applied to political history (North et al., 2009). Sociological institutionalism was generated from sociology, as its name implies and talks about the importance of culture in determining the nature of institutions and the way in which they shape actor behaviour. Here, institutions include values, symbols and frames that determine a set of practices that are specific to a particular culture and have no link to economic efficiency. Historical institutionalism was established within political science and focuses on the nature and distribution of power. This includes norms, routines, and how institutions not only resist change and but also constrain change. This is a situation that results to incremental and path dependent political change (Mahoney et al., 2010; Pierson, 2004).
Lastly, Schmidt (2010) suggested that discursive institutionalism should be recognised as a distinct approach, which provides a greater attentions than the other three types of institutionalism in respect to ideas and discourse in shaping institutional change and political change. Previous studies have used institutionalism to interpret the energy sector. The earliest ones applied rational choice institutionalism to challenge public utilises such as energy and telecommunications (Joskow, 1991; Stern et al., 1999). Other research in recent times has tried to apply institutionalism in trying to explain the nature and consequences of the energy sector reform in countries like the former Soviet Union, Central and Eastern Europe (Locatelli et al., 2011), It has also been applied to many aspects of the energy sector like electricity (Signorini et al., 2015), national oil companies (Boscheck, 2007), natural gas (Ruester, 2009), urban transport (Brette et al, 2014) and technological innovation (Mokyr, 2002) and governance challenges in the various industries within a country (Vicchini, 2007).

The UK energy sector can be viewed as socio-technical regimes that comprises of various institutions that are have been developed with the support and the use of new innovations and technologies (Smith et al, 2005). Andrew-Speed (2016) explained that the term institution has been defined as both the informal and formal rules that exist within a society and organisations in which they exist. These socio-technical regimes consist of policies, regulations, laws markets, values, expectations, and routines of stakeholder's, e. g

users of technical services such as energy (Geels, 2002). Hence, the actions of such stakeholders are usually conditioned by the regime in which they exist and they will therefore try to build strong economic and political interests. Andrew-Speed (2016) explored how institutional theory can be utilised in low carbon energy transitions by drawing on rational choice, historical institutionalism and discursive institutionalism. This was done to provide a better understanding of the application of institutionalism to understand socio-technical transition. He further described a key component of socio-technical regime as the policy paradigm. Kuhn (1962) described paradigm as the nature of scientific research and discovery. UOG was termed as a transition fuel as it was expected to be a carbon fuel compared to the traditional coal burning. In addressing the long-term goals of a low carbon future regime, this will take decade as the UK is still in its early stage of transitioning to renewables with an envisioned 25years or more ahead to formulate energy policies and guidelines (Meadowcroft, 2009; Voss et al, 2009; Kemp and Loombach, 2006).

Andrew-Speed (2016) further examined how the ability of an institution or regime to accept change is dependent in the adaptive capacity, powerful stakeholder, policy makers and their behaviour. China was cited as an example of a country that practices low adaptive capacity especially to energy transition as a result of the homogeneity of its institution, such as the restrictive government policies and their strict conformity laws. In comparison to the United Kingdom, the adaptive capacity appears to be the opposite with open-access social order that has led to institutional independency and endless development of new innovation policies. The downside here is that in the UK, there is a slow progress of energy policy implementation aside from it been incremental, it is liable to unexpected changes e.g. the constant review and updating of planning approval in order to promote energy policies that that promotes local participation in the planning process. The lack of engagement in planning approval processes resulted to the opposition experienced in the onshore oil and gas industry.

Andrew-Speed (2016) did not address how the actors of these socio-technical regimes in the low carbon energy transition using institutional theory will be more effectively managed in order to have the desired outcome in a new policy regime. He was able to address the importance of the study of institutions as a major aspect in policy formulation and analysis but did not address how political, economic and legal systems shape policy making in the UK energy sector and factors that shape the governance of UOG transition.

The importance of reviewing institutional theory was to understand how institutionalism affects decision making process in regards to policy formulation. Decisions on UOG development cannot be discussed without considering the socio-cultural and environmental

implication of fracking while looking at the principles that underpins PPFPE within the discourse. Andrew-Speed (2016) emphasized about the need for the actors that promote local participation in decision making process for stakeholders to accept change and new policies. The actors in this case cannot be discussed without including the factors that determines the reason for their opposition or support of UOG development in the UK. PPFPE explains the need for the two elements of environmental justice in fracking related discourse as this is vital in the decision making process. A clear understanding of the systems within the UK, which shapes energy policy, needs to be effectively managed, as it cannot be separated from societal and environmental implications of fracking. Institutional theory does not address how these systems affect the planning decision making process and environmental aspects of fracking. This justifies the use of PPFPE to better understand how environmental planning decisions could be effectively managed to provide a desired outcome that does not undermine environmental justice.

The relatively short amount of time available for the global low-carbon transition also distinguishes it from the historical transition times and this is particularly challenging in terms of meeting climate change agenda and goals. Is it therefore essential for the UK government to increase its effort in driving change in the public's behaviour and perception to new technologies such as fracking in order to realise its benefits and meet it climate change goals. This justifies the use of Reed et al. (2018) as a theoretical framework in this study as seen chapter 8 to address such problems that has to do with policy decision-making processes instead of institutional theory.

3.1.4 Stakeholder Theory and UOG development in the UK

Stakeholder theory is concerned with the relationship between stakeholders and an organisation. Ansoff (1965) was considered to be the first to use the term "stakeholder theory" (Roberts 1992); the term stakeholder was used as way back as 1947 (Johnson 1947). It was not until after the mid 1980s that it was acknowledged. Freeman (1984; 1994; 2005) together with other scholars like Clarkson (1994; 1995), Freeman and Harrison (1999), Donaldson and Preston (1995) Carroll and Buchholtz (2009) explained the core areas of stakeholder theory. Thus, stakeholder is defined as "any group or individual who can affect or is affected by the achievement of the firms objectives" (Freeman 1984, p.49). Freemans remains the founder of the definition of stakeholder, while other scholars tried to classify stakeholders using different means. Examples include, strategic and moral stakeholders (Goodpaster); latent, expectant and definitive stakeholders (Mitchell et al., 1997); primary and secondary stakeholders (Clarkson, 1995); subgroups of stakeholders such as employees, customers, and shareholders (Wood, 1994); voluntary and involuntary stakeholders (Savage

et al., 1994) to mention a few. This shows that there are various categories or groups of stakeholders with different expectations. For any stakeholder, an organisation is expected to meet the multiple expectations of all of its various types of stakeholders, rather than that of shareholders in the traditional shareholder theory. Stakeholder theory tends to highlight the accountability of organisations beyond just the financial and economic performance (Guthrie et al, 2006). Stakeholder theory suggests that in managing an organisation, the management is expected to perform its accountability towards its stakeholders by undertaking activities that are in the interest of the stakeholders and by reporting information (Smith, 2008). Furthermore, it explains why the term accountability constantly relates with stakeholder theory, with literature establishing how organisations deliver its accountability to its different stakeholders. There are some assumptions around stakeholder theory. These assumptions appear throughout most stakeholder literature in a number of fields like Corporate Social responsibility (CSR), strategic management, Business and Society and business ethics discipline (Freeman 2005). These assumptions suggests the overall insight into stakeholder theory an can be seen below:

- *Organisations need to manage its stakeholders effectively in order to achieve its organisational goals.*
- *Different categories of stakeholders exist and can be conflicting most times because of a variety of interests.*
- *Stakeholders can be identified from one important position to the next.*
- *An organisation has social, financial and environmental responsibilities to its stakeholders.*
- *The ability of stakeholders to pressure an organisation all depends on the organisational attributes of the stakeholders.*
- *Organisation must be able to balance both external and internal conflicts of interest of all its stakeholders.*
- *Stakeholders pressure an organisation as a result of their stake or expecting something in return.*

From the above assumptions, there are different kinds of classification for stakeholder theory in literature. These includes normative, descriptive and instrumental (Donaldson et al., 1995). While Berman (1991) earlier proposed two models; namely strategic management model and the intrinsic stakeholder commitment model. For the purpose of this research the two other major branches of stakeholder theory that are common in various literature would be discussed in relation to the development of UOG in the UK and Corporate social responsibility (CSR). These are ethical and managerial branches of stakeholder theory (Deegan, 2009; Gray et al., 2010; An et al., 2011).

i. Ethical perspective of Stakeholder theory

The ethical aspect of stakeholder theory suggests that irrespective of the power of the stakeholder, all stakeholders have the same right to be fairly treated by any organisation (Deegan, 2009). Hence this is grounded in mostly Critical Accounting Theory (CAT), which is concerned with the approach to which most accounting research that specializes on the application of a specific accounting method, rather than focusing on only powerful stakeholders that are in control of providing important resources to the organisations but instead ethical perspective calls for equal considerations of all stakeholders (Deegan et al., 2006). To this end, organisations are not viewed as a mechanism but rather as an entity that meets all its stakeholders' expectations; which may require that the economic motivations of organisations are to be profitable and thus take account of the moral role of the organisation and how it affects the social life of individuals (Stanley et al., 2001). The ethical perspective relates to the accountability model of stakeholder theory which was suggested by Grey et al (1996), that explains that organisations should be accountable to all its stakeholders instead of the most power ones (Grey et al., 2010). One major limitation of ethical perspective of stakeholder management would be the inability of an organisation to meet all its stakeholders' expectations or to treat all stakeholders fairly, as most stakeholders have different interest. Hasnas (1998) suggested that when there is a conflict of a conflict of interest amongst different stakeholders, the organisation should strife to attain optimal balance or equality amongst them.

ii. Managerial perspective of stakeholder theory

The managerial perspective of stakeholder theory deduces that managers in organisations attempt to meet expectations of the powerful stakeholders that control important resources that the organisation requires (Mitchell et al., 1997). Thus, organisations are only expected to be accountable to the most economically powerful stakeholders, compared to the ethical perspective. To this end, stakeholder involvement is very vital to the organisation, and can impact the organisation either positively or negatively (Murray et al., 1997). A limitation here is in how organisations are to decide to whom they are responsible for and the extent of their responsibility to the stakeholder (O'Riordan et al., 2008).

iii. Stakeholder theory and corporate social responsibility (CSR)

The Corporate Social Responsibility (CSR) construct describes the relationship between organisations and the larger society. Pinkston et al. (1996) explained that the exact definition of CSR is indefinable since attitudes and beliefs regarding the nature of this association are dependent on the relevant issues of the day. Milton Friedman contributed to the creation of

CSR theory by asking questions like “Should companies take responsibilities for social issues?” (Kok et al., 2001, p. 286). He further argued that the only social responsibility of organisations is for profit realisation and increase through legal means. Also, Pinkston et al (1996) suggested the use of organisational resources such as donation to charitable course and charities for the greater good, is harmful to companies, as this may decrease profits or increase product prices as the case may be. While other critics argue that organisations or companies exists to serve the community as well as direct beneficiaries of the companies operations. Hence, Kok et al. (2001) defined CSR “as the obligation of the firm to use its resources in ways to benefit society, through committed participation as member of society, taking into account the society at large and improving welfare of society at large independent of direct gains of the company”. Carroll (1999) also identified four elements of CSR namely: legal, ethical, economic and discretionary or philanthropic. The legal element involves the duty of companies to obey the law and to play the rules of the game. The ethical element involves their responsibility to respect the rights of others and meet the obligations placed on them by the communities where they are operating. The economic element is the company’s foundational goal, which is to make profit and grow. Lastly, the discretionary element involves philanthropic activities like charitable works that support the larger community. Stakeholder theory parallels CSR, where companies are responsible on such dimensions to specific stakeholders (Maignan et al., 2002). Coombs (1998, p.289) also identified that the stakeholders are grouped according to their “interest, right, claim, or ownership in the organisation”. Research with UK and US companies has shown that companies often report socially responsible behaviour based on the stakeholder groups. Hence, stakeholder theory provides a useful framework for evaluating CSR through social reporting activities.

As discussed earlier above, stakeholder theory emphasises on the rights of stakeholders and accountability of organisations. Accountability is derived from the concept of responsibility. That is, the responsibility of one individual to another who is entrusted to perform certain duties (Mulgan, 1997). One major aspect of accountability is in the disclosure of information. Grey et al., (1996) emphasised that information provision and dissemination should only include financial or regulated information but also the non financial and unregulated information because according to stakeholder theory, the community has a right to know about certain aspects of any company’s operation especially in their local communities. Roberts (1992) tested the ability of stakeholders to impact CSR disclosures using stakeholder theory and it is discovered that that level of power of stakeholders and the information needs provided some explanation about the level and type of CSR that would be disclosed. In another study where the annual reports of public trading environmentally

sensitive Canadian companies were analysed, it was discovered that most companies were more responsive to the concerns of the government regulators and other powerful stakeholders more than the other stakeholders like the environmentalists. This goes to show the lack of responsibility and accountability of these organisations towards the stakeholders in local communities where the members of the public reside and would bear the risk of any negative environmental impact as a result of UOG development around their communities.

Freeman (1984) stakeholder theory looked at the problem of trade and value creation. Theorists like Trist, Ackoff, Mason, etc tried to explain how business environments could be understood against the ever-changing environmental turbulence (Ghoshal, 2005). Some questions were arrived at as to how businesses could be run side by side with ethical implications (such as CSR). Another question is that, are business executives required to do what is right in order to run their companies operations. As such business executives are also stakeholders in policy decision making processes. The decision to adopt a new technology such as fracking would require transparency, openness and responsibility to the public/community to which UOG development would be taking place. The problem with Freeman (1984) suggests that some theories of business connote that business decisions should be separated from ethical decisions. Which is one of the problems surrounding UOG development in the UK. Stakeholder theory is primarily a theory that explains how a business works, and how it could be improved.

Donaldson and Preston (1995) argues that it could be managerial and not just descriptive, prescriptive and instrumental. Thus, a theory that is used to solve problems of value, trade and manage businesses effectively. Therefore if businesses were to be managed effectively, it would take into account the responsibilities towards its stakeholders. The stakeholders in UOG development consist of the UK government, onshore oil and gas developers, regulators, taxpayers, and residents of the local communities. Humans are complex creatures, thus the need for effective stakeholder management. The oil and gas developers, who had interest in UOG development in the North of England, are expected to devote interest in improving the local community either by providing amenities and facilities to such communities. Friedman (1962) argues that such actions should not be called corporate social responsibility as these provisions are done in the self-interest of the onshore oil and gas developers. Freemans stakeholder theory (1984) encourages maximizing business profit such that these onshore oil and gas companies support the communities where the run their operations. While Freidman (1962) believes that business-maximizing profit (capitalism) is what makes businesses successful and not supporting local communities where their operations are run.

Furthermore, although policymakers have stressed that UOG development will make the UK more energy secured, help reduce energy bills and provide jobs. Other stakeholders like anti-fracking groups and the local communities have highlighted their fears and the risks it poses to their lives, livelihood and the environment. A major barrier to UOG development is public acceptability to such a technology. Understanding stakeholders perception, attitudes and values towards new energy sources may also lead to a better and fairer decision making process (Fiorino, 1990). From most literature within the fracking debate, lack of effective public engagement in the decision making process appears to be one of the reasons for the high level of opposition around fracking. Environmental groups who are against fracking also believe that a critical understanding of public attitudes towards environmental related technologies is also vital, as this needs to be taken into consideration at the early stages in policy decision making process. This should be done before the public's attitudes become polarized and decision makers become potentially distrusted by the people (Kibble et al, 2012). Therefore, some school of thought will question whether effective public engagement will have been enough to change the attitudes of these stakeholders towards UOG development. Environmentalists and anti-fracking campaigners find renewable energy sources to be more favorable in comparison to UOG as they see fossil fuel to be polluting, outdated and a finite resource. This is why renewable energy developments appeal more to local communities due to the environmental friendliness and less polluting. Furthermore, such stakeholders value effective engagement and support new energy systems that brings about efficiency, affordability, safety, nature protection, cultural identity protection, freedom, fairness and quality of life. This is because of the history of conventional oil and gas even though not many comparative studies have been explored about the perceptions of unconventional oil and gas in the UK. Thus, stakeholder theory and CSR literatures had to be reviewed in this study in order to understand how stakeholder relationships are necessary when introducing a new technology such as hydraulic fracturing in local communities and how maximizing profit can be counter productive if these onshore oil and gas developers do not support and become transparent in their decision making processes in such local communities (e.g. the case of Lancashire).

3.1.5 Reed et al (2018) Theory

Reed et al (2018) Theory explains that participation is the process of individuals, groups, and stakeholders (organisations, government) engaging in decision-making process that involves and affects them. This can be through consultation or two way communication/information sharing (Ikegami, 2000; Dewey, 1927) explains that public as a

group of individuals who are not affected by or able to make/take decisions that affect them but are able to engage in discussions that affect them, while stakeholders can take and make decisions on issues that affect them (Freeman, 1984). In the policy and decision making process of UOG development in the UK, the public are grouped as part of the key stakeholders as the subject of fracking is a controversial topic that has potential to cause human and environmental risks and harm. The terms of public participation and public engagement are mostly used simultaneously in academic literature and in policy documents (Wynne and Felt, 2007; Nowotny et al., 2001). However, there has been an increasing tendency to favour public engagement over public participation (Wynne and Felt, 2007) but linguistically, engagement can imply generating interest while participation depicts active involvement. Wilsdon (2005) also suggests the preference of public engagement as it relates to the concept of upstream engagement. Public engagement can therefore be taken to refer to a more inclusive form of participation and a need to generate early interest (Delgado et al, 2011).

Rowe and Frewer (2004) emphasises on the lack of clear definition which may arise due to lack of agreement on how inclusion of the public is expected to take place in practice. Public participation and public engagement should be different from deficit model (Scott and Du Plessis, 2008; Lewenstein, 2003). Therefore public engagement should not simply be about the generation of public acceptance through the provision of information but about individual's active involvement in the development of socio-technical, economic, socio-economic, socio-cultural, environmental and political decision-making processes. When science lost to public confidence, just like hydraulic fracturing technology in the discussion of UOG development in the UK; public engagement exercises are used to deactivate, silence opposition and skepticism to the new technology (Chilvers, 2008; Tutton, 2007; Rogers-Hayden and Pidgeon, 2007; Wynne, 2006; Irwin, 2001, 2006). Wynne (2006, 2007a) argues that public engagement activities reproduce assumptions and consequences of deficit model, whereby the developing science and technology continuous to be ongoing and it excludes lay views and engagement instead of opening up for avenues for dialogue and mediation. Therefore, it is vital to mind the gap between theoretical ideals of public engagement and its implementation in practice (Wynne, 2006; Irwin 2001).

There are many ways of describing the various type of public engagement in environmental related developments like UOG in the UK that could be descriptive; but some literatures try to explain why public engagement may or may not deliver the desired outcomes. Some existing theories try to characterize the mode of engagement in three different ways:

Top-down/Bottom-up public engagement- Top-down is the form of engagement that is initiated by those in authority (e.g. the UK government, Oil and gas regulators, oil and gas companies) and further wish to empower interested parties with less power and a different opinion/interest to make decisions (Reed, 2008; Fraser et al, 2006). While the bottom-up form of engagement involves individuals, public or local groups with limited decision-making authority/power.

Motivational drivers for public engagement- There are different drivers and outcomes to engagement processes. Motives can be normative (the expectation that the public should participate in a decision making process), pragmatic (better decisions that rare likely to taken into consideration and executed), or for the purpose of enhancing trust in decision-making process among stakeholders (Reed, 2008; Rower et al., 2005; Rowe and Frewer, 2004). Hence different motives can be used to address the various public engagement outcomes. In this case, normative engagement in the UOG development narrative would align more with discussions that seek to build trust and learning which is more likely to target that benefits of the public. Pragmatic motive for engagement is more aligned to issues like environmental protection.

Information Exchange continuum- Engagements that occur at the knowledge and information-sharing spectrum but on a one way flow kind of information transfer to the public and feedback expected by the industry bodies and those of authority (e.g. consultation) to a two way knowledge sharing and joint formulation of the desired outcomes just like in the robust Scottish government consultation on UOG development (Rowe et al., 2005; Rowe and Frewer, 2004). In addition to the three modes of public engagement that has been described above, engagement can be viewed in terms of its design, context, scalar fit and power.

Engagement as design emphasises that the structure of an engagement process will relatively affect the outcome. Brook et al (2013) explains that in an analysis of 136 community projects, displaying the proposed plan was critical for the desired outcomes because this provided opportunities for public participations and feedback. One of the primary reasons is that design is vital for determining decision-making outcomes as effective public engagement and stakeholder management underpins most successful policies (Newig, 2016). De Vente et al (2016) supports the notion that a well designed public engagement process such as the Scottish consultation process on UOG requested public opinions perspectives from all stakeholders before placing a ban on fracking eventually in 2019. Sterling et al (2017) argued that after analysing 82 case studies of participatory projects, the stakeholders

attitudes were dependent on the stakeholder's knowledge and value of the proposed plans. This further reiterates why the support for fracking in North England met with opposition as a result of the lack of trust, transparency and engagement from the onshore oil and gas companies.

Engagement as context depicts how a proper understanding of the local context in which the public engagement process is to be incorporated that will determine the outcome of the engagement process (Ingram, 2011; Blicharska et al., 2011). In a sociopolitical context, where the onshore oil an gas companies are not thinking about environmental conservation, most of the local communities wanting to green but were rather encouraging energy policies that were tailored towards all out for shale propaganda by the UK's Conservative party. Which later resulted in the public's lacks of trust in the UK government concerning UOG payback benefit schemes. Parkins et al (2017) suggests that trust is a precursor public engagement and therefore can affect an individual's choice to engage. While in some situations, public engagement can be endangered due to trusting too much (Poortinga and Pidgeon, 2003). This is because sometimes in a long trusting relationship, one might lose clarity for critical evaluation in decision-making process.

Engagement as scalar fit examines how public engagement is conducted at various levels and timescales. Humans are spontaneous; therefore preferences and choices can change overtime. Reed et al (2018) explains that the choice of engagement can be dependent on the time that the engagement occurs depending on the values of the stakeholders involved.

Engagement as power can be viewed from a lens of power dynamics. An effective management of power dynamics will result to the engagement process producing the desired outcomes and vice versa. In this regards, Reed et al (2018) further suggest that the engagement design should be structured in a way that the value of every stakeholder is recognised and given equal opportunities in the decision making process. Sometimes, mediation can be integrated into power dynamics in order to prevent disagreements and reduce oppositions in deliberation processes. Public engagement theory will provide insight the reasons why shift in power in planning decision making from the local level to the national level in some cases; as some local planning decisions were overridden by government officials at the national level.

3.2 Chapter summary

In summary, in the discussion of UOG development in the UK, there appears to be lack of effective public engagement process before permits and approvals were granted to the onshore oil and gas developers as this resulted to setbacks for the developers from constant protests and oppositions from the public and non governmental organisations (Friends of the Earth, Greenpeace, WWF etc).

The SAP model, PPFPE, institutional theory, stakeholder theory and Reed et al (2018) theory were all explored and discussed in relation to UOG development in the UK in this chapter. Shrader Frechette's PPFPE was used a yardstick to address the planning procedure issues such environmental justice in the decision making process of UOG. While Reed et al (2018) theory was modified to provide further clarification and understanding on the implications of public engagement as a critical success factor of UOG development in the UK would be discussed later in Chapter 8 of this study. Limitation to this framework is that in its application, individuals' and groups' decisions will likely be subjected to their perceptions on new energy systems. Application of this framework has to be timely in order to aid influencing the attitudes to achieve the desired outcome (a time-dependent framework).

CHAPTER FOUR
RESEARCH METHODOLOGY

4.0 Introduction

The previous chapter discussed the existing literature with unconventional oil and gas development in the UK. This is to enable a proper positioning of the study in order to identify the theoretical gaps in knowledge. This chapter focuses on the research methods that were utilised in achieving the set out aims, and objectives. Furthermore, the chapter also identified and described the research approaches, paradigm, philosophical positioning, data collection methods and analysis process.

Research methodology can be considered as the general research strategy. Research methodology was defined as the logical thought processes, which are associated with the investigative process (Fellows and Liu, 1997). The overall method to justify the key aims of the research project or investigation (Hall and Hall, 1996). The main goal is to construct a theoretical framework on which to apply the principles and procedures that are necessary for a research conclusion.

As discussed in chapter one, the aim of the study is to critically evaluate the planning procedures and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in England. To this end, the philosophical approach to the research, the proposed methodological stance, the research instruments and the analytical tools that would be adopted are taken into consideration.

4.1 Research Methodology: An Overview

Research methodology is the overall strategy to achieve a research study aims and objectives. There are three dimensions of research methodology (Sutrisna 2009). This includes the emerging research design, as each dimension informs its ensuing relation. These dimensions are the research philosophy, the logical reasoning of the research and the data dimension.

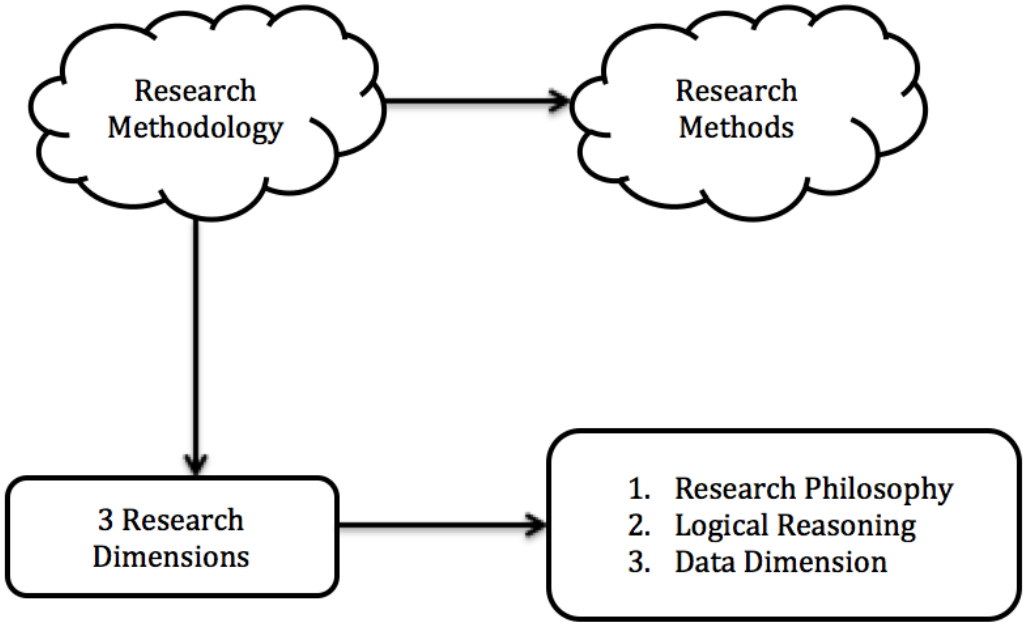
Looking at fracking as a technology, some people might say it can make direct contribution to the improvement of the lot of developing nations economy but the fracking discourse that took place in UK was the opposite. The communities where the fracking sites were located are against the technology due to socio-economic, environmental, cultural implications and health implications. The proposed benefits energy security, job creation and economic boost of fracking appeared not to have outweighed its risks such as the induced seismic events that occurred at the Lancashire site that led to the moratorium in England. As a result of this, the study conducted and investigation in order to understand individuals opinions, views, lived experience and their decisions in regards to UOG development in the UK.

The researcher also examined why individuals view phenomena from different angles and endeavour to understand how individuals lived experiences affect how they think or take decisions.

4.2 Research methods overview

Sutrisna (2009) emphasised the need to differentiate between research methodology and research methods used within any research project. Furthermore, he suggested that research methods are merely tools that could include the use of various approaches within the over-arching methodology. As discussed above, the Figure 10 below shows the interrelationship between the three research dimensions, research methods and the overall research methodology.

Figure 10 The relationship between the research methods, research methodology and the three research dimensions



Adapted from Sutrisna, 2009.

The Figure 10 above shows the relationship between the three main research dimensions, the research methodology and the overall framework of the research project (Sutrisna, 2009). This was notably suggested that it begins from philosophy, through reasoning, and finally onto data. This is not a transition, but rather it goes from subjectively intangible (qualitative), to tangible and measurable (quantitative).

Thomas (2009) supported Sutrisna's description of research methods as merely tools but used the term 'work tools' instead, this went further by taking a look at how and how these tools can

or are used. Thomas (2009) presented a logical statement that it would be rare for a craftsman to lay out his tools, and then decide what to construct just by looking at the tools. He argues that this is no different in research, that is, it is only by understanding the research question, aims and objectives, would it be possible to understand the type of data that would be collected.

Research studies are conducted and carried out for specific purposes that utilises different research methodology and method to justify and answer the different research questions. The subject of UOG development in UK has caused quite a stir resulting to debates and conflicts of interests amongst all the stakeholders involved. Thus, it is only by understanding why there is a discord on this issues and how to go about dialoguing or mitigating all the manageable risks can the subject of UOG be properly understood. Hence the reason for the generation of the research questions, aims and objectives using secondary data to generate themes to help develop the interview questionnaires that would enable the researcher conduct an investigative study to explore the stakeholders/participants/individuals experiences and thoughts on the subject matter in order to justify and answer the research questions. An example is the outcry by the public over the amendment of Trespass law continues to be ignored by the UK government, with local councils decisions overruled by ministerial authorities at the national level. A rethink needs to be explored towards reviewing UK's policy decision-making process by reconfiguring the planning consent regimes promote inclusiveness and public engagement/participation in the development of UOG (Cotton, 2017).

Shrader-Frechette (2002) argues that it is appropriate for Governmental and industry to fulfill both participative and distributive justice requirements for the purpose of providing ethical legitimacy to a decision making process for environmentally damaging industrial projects like UOG development as this is required for policy decision making process. In addition, Cotton (2017) argues that there is a contradictory picture of political equality in hydraulic fracturing related to environmental justice. Indicating some elements of harm in the nationwide moratorium following early seismic activity. The local community formed protest groups together with NGOs and protested outside the gates of the fracking sites citing fracking as a their daily lives, environment, water, air, climate change, and their culture. Cuadrilla's exploratory operation at Preston New Road site in 2011 resulted to tremors of 1.4 and 2.3 magnitudes. All activities on the site were halted with OGA and the Environment Agency (EA) installing a traffic light monitoring system to monitor seismic activities on the site. Such protests as indicated earlier, continued until the induced seismic event that caused the tremor with a 2.9 magnitude in 2019 at the Cuadrilla site and OGA had to put a stop to all fracking activities, followed by the moratorium in England (Cotton, 2017; DECC, 2013). The conflict of interest amongst the stakeholders prompted the researcher to investigate the reason for the controversy surrounding fracking using research methodology and methods that would answer the researchers questions.

4.2.1 Research Philosophy

In conducting any research project, there are quite a number of philosophical approaches that can be used. It was proposed earlier that this starts with the identification of a continuum, for critical understanding that can be translated and discussed. There are two main philosophical approaches that provide a relevant direction for the any research project. These are namely the epistemological and ontological schools of thought. These two schools of thought do not oppose each other on the continuum but rather at two distinct ends. Bryman (2016) explains that research has the characteristics of an information-gathering exercise. As a result of this, the study employed various paradigms such as concepts, theories, methods, approaches etc to justify contribution to body of knowledge and field of study. Creswell and Poth (2018); Campbell et al (2016) outlined that the philosophical stance of a study is embedded in the theoretical, analytical, logical, and the rational study of knowledge for the sole purpose of problem solving and clarification. There are four reasons for understanding philosophical paradigms in a research study (Eastery-Smith, et al, 2015) as seen in Figure 11.

Figure 11 Reasons for philosophical paradigm

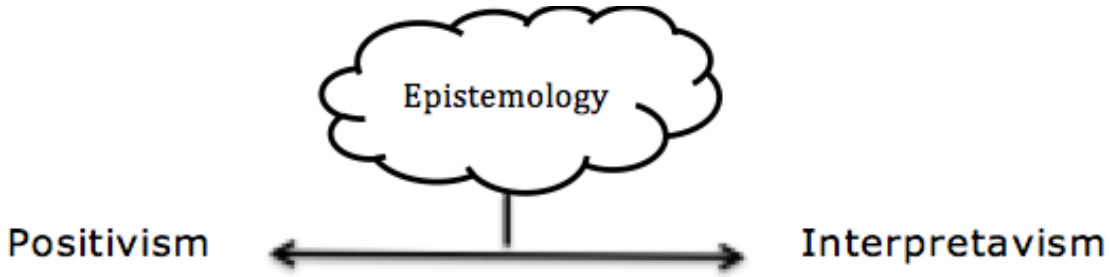
Reasons for philosophical paradigms (Eastery-Smith et al. 2015)
1. To enable the researcher understand the epistemological problems and to identify the researchers insightful role in the study.
2. To provide clarity and understanding of the research design, thereby providing answers to the research questions.
3. To structure the research design to help mitigate and accommodate unforeseen instance during the study.
4. To help the researcher in the development of models, theories, frameworks even without prior experience in the area of study.

Saunders et al (2012), Campbell et al (2016) explained that the decision on selecting philosophical approach and paradigm are usually dependent on the epistemological and ontological assumptions about the study.

i. Epistemology

Epistemology explores the position of the researcher's ability to understand a phenomenon. Fellows and Liu (2008) explains that epistemology seeks to identify and explore the origins, limits of human nature. Just like Ontology, epistemology sits across its own qualitative/quantitative continuum. It takes two theoretical positions across the spectrum namely interpretavism and positivism.

Figure 12 The Positivist/ Interpretivist Continuum



- Positivism

In the positivist approach connotes a single objective reality that is observed or experienced by the researcher. The founding father of positivist paradigm August Comte in his work 'A general View of Positivism' (1956) as explained by Thomas (2009). Further explaining that academic research was based on principles that correlate with a detailed scientific nature. The positivism approach is quantitative in nature. The positivist philosophical stance follows a deductive approach in its reasoning, but also with elements of inductive approach (Creswell and Poth, 2018). Easterby-Smith et al. (2015) also argues that it is only through an independent, objective and measurable reality is truth known. This helps in todays understanding of positivism within the context of any research. While Creswell and Poth (2018) argues that the application of absolute truth of knowledge is not suitable for human behaviour and action research but more applicable for determining cause and effect. Therefore research studies that involve numerical methods and measurements, a positivist approach will be more suited for it. Hence, the positivist positioning is not suited for this research study, which is qualitative by design.

- Interpretavism

Just as positivism and objectivism possess similarities, the interpretivist approach is more similar to constructivism. Thomas (2009) explains that

" …the world…is not straightforwardly perceivable because it is constructed by each of us in a different way."

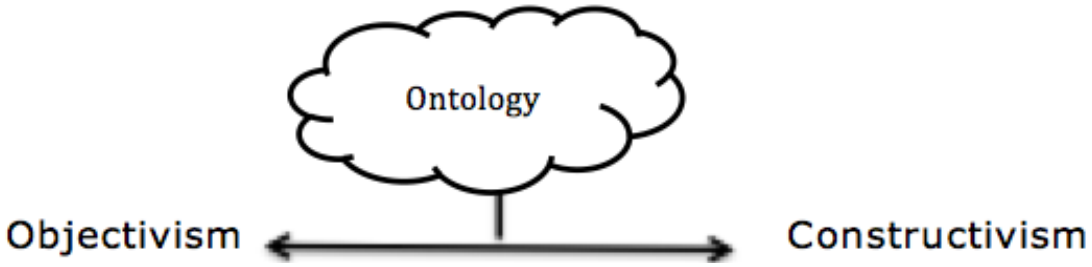
Interpretavism lies within the qualitative camp and suggests that the researcher views the phenomena, constructs and interprets this within their own understanding thereby forming and interpreting their own truth from that which is being observed or researched. Thus, it is the researcher or observer that interprets the truth from reality, leading to the argument that there exist distinct boundaries and parameters to human beings access to knowledge.

Maxwell's (1996, p.19) five reasons for a qualitative approach research agree with the interpretivist school of thought. This would be discussed further in this section as it involves how to identify and understand the stakeholders lived experiences and how in this context, unconventional oil and gas (UOG) development in the United Kingdom affects/has affected the participants actions and decisions so far. Therefore the nature of this study necessitates the adoption of an interpretivist approach in order to understand the perceptions and views of the stakeholders associated or affected by United Kingdom energy policy and decision making process relating to UOG development. An interpretivist approach was best suited for this study because the research is more subjective in nature and it involves qualitative data that informed the research questions (why, how, what) to help understand the different perceptions, experiences surrounding how the planning procedures and engagements processes concerning the fracking debate affected decision on UOG development in the UK.

ii. Ontology

Guba and Lincoln (1994) described ontology as seeking to identify what is there, what the acclaimed reality looks like from what is made and how it interacts. Fellow and Liu (2008) also described ontology approach as the assumption in conceptual reality. Objectivism and constructivism, which are both at the opposite ends of the continuum, were identified as the most popular forms of ontology's theory (Sutrisna, 2009). This can be seen in Figure 13 below.

Figure 13 The Objectivism/Constructivism Continuum



- Objectivism

Objectivism is from the ontological school of thought and lies within the quantitative side of the theoretical framework. Thus, proposes that existence in itself is independent from all actors and therefore, there exist a single objective reality that is experienced by all individuals in the same way (Saunders et al., 2012). Furthermore, objectivism sees organisations as tangible objects that exist with a set of procedures, rules and regulations, which are drawn up to achieved objectives by the assigned people. Thus, organisational realities exist outside its people (Bryman, 2016). This does not align with the research aim of the study, as the research participants' experience, view and opinion is vital for the study.

- Constructivism

Constructivism also lies within the ontological school of thought and is understood as the opposite of the spectrum from objectivism. Thus is associated with the qualitative theoretical approach unlike in objectivism, which is aligned with the quantitative theoretical approach. Hence, this can be interpreted that each individual views and interprets phenomena on an independent basis, to this end; the qualitative link is self-evident. Cobb (2006) defines constructivism as….

"…the notion that knowledge must be assembled from pieces rather than the assimilated whole…"

Although this does not look like the direct opposite to objectivism, however, constructivism in this context is not looked at from a single viewpoint. Morgan (2014) explains that the main attribute of this school of thought rests on the assumption that each individual has different

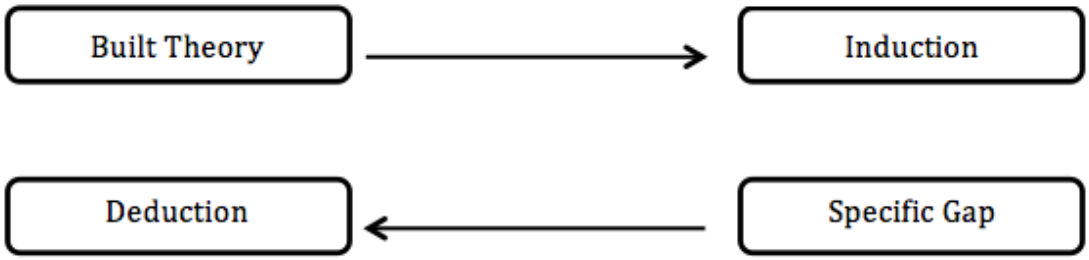
experiences and beliefs hence; no reality exists outside ones perception. Thereby, resulting to multiple views of constructed realities (Sobh and Perry, 2006). Thus, providing the typical assumption of a qualitative research. Such a philosophical stance, fits the approach needed for this kind of research study and would be adopted to gain the understanding of the perception of all the stakeholders associated with unconventional oil and gas (UOG) development in the UK. However, as regards understanding the perception of the all the stakeholders involved, a semi-structured interview with the various representatives of each of the identified group of stakeholders was conducted in order to investigate and understand their various views and perceptions related to the subject of fracking in the UK.

4.2.2 Logical Reasoning

Earlier in the research methodology, it was identified that there exists three dimensions in research methodology (Sutrisna, 2009) and this can be seen in Figure 10. The first dimension was identified as philosophy, which was discussed above in the context of research. The second dimension to be discussed is logical reasoning, which has a hierarchical connection to the philosophical dimension (Sutrisna, 2009). Within logical reasoning lies two main approaches within the context of the research project and are essential to be discussed. These are namely the deductive and inductive research approaches. Deductive reasoning depicts working from the general to the specific, whereas inductive reasoning begins from a defined set of observations that later builds up to a broader level of understanding (Research Methods Knowledge Base, 2012).

The deductive and inductive approaches do not necessarily oppose each other as with epistemology and ontology, thus, could be visualized as working in the opposite direction from one another. This is illustrated in Figure 14 below.

Figure 14 The opposing directions of the Inductive/ Deductive approaches of Logical Reasoning



i. Deductive Reasoning

In logical terms, the deductive/inductive approaches travel in opposite direction logically as discussed above, as both reasoning approaches do not lie at the opposite ends of the spectrum like epistemology and ontology. Deductive approach aligns with both the positivist and objectivist approaches within epistemology and ontology respectively (Sutrisna, 2009). The deductive usually begins by asking questions about what is already there. Doing this by looking at the wider picture in the context of the research aims, objectives in order to find the missing information or gaps, which will help influence the development of the research questions. The main reason is that the deductive approach works from the general information to the specific, as the hypothesis is made up from the existing body of knowledge.

ii. Inductive Reasoning

Fellow and Liu (2008) explained that just like the deductive reasoning, the inductive reasoning process generates the research question. Although in a less structured way unlike the deductive reasoning process. During the construction of the hypothesis, there is much more freedom for the researcher in the data collection process while observing as the research begins to takes shape. It was also suggested that given the nature of inductive approach, the literature review should be omitted in the early stages of the research in order to ensure there is clarity and unbiased and open-mindedness by the researcher (Glaser, 1978). Thus, to observe as you go approach towards the research that seems to be aligned with interpretavism and constructivism despite not having a continuum of its own.

4.2.3 Data Dimension

The information so far in the chapter has been based on two out of the three dimensions of the school of thoughts. These two schools of thoughts: philosophical and logical reasoning have been characterised into either qualitative or quantitative. The third dimension, which is the data dimension as identified by Sustrisna (2009), with the view that there appears to be a hierarchy to the structure the broader research methodology, whereby data is the lowest denominator. As

explained in the previous philosophical approach, qualitative characteristics (e.g. qualitative data collection process) runs throughout the research project process. This would be discussed below in the next section of the research method adopted in the study.

4.3 Introduction of the Research Methods

Research methodology refers to the justification of why certain options were made during the research process, whereas the research methods are the different approaches used in the research process. Crotty (1998 p.3) defined methods as

> *"…the techniques or procedures used to gather or analyse data related to some research question or hypothesis…"*

During a research study, there are various available options of the type of method the researcher requires to undertake the study, but this is solely based on the type of research while selecting the associated methodology that justifies the theoretical point of view.

The previous section has tried to illustrate the characteristics and relationship of research methodology and the identification of the research methods as necessary tools (Sutrisna, 2009) for the study. This is relevant to the direction of qualitative approach utilised in the study. The research methods used for the purpose of the research study was dependent on the method of inquiry and the source of data collection. There are various types of data collection processes. This research adopted primary data collection using semi-structured interviews (Whiting 2008), and secondary data sources (Yin 2014). Yin (2018) points out that there are primarily three types of research method namely quantitative, qualitative and mixed methods. Yin, (2018); Creswell and Poth (2018); Bryman (2016); Saunders et al. (2016) and Easterby-Smith et al. (2015) identified that qualitative method aligns with the interpretivist stance. The quantitative method aligns more with positivist views and is numerically inclined. While the mixed method, is driven by the limitations of both the qualitative and quantitative methods. Each method is unique and is not superior to the other but the application of any of the method is tailored towards the type of research design.

In social science research especially in the field of management, scholars have four main data collection tools, which are interviews, questionnaires, participant's observation and lastly secondary sources (Buys and Bursnall, 2007; Huxham and Vangen, 2005; Cooper and Schindler, 2003; Bansal and Roth, 2000; Snow and Thomas, 1994; Meredith et al., 1989). As stated above, this study adopted a semi-structured interview, and secondary data sources for the data collection process from the England, Scotland, United States, Australia and Poland to answer the research questions.

i. Quantitative Method Approach

Quantitative method is underpinned by values from numerical data (Creswell and Poth, 2018). According to Yin (2018) and Saunders et al (2016), quantitative method aligns with positivism, objectivism and deductive approaches. The positivist and deductive reasoning does not align with the research aim. The study aims is to critically evaluate the institutional framework and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in UK. Since quantitative data primarily involves facts and figures. In this case, the data appears to be observable involving questions like *how many/ how much/ how often* and so on. To this end, the researcher appears to be just a neutral observer; hence the research sees figures and facts by not been opinionated other than what the facts and figures displays/discovered. Hence, the study aligns betters with questions like *why, how, what* which are not quantifiable (Yin, 2018).

A major limitation to quantitative method is that it does not provide a robust understanding or interpretation of individual's experiences, opinions, views by leaving out some key variables of the study, regardless of the context in which they are applied (Campbell et al., 2017; Saunders et al., 2016). This study entails understanding and interpreting human behaviour towards the implementation of new technology like fracking and their perceptions towards energy decision-making process in the UK.

ii. Mixed Methods Approach

Mixed method can be used within the continuum framework but it is noted that the *methods* in this case refer to the systems or tools that are to be used within the philosophical stances shown. The actual methods in this context have not yet been discussed, although there is a non-crossable line, which restricts the application of mixed method approach (Sutrisna, 2012). The reason for a mixed method approach is to allow for weakness in one approach to be strengthened by the applications of the other approach used in the research project (Fellows and Liu, 1997). This is usually most suitable for social research that requires both a humanist and scientific approach to study a phenomenon. Amaratunga et al (2002) supported this by describing such an approach as a counter-balancing force that provides a mutual compensation for both approaches used as the case may be. A typical example of the adoption of a mixed method will be to use the combination of both semi-structured interview (qualitative) and a survey (quantitative) in a research study to provide a deeper understanding of the research study.

The example cited above, does not align with the interpretivist approach which is word based and is selected by the researcher for the study. This underpins the belief that the selection of a

research methodology is driven by the researchers philosophical reasoning (Ackroyd and Hughs, 1992).

iii. Qualitative Method Approach

Qualitative research area is quite vast and can be divided into five distinct traditions (biography, case study, ethnography, grounded theory and phenomenology) as recognised by Creswell (1998). These five distinct groups would not be explored in this chapter due to the space constraint and the scope of this research project, hence, there should be an understanding of the characteristics of qualitative data that should be explored. Qualitative approach naturally aligns with the interpretivist, constructivist and the inductive school of thought and reasoning. The qualitative approach is less structured in the collection of qualitative data in the context of philosophical dimensions but has more value in the field of social research given its social nature. Compared to the quantitative approach, qualitative data is more subjective and seeks to be more people centered in its approach by asking questions like *why/ what if?*

Divan et al (2017) explains that qualitative data is widely used in social research, while theoretical and epistemologies assumptions can sometimes be unfamiliar and challenging to those especially from science and engineering backgrounds (Rowland and Myatt, 2014), there still remains a value for the use of these approaches (Rosenthal, 2016). Most times than often, there are resources on qualitative approaches, however, they tend to focus on the research design, assumptions and data collection rather than the analysis processes involved. Clarke and Braun (2013) recognises that a clear guidance is required for the practical aspects on conducting any qualitative research project. Nowell et al (2017) also explains the lack of focus on the relevant thematic analysis has implications in relations to the credibility of the research process. Within the scope of the study, thematic analysis was adopted in the secondary data collection stage in order to inform the researcher's framing of the interview questionnaire required for the primary data collection. The justification of this method for the study is discussed below.

4.4 Justification for the use of Qualitative Method

This research aims to critically evaluate the institutional framework and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in UK. Therefore, there will be a need to describe, explain and explore the various regulation, governance and fracking polices in the UK and the potential socio-economic and environmental implication to UOG stakeholders. The qualitative method seeks to understand phenomenon such as the issues associated with policy decision-making process in order to achieve the aim of the research study in section 1.2. The philosophical interpretivist constructivist stance underpins the

how, why and what questions of the research study (Yin, 2018). Qualitative method was selected as the appropriate approach for this research as the study seeks to understand "how" lack of public engagement has affected policy decision-making processes in the United Kingdom in relation to unconventional oil and gas development and "why" it resulted to protest, debates and dispute between the local communities, and the other stakeholders. This research would investigate how the various stakeholders have interpreted the narrative surrounding UOG development. In order for the researcher to undertake this study, UOG related literature and data would be collected and reviewed in order to analyse and to make useful meanings and add to the body of knowledge of literature from an interpretative perspective using the qualitative method to make meaning of the data collected. Corbin and Strauss (2008, p.47) who argues that any research which is interested in

"…analysis as an interpretive act, concepts form the basis of analysis, concepts vary in levels of abstraction, there are different levels of analysis, analysis can have different aims and analysis is a process…" should view from a qualitative lens.

Maxwell (1996) also agrees that there are five research reasons why a research should adopt the qualitative approach. This is highlighted below guided the research through each stage of this study:

- To understand the reason for participants in the study of the events, situations and the information they give about their lived experiences.
- To identify and understand the particular context within which the participant react and how the context affects the participant's actions.
- To identify unexpected influences, thereby generating new theories.
- To understand the process by which events and actions occur.
- To develop casual clarifications.

4.5 Types of analytical methods

There are various types of analytical method that can be implemented in qualitative research. These include the following: *Grounded theory*, *Discourse Analysis (DA)*, *Narrative Analysis (NA)*, *Interpretative Phenomenological Analysis (IPA)*, *Case Study*, *Content Analysis and lastly Thematic Analysis.* Thematic analysis was more suited for the study as explained below.

Thematic Analysis

Thematic analysis is the most commonly used method of analysis (Guest et al., 2011) that is usually used in identifying, analysing and reporting within data (Braun and Clarke, 2006).

Thematic analysis method should be driven by both the research question and the theoretical assumptions. This method allows for flexibility amongst various methodological backgrounds as it allows for other types of methodologies to engage in this type of analysis. Although there is abit of concern about this method as a result of wide variety of themes that are interpreted to a large amount of themed texts, especially during coding (Guest et al., 2011). The rationale for implementing this method is because it allows for theoretical flexibility, which enables the researcher access and use a variety of information in an organised manner by carefully synthesizing the data into themes to make sense out of it (Boyatzis, 1998).

Thematic analysis is a process of identifying themes and patterns within qualitative data, and it is primarily the first qualitative method that should be learned as '…it provides core skills that will be useful for conducting many other kinds of analysis…' (Braun and Clarke, 2006, p.78). Unlike many qualitative methodologies, thematic analysis is not tied to any particular theoretical or philosophical approach, meaning it is flexible method for research purposes (Braun and Clarke, 2006; Clarke and Braun, 2013). Although there are many ways to approach thematic analysis (Boyatzis, 1998; Alhojailan, 2012; Javadi and Zarea, 2016), nevertheless, this variance means that there exists some misunderstanding. This includes how different it is from qualitative content analysis (Vaismoradi et al., 2013). The main goal of thematic analysis is to identify themes, that is patterns in the data that are termed important and use these discovered themes to answer the questions in the research. This goes beyond just summarizing the data but rather interpreting the data to make sense of it. Clarke and Braun (2013) explains that one common drawback is when you use the main interview questions as the themes, showing that the data has just been organised and summarized instead of been analysed.

Themes can be in two levels namely latent and semantic themes; Braun and Clarke (2006) distinguish these two levels of themes. The latent level themes look beyond what has been said and '…starts to identify or examine the underlying ideas, assumptions, and conceptualisation - and-ideologies-that are theorised as shaping or informing the semantic content of the data' (p.84). While semantic level themes '…within the explicit or surface meanings of the data and the analyst is not looking for anything beyond what a participant has said or what has been written.' (p.84). Based on the nature this research, a thematic analysis was undertaken, with the themes emerging from the data interpreted from the semi-structured interviews and from the literature review process (government policy documents, party manifestos etc). Thus such a method displays the problems associated with lack of communication and engagement amongst all the actors in United Kingdoms UOG industry without an imposition of a predetermined viewpoint. This is discussed extensively in Chapter 5 of this study.

4.6 Design of the Research Framework

The previous section provided a broad range of explanation and discussion on the structure, composition and meaning of the research methodology, methods and the justification for their application in the study. As noted earlier, the actual research methods have only been highlighted upon, thus this section discusses the research design frame used in the study. This chapter utilises Sustrisna's (2009) dimensional groupings of research methodology to address the three listed points below.

- Identification and justification of the philosophical stance
- Identification and justification of the logical reasoning of the research
- Identification and justification of the type of data collection.

4.6.1 Philosophical stance

The research methodology has been highlighted and discussed in the previous section and how research method was introduced into it. It was also described in the previous section that the research question should be identified in order to allow the researcher to reflect on which methods and tools to employ in the study. The gaps in knowledge from reviewing literatures of UOG development in the UK resulted to an inductive reasoning approach to be adopted. This has also been vital in filling the gaps in order to support the introduction of new concepts and questions to the design frame by means of critical reflection, informal communication and interviews.

It is difficult to separate the deductive and inductive reasoning from the philosophical stance. Sutrisna (2009) also observed this, as a key requirement in any doctoral research process is to identify the nature of the research, and also to describe the viewpoint of the researcher.

4.6.2 The Research Questions

There are three main research questions that have been identified. These questions must be answered as part of the research process.

Question 1

The storyline for UOG development appear to have shifted from a local level to the national level. How did it influence the decision-making process surrounding UOG development in the UK?

Question 2

The UK National Planning Policy Framework (NPPF) entails achieving a set of objectives to ensure sustainable development while taking into account the local circumstances. Did this affect the support and decisions for granting planning permits applications for UOG development?

Question 3

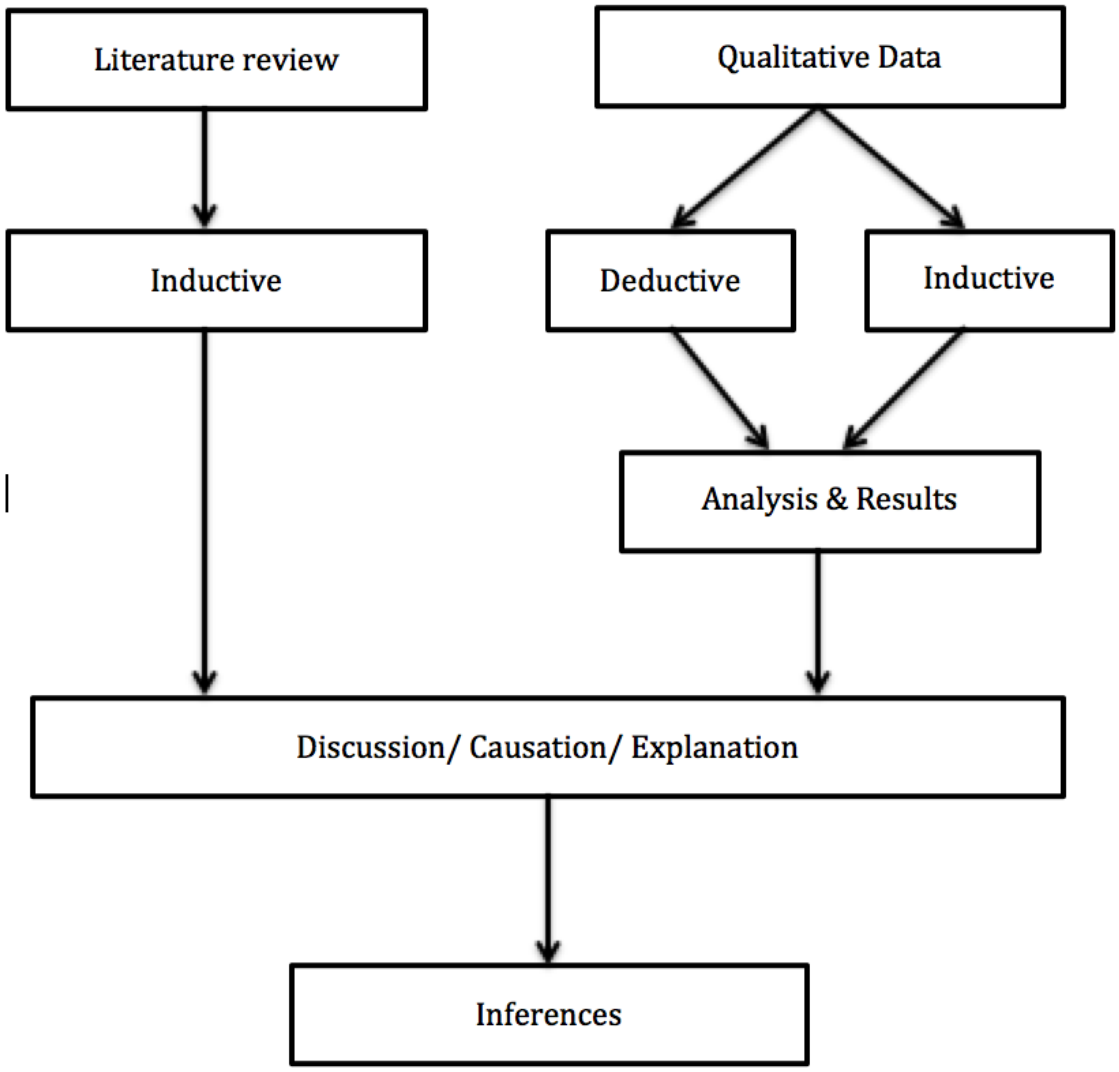
Does UOG development have a role to play towards the implementation of the UK's transition to Net Zero Strategy and its implications for meeting the climate change target of 2050?

This research aims to critically evaluate the planning procedures and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in England. A clear understanding of the UK's energy policy planning procedures in regards to UOG development has been discussed in Chapters 2 and 3 to provide answers to the research questions 1, 2 and 3. Furthermore, this assisted the researcher in drafting the interview questionnaire for the interview process.

4.6.3 Reasoning of the Research

It has been described and demonstrated in the previous section, which explained that the second dimension of the research methodology comprises of both the deductive/inductive approaches. It has been suggested that from the research questions and what the research entails, and a justification provided for a qualitative method approach to be undertaken. The Figure 15 below illustrates the conceptual positioning of the deductive and inductive approaches in relation to the qualitative method approach of the research design and how they have actually been applied in the research study.

Figure 15 The use of deductive and inductive within the qualitative method approach

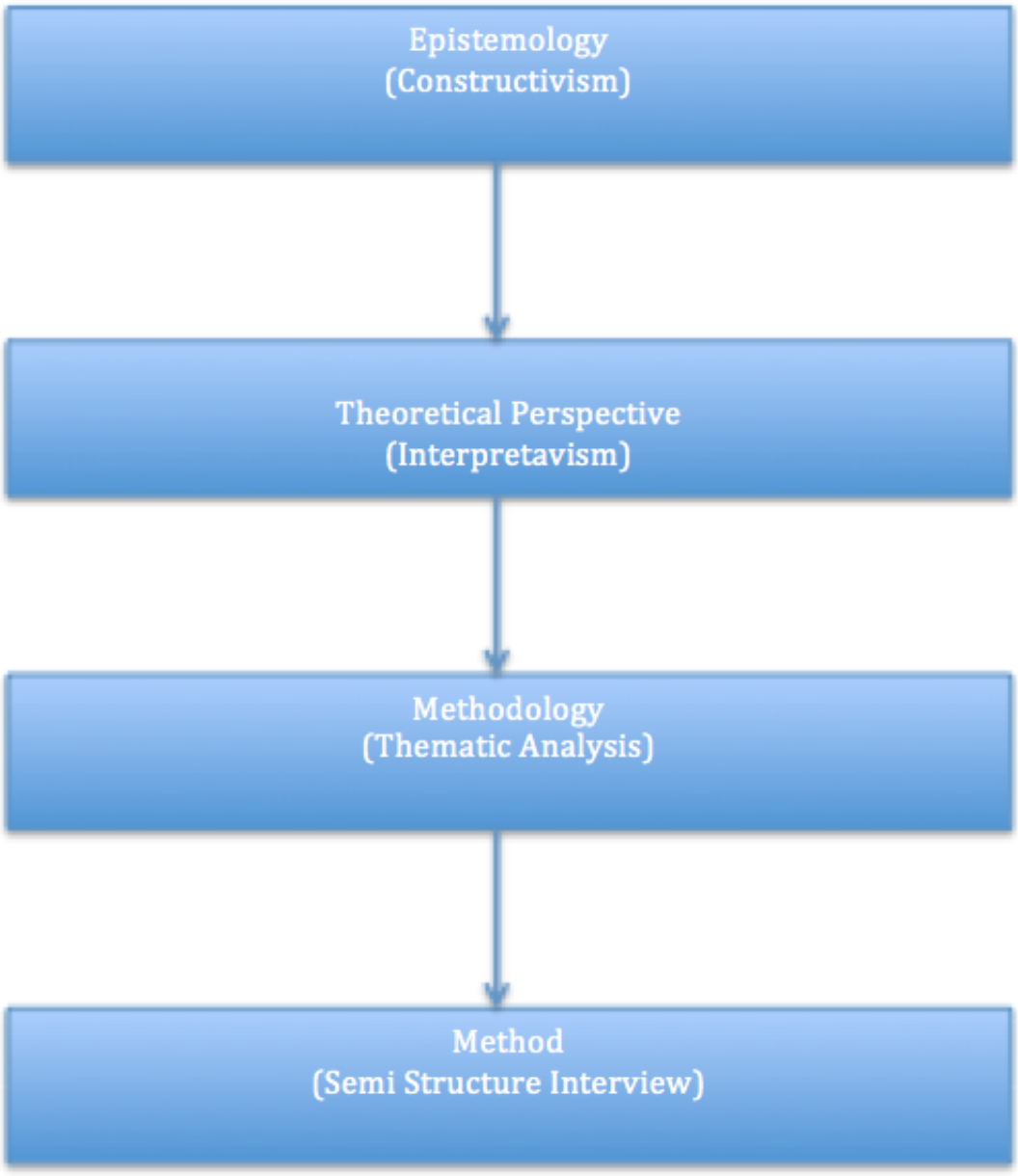


Source: Author generated

A country like the United Kingdom where oil and gas companies, government agencies, non governmental agencies and local communities all co-exist, from an ontologist point of view, objectivist scholars would assume that the researcher can be biased with the present unconventional oil and gas debate. Such a perspective would tend to tilt toward an epistemological school of thought such as positivism (Bryman, 2016). While the constructivism approach proposes that the reality is socially constructed (Bryman, 2016) which is primarily related to social influences that includes human behaviours, social environment and social relationships. From a constructivist school of thought, knowledge can be viewed as the possession of social settings as well as the individuals in that setting. Therefore, a social setting

like the areas of Lancashire and other parts of the North of England which were the proposed fracking sites, are perceived by the participants, the researcher and the interactions and relationship's within that setting as all interdependent. Thus, one cannot be understood without the other (e.g. why did protests occur in these locations) (Bryman, 2016). Thus, this assumption about the nature of reality leans toward an epistemological school of thought known as interpretavism (Bryman, 2016). Hence, a constructivist approach is more in line with this research as it is embedded in constructivism (Burr, 2002). This social relationships and interactions places power dynamics in decision-making processes at the center of policy making, engagement processes and their actors as the drivers of the participation process. The interpretivist approach is useful for this research as it explains, uncovers and theoretically interprets the actual meaning of social actors, their reactions, and emotions in relation to a particular event or subject matter. The interpretivist approach is not holistic, but it allows the interpretation of how particular meanings become contested, shared in situations where understandings are hereby possible (Gephart, 2004). The Figure 16 below illustrates the thesis epistemology, theoretical perspective, methodology and methods.

Figure 16 Thesis epistemology, theoretical perspective, methodology and methods



Source: Author generated adapted from Crotty (1998)

4.7 Research Data sources

The research study detailed a data collection of credible and rich data set from various sources. Data was collected through semi-structured interview with 20 respondents from a broad spectrum of stakeholders in the United Kingdom is discussed further in this chapter. This includes United Kingdom (UK) government officials (MP's and MSP's), oil and gas regulatory bodies, onshore oil and gas companies, Scientists/Experts, representative of Non-governmental

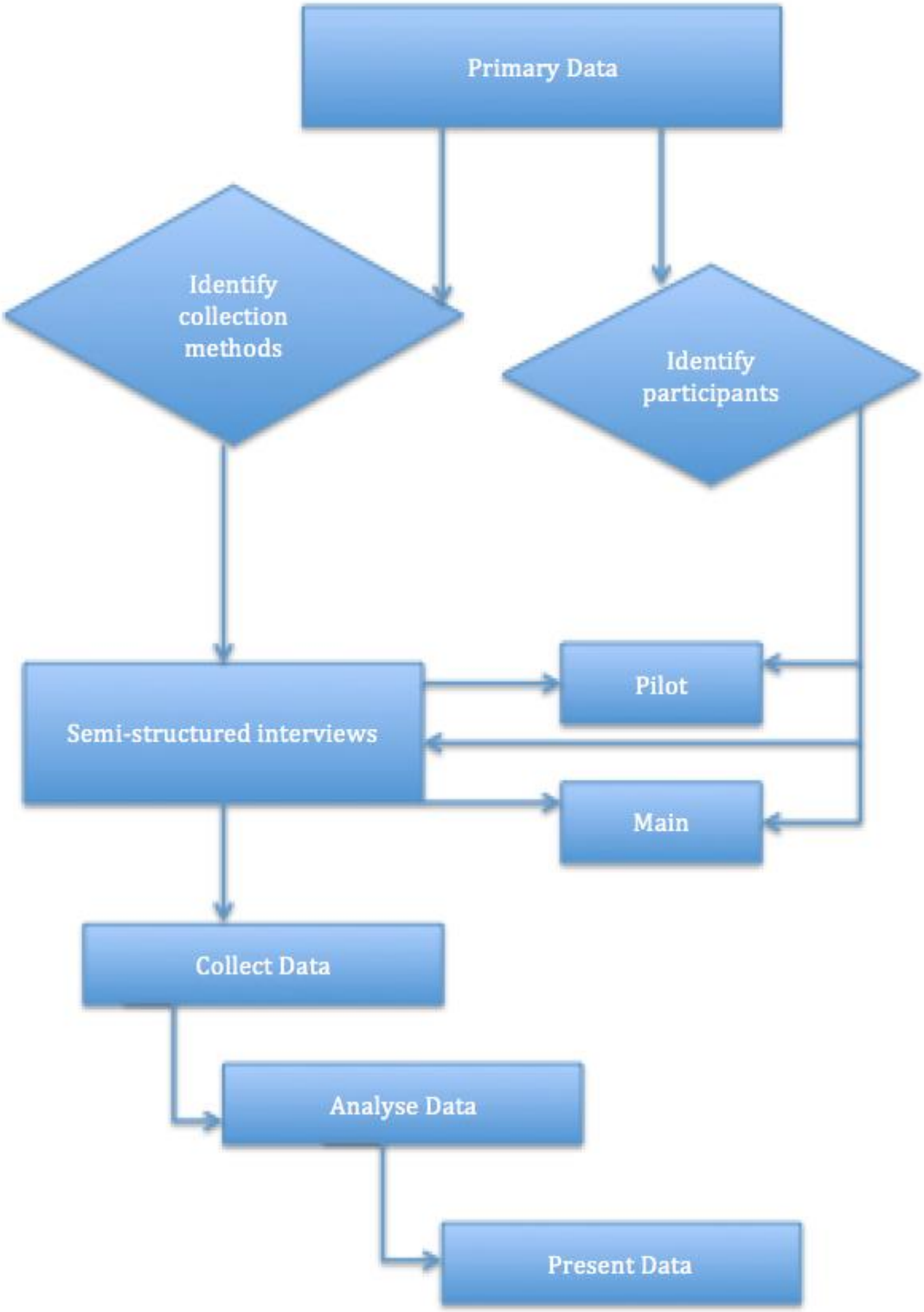
organisations (NGO), journalist, members of local communities (civil servants and senior protest groups) at the proposed UOG development sites.

The data collection process commenced with a pilot study of semi-structured interview in March 2021. This consisted of members of local communities and Scientists/Experts. After a review of the participant's response, the research questionnaire was revised in accordance to the prevailing themes and issues of UOG development in UK from the pilot study conducted. The time plan fieldwork was from May-July 2021 in the United Kingdom. The semi-structure interviews were conducted, recorded, while the researcher also wrote and took hand written notes. The data collection was transcribed and thematically analysed using NVivo 11 software.

4.7.1 The Primary Data

The primary data is the data that the researcher collected during the research process. The data requirement necessitated qualitative data collection. A range of methods was employed during the data collection that included semi structured interview process and observation, which is discussed extensively in section 4.9 of the study. The main objective of the primary data collection was to verify the secondary data collection process findings and to extract enough information to help inform the development of the research findings. This provided a better understanding of the specific research area, which was essential in identifying and designing the specific set of method and instruments in regards to the population sample (20) for the research. The population sample is seen as a dimension of the procedures that is associated with the sample frame as seen below

Figure 17 Primary data frame



Source: Author generated

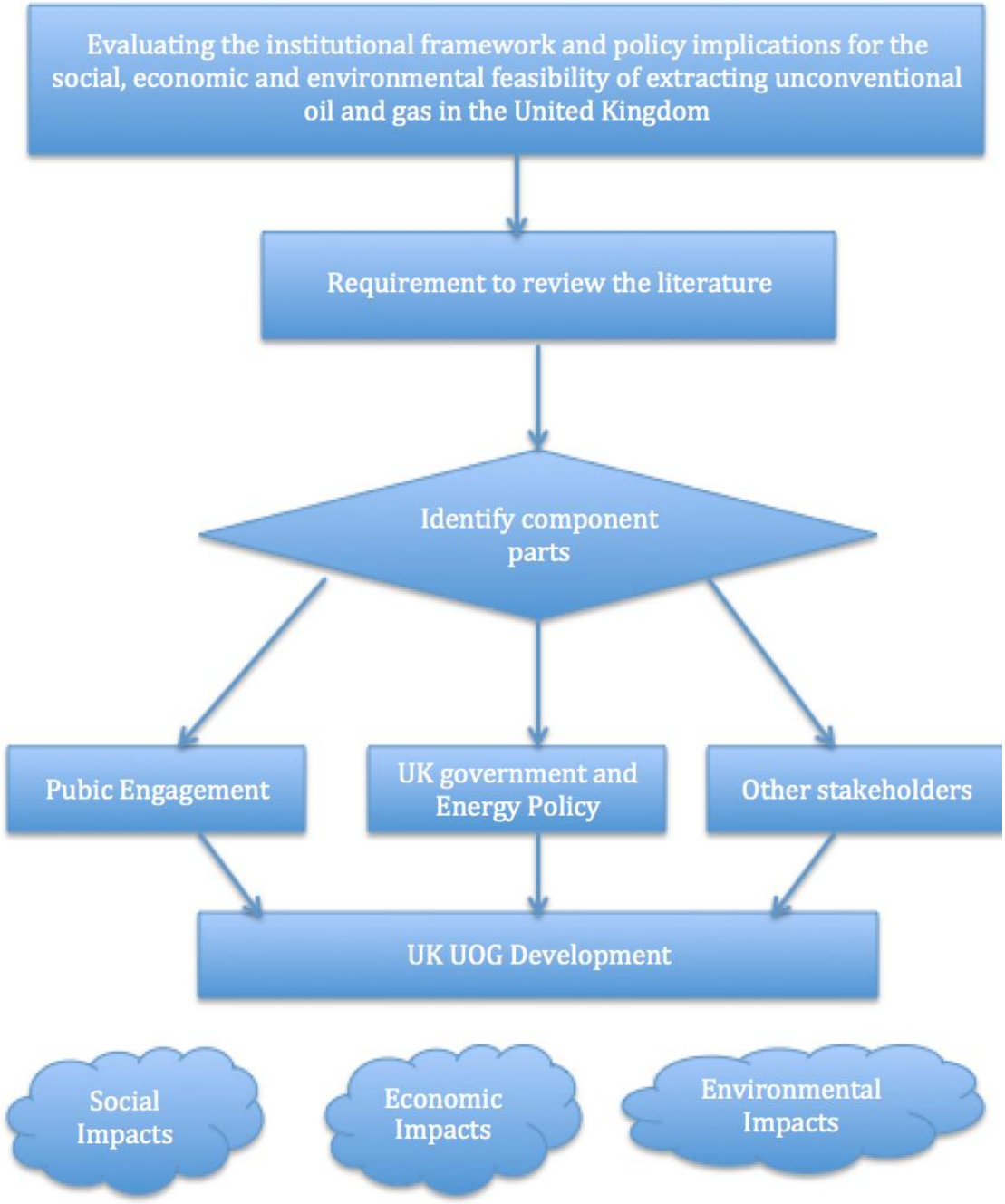
4.7.2 The Secondary Data

The secondary data comprises mostly of the results of the literature review, which provides a foundation for the research design and by its nature takes the inductive approach. Alternatively, it can be argued that the study of literature has acknowledged subject areas such as decision-making processes in isolation and therefore demonstrates an inductive approach. Hence, this is discounted within the research as been more related to the process of the research findings. Secondary data was correlated from the literature review process, to review, understand and adopt a theoretical perspective that answers the research questions. This was done using the SAP model, Shrader-Frechette's (2002) PPFPE, Stakeholder theory, Institutional Theory and Reed et al (2018). The researcher identified that Shrader-Frechette's (2002) PPFPE and Reed's et al (2018) theory was more applicable to the research area.

The Literature Review

The literature review process is a vital part of the doctoral research study, which has been recognised as a method that underpins the total research project. The first stage is developing the literature review, which is necessary for the aims and objectives of the research, and could be further broken down into the required component parts. Figure 18 below illustrates the process of deconstructing the research study which provides the essential step in the refining process that brought about the initial research idea, by narrowing down the process to identify the specific research topic as seen below.

Figure 18 Deconstructing the Literature review as a research method



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4.8 The Sampling Technique

The literature review helped to facilitate the identification of the population sample. The identification of the actors and processes from the literature review findings provided the necessary amount of information that allowed for the composition of the research question that was highlighted earlier on in this section. Right from the development of the research questions, a selected group of professional and experts in the desired discipline required for the data collection process were identified. Given the criteria for the research, the sample method used was directed towards the non-random sampling approach. Such non-random approach was necessary as only a specific targeted audience or group of individuals were admissible as the required sample participants for the research. There is a wide range of sampling methods but the sampling method is dependent on the purpose of use in the research (Creswell, 1998).

Walliman (2016) defined sampling as the method used in selecting cases or respondents for a study. Sampling also helps to manage the various factors that may influence the study. Thus, the findings have enough representatives to enable generalisation.

4.8.1 Types of Sampling Techniques

Campbell et al (2016); Saunders et al (2016); Sekaran and Bougie (2013); Davies and Hughes (2014) grouped sampling techniques into two categories namely: probability sampling and non-probability sampling.

i. Probability Sampling

This technique involves the selection of representatives from a larger population using the theory of probability (Campbell et al., 2016; Saunders et al., 2016; Sekaran and Bougie, 2013). That is, everyone within the population has an equal probability to be selected in the study. This is the type of random sampling employed to obtain a sample that is considered a representative of the whole population (Bryman 2016). This sampling method includes: Simple random sampling; stratified random sampling and cluster sampling. The study did not align with probability sampling because it was a field based research and did not need to identify or utilise the probability theory in selecting its sample.

ii. Non-Probability Sampling

This sampling method is also known as non-random sampling, as it provides less justifiably representative samples and most times, it is used to minimise the cost of probability sampling or in cases when it is quite difficult to obtain the entire list of a given population (Campbell et al., 2016; Saunders et al., 2016; Black, 2000). These includes sampling techniques like Quota sampling: Convenience sampling and purposeful sampling. The study adopts a non-probability sampling method using the purposeful sampling technique because of the following factors:

- United Kingdom consist of four constituent countries namely England, Scotland, Wales and Northern Ireland. Within these constituents' countries exist political parties that are pro-frackers and anti-frackers. As the scope of this research is England, the researcher identified the political parties in the UK Parliament where policymaking decisions are decided. These include 4 (MP, MSP) from the four major political parties (Conservative party, Labour party, Scottish National party, and Green party) in the UK parliament (not a non–random population) and have the capacity to and knowledge to answer the interview questions.
- A selection of representatives from the four major UOG developers (Third Energy, Cuadrilla Resources, Ineos, and IGas) based on the companies that have been granted licenses to explore UOG in the UK and have caused so much media attention, protests and disputes from both the local councils, communities, NGOs etc has also been selected for the semi-structured interviews. This was to ensure that the proposed populations of UOG companies in the UK are represented. Only 2 companies agreed to be interview. The others sent links their public reports on the subject area.
- A selection of 2 scientific experts (geoscientist, chemical Engineer) in the field of Sciences and Engineering were interviewed to help understand the technology of fracking from an expert's point of view.
- A number of Non Governmental Organisations who are environmentalists and have been backing "No to fracking" related operations in the UK are selected purposefully for this study. This would include 2 representatives from the major non-governmental organisations (WWE, Friends of the Earth, Greenpeace) that have been strong anti-frackers and climate change champions in the media are to be interviewed.
- In England, there are four onshore regulatory bodies. The selection of representatives of the Onshore regulatory bodies in England ranging from (Department of Business, Energy, and Industrial Strategy (BEIS); Environment Agency (EA); Health and Safety Executive (HSE) and Minerals Planning Authority (MPA). Interviews were conducted with 3 of the representatives of these bodies.
- Lastly, a selection of 7 individuals (4 civil servants, 2 senior members of anti-fracking protest groups, 1 Journalist) from those areas specifically where UOG exploration has been witnessed in the UK were also included for the interview process. This was dependent on the participants that were willing to be interviewed about the controversies surrounding UOG development and how it affected their local communities and their everyday life.

The researcher adopted the purposeful sampling technique from all the factors listed above for the study and the sample size (20) was arrived at due the number of interview request acceptance

received. The interview process was conducted during the COVID-19 pandemic period in 2021. Despite this, the researcher was able to receive acceptance for interview from participants that were very equipped, experienced to engage and provide credible response about UOG development in the UK. This helped to mitigate the problem with the sample size. The Table 3 below shows the demographic profile of the participants. While Table 4 shows the stakeholders and the number of interviews conducted.

Table 3 Demographic profiles of research participants

S/N	Participant Pseudonym	Gender	Form of Interview	Profession	Years in profession
1	FRAC001	Male	Zoom	Civil servant	15
2	FRAC002	Male	Zoom	NGO	10
3	FRAC003	Male	Zoom	NGO	9
4	FRAC004	Male	Zoom	MP	8
5	FRAC005	Male	Zoom	Oil and gas regulator	25
6	FRAC006	Female	Zoom	Civil Servant	8
7	FRAC007	Male	Zoom	MSP	22
8	FRAC008	Male	Zoom	MP	15
9	FRAC009	Male	Zoom	Oil and gas regulator	12
10	FRAC010	Female	Zoom	MSP	5
11	FRAC011	Male	Zoom	Senior member anti-fracking protest group	12
12	FRAC012	Female	Zoom	Journalist (Editor in Chief)	20
13	FRAC013	Female	Zoom	Civil servant	16
14	FRAC014	Male	Zoom	Chemical Engineer	15
15	FRAC015	Female	Zoom	Geoscientist	14
16	FRAC016	Male	Zoom	Geoscientist	10
17	FRAC017	Male	Zoom	Oil and gas	12
18	FRAC018	Male	Zoom	Oil and gas	15
19	FRAC019	Female	Zoom	Civil servant	19
20	FRAC020	Female	Zoom	Senior member anti-fracking protest group	12

Source: Author generated

Table 4 Stakeholders and number of interviews conducted

Stakeholder Designation	Number of interviews conducted (20)
MP	2
MSP	2
Oil and Gas Regulators	2
Onshore oil and gas companies	2
Geoscientists	2
Chemical Engineer	1
Non Governmental Organisation (NGO)	2
Civil servant	4
Senior member of anti-fracking protest groups	2
Journalist	1

Source: Author generated

The sample size composition can be justified, as the research did not want to get to the stage of saturation but rather allowed selecting participants that have high level of knowledge and years of experience in their various fields, positions and professions that will provide valuable information and data in the subject area. Wilson (2015) and Halpern et al (2001) explains that from the value of information perspective, not every data collected is valuable. That is, having multiple participants responds with the same answers defeats the purpose of the study and will therefore bring about additional costs. This way, the cost of data collection then outweighs the benefits. Therefore to mitigate this problem, the sample size of 20 was more cost efficient, as resources was quite limited during the fieldwork of this study while the UK was still in the COVID-19 lockdown phase and also provided valuable data that informed this study.

4.9 Data Collection Overview

Data for the first part of this study which is the secondary data was collected from various sources of literatures, policy documents, political manifestos, consultation documents from the Scottish government, UK government, oil and gas industry websites, textbooks, relative articles and journals. These sources were identified as data collection techniques Skinner (2012). As a starting point, thematic analysis was conducted and the themes generated were used to develop the primary interview questionnaires. A pilot study was then conducted using the interview questionnaire followed by the semi structured interview of participants, that included UK Government officials, oil and gas authority and regulators, representatives of UOG companies,

scientific experts, non governmental organisations, journalists, and members of the local communities where fracking related activities and protests occurred.

4.9.1 The Pilot Study

Prior to the collection of primary data needed for this study, the researcher carried out a pilot study in March 2021. Pilot studies, according to Polit et al., (2001, p.467), are "small scale versions(s), or trial run(s), done in preparation for the major study". The idea of pilot study allows a pre-testing of trying out of a research instrument as suggested by (Baker, 1994). Davies and Hughes (2014) argues that the whole essence of the pilot exercise is to give the researcher the confidence that all the preparation towards the study that includes the adequate research instruments have been developed for the purpose of the study. This is because the result from a pilot study helps to refine or fine-tune a better research instrument. In some instances, the feedback from a pilot study might help to point out uncertain unanswered questions or questions that could have been misunderstood. Furthermore, irrespective of the research method, a pilot study can be carried out. Teijlingen and Hundley (2001) explains that apart from a pilot study helping to boost the confidence of the researcher with regards to the validity of the instruments adopted, it also helps the researcher evaluate the feasibility of the study, assess if the research protocol is realistic, evaluate the efficiency of the sampling frame, identify any foreseeable problems that might affect the research methods, and deduce if the proposed methods are inappropriate for the study. The pilot study in this case would be advantageous for the proposed main fieldwork.

The researcher conducted the pilot study in March 2021 using semi-structure interviews with a sample size of 5 individuals. That is, 3 members of local communities (those directly affected by fracking) and 2 Scientists/Experts (have scientific backing about the impacts of fracking). Feedback and response from the semi-structured interviews aided in the revision of the questionnaire that was used in the fieldwork. Responses from the pilot study varied due to the level of knowledge of fracking and the information that has been made accessible to the participants by the UK government, regulators, developers and NGO's. Those from the local communities that have experienced the environmental impacts of UOG were very keen to speak about it and were quite knowledgeable about the information on fracking compared to those who did not live within close proximity of the fracking site. A key issue here was in the engagement process associated with the fracking discourse and how they have been left out of the planning decision making process. This resulted in the researcher dividing the participants into two groups (specialist and non-specialist group) and draft two separate questionnaires with their questions structured in the same way for the actual semi-structured interview process.

4.9.2 The Interview process

The interview process began with a pilot study conducted in March 2021. The fieldwork ran from May 2021- July 2021. An introductory letter was designed and is included in the Appendix section of the study, together with a Consent form following the Robert Gordon Research Ethics and guidelines. The introductory letter was emailed out to the participant detailing a request for interview including the research topic, aim, time, form of interview, and also stating the UK Data Protection Act 1998 with the researchers contact details. The average length of time needed for the interview (Zoom online platform) was included in the introductory page of the interview questionnaire, which was 45mins. This was the average time set for the interview in order to mitigate the respondents giving excuses that they had busy schedules. Surprisingly, most of the interview session conducted ran over 60mins with both written and verbal consent given prior to the beginning of the session (using Robert Gordon University audio recorder). The data collected was coded and analysed using NVivo 11 software and is discussed extensively in chapter 6 of the study.

4.9.3 Justification for semi-structured interview technique

Yin (2018); Saunders et al (2016) identified three types of interview techniques as in-depth, semi-structured and unstructured. Saunders et al (2016) explains that in-depth interview technique involves intensive singular interviews. This is usually with small number of participants in order to explore their perspectives on specific issues or events (Bryman, 2016). This further creates room for probing the participants with further questions. It is time consuming technique and if not managed properly might derail the interview subject area. Probing in in-depth interview technique might lead to a roadblock and the research participants will likely decline answering such probing questions. This might lead to having insufficient data after a time such a time-consuming interview session. This makes in-depth interview technique not suited for the study

The semi-structured interview technique is similar but in this case, the researcher is seeking information from a set of pre-determined but open-ended questions (Campbell et al., 2016; Bryman, 2016). It is an interview technique that creates creativity as the questions are designed towards the participants' perception, views and lived experiences towards the subject matter. It could also be time-consuming as it contains open-ended questions that can arguably lead to building of rapport between the interviewer and the interviewee and is best suited for the study.

Finally, an unstructured interview technique follows a more flexible approach and does not come with a predetermined set of questions; whereby the researcher designs and asks open-end

questions that relates to the research topic. Saunders et al (2016) argues that such a technique can easily disrupt the interview process, as both the interviewer and interviewee begin to have an easy flow of discussion that might just lead both parties off the research topic.

4.9.4 Limitations to the Interview process

The interview process was conducted during the Covid 19 pandemic, with the restrictions still in place, most of the interviews were conducted online using Zoom platform with both researcher and participants having to deal with technological delays/glitches at times during the interview process. Having the recordings done using multiple devices helped to mitigate this problem.

The interview process was time consuming as some of the participants had to be reached out to over and over again in order to grant the interview session. There was also a bit of setback, when a participants had agreed to grant the interview but during the session refused to give response from a company/industry point of view in which they are presently still employed. Some participants that are key stakeholders declined and refused to grant interview based on the lack of capacity and resources in their organisations to allocate personnel to answer the interview questions and they referred the researcher to their company reports. Using their company reports and public statements helped mitigate this issue.

4.10 Ethical Considerations of the Research

Ethics is described as the norms for the conduct that differentiates acceptable and unacceptable behaviour in the case of research (Resnik, 2015). Bryman (2016) also explains that the integrity of any given research is directly linked to the proper consideration of ethical issues involved or required in the research study. Thus, the importance of ethics in research cannot be overemphasized. Diener and Crandall (1978) categorised research ethics into four major principles that should be taken into consideration when conducting social research. These include: informed consent; no harm to participant; no deception and no invasion of privacy. Aside these principles, this study was carried out in line with the University guidelines (Robert Gordon University). The research ethics form (i.e. Research Ethics: Research Student and Supervisor Assessment (RESSA) is a self-assessment form that is aimed at promoting good ethical practices in the conduct of any academic research. This form was completed and signed at the beginning of the study by both the researcher and the principal supervisor and then submitted to the Research degree Office for review and assessment. In summary, this research adhered to the ethical principles regarding this study (Davies and Hughes, 2014).

4.11 Credibility

The issues with validity and credibility often constitute the source of a majority of criticism surrounding research involving qualitative methodologies and methods (Akinsete, 2012; Denzin and Lincoln, 1998). Validity as a term tends to be over specified within the quantitative research, thereby creating confusion when it is been used for qualitative studies (Wolcott, 1992). This study not only utilises the methodology in section 4.8.1, such as a selection of well-informed participants (key stakeholders) from the targeted group of sample size, description, and literature comparison to ensure validity of the data collected. Following the interview session, the interview transcripts were sent to the interviewees for effective validation process before the researcher carried out the coding process. Credibility of a study essentially hinges on the quality of the data. That is, how it is collected, handled and who handles it (Akinsete, 2012). Furthermore, the issue of credibility deals with three major concerns namely: the credibility of the researcher; the rigour of the data collection and analysis; and lastly the philosophical underpinnings of the study (Patton, 1999 in Akinsete, 2012).

Credibility of the researcher- There is no definitive set of criteria to address the credibility of the researcher, but factors such as the researcher being the primary driver of the investigation means that issues and concerns like interview experience, trainings and preparations have to been given due diligence (Patton, 1999). In this regard, the researcher is equipped with knowledge and familiar with research methods.

Rigour of the data collection and analysis- The selection of the research sample was informed by an extensive literature review on UOG development in the UK and the issues surrounding the subject area. This resulted to a purposeful sampling to select the targeted key stakeholders of UOG development in the UK in order to conduct a pilot study to understand the underlying issues in the debate. Following this, a review of the data collected and updated to suit a wider set of stakeholders for the semi-structured interview process. A data transcription process was carried out and a thematic coding process was done in order to generate themes from the data analysis process to validate the thematic analysis undertaken from the literature, policy documents and government reports from existing documentation and information on UOG development in the UK, which is discussed in Chapter 5 and 6.

4.12 Chapter Summary

The chapter has presented a detailed structured discussion of the research methodology and method. The study philosophical underpinnings as an inquiry study, adopted the interpretive paradigm that is inductive in nature (Creswell, 2009) in order to address the research question.

The researcher applied direct participant observation, documents, and semi-structured interviews for this study as recommended by Yin (2018). The selected methodology was presented and justified showing the qualitative methods approach to the research design and data collection techniques. The findings through a thematic analysis of the secondary data in relation to UOG development in the UK underpinned the primary data collection process of semi-structures interviews to answer the questions.

The next chapter presents the thematic analysis of the secondary data where themes were identified and informed the data collection process discussed in this chapter and coded, analysed and presented in chapter 6 of the study.

CHAPTER FIVE
THEMATIC ANALYSIS

5.0 Introduction

Thematic analysis is a method used in identifying, analysing and reporting patterns (themes) within data, thereby organising and describing the data set in a detailed form (Braun and Clarke, 2006). Boyatzis (1998) explains that it goes further than arranging the data into patterns but also interprets various aspects of the research topic. Thus, it is widely used but there is not a clear agreement on how to go about doing it (Tuckett, 2005; Attride-Stirling 2001; Boyatzis, 1998). Sometimes, thematic analysis can be seen as a poorly branded method as it does not appear to exist as a named analysis in comparison to other methods like grounded theory or narrative analysis. Braun and Clarke further argue that it is not usually claimed as a method of analysis, when, most analysis are essentially thematic but rather claimed as Discourse analysis or Content analysis (e.g., Meehan et al., 2000). Braun and Wilkinson suggested that there are occasions where data are subjected to qualitative analysis for commonly recurring themes. Thus, if we do not know how individuals go about analysing their data or the assumptions which informed the study, it is difficult to evaluate or compare the research with other studies on that subject (Attride-Stirling, 2001) Thus, for this reason, clarity on the process and methods used in this study is important.

Thematic analysis differs from other analytical methods in research as it seeks to describe patterns across qualitative data like Grounded theory, Discourse analysis, Interpretative phenomenological analysis (IPA) etc. Grounded theory and IPA both seek patterns within the data but are both theoretically bounded. Charmaz (2002) explains that grounded theory comes in different versions. Its goal is to create a plausible and useful theory of the phenomena that is already grounded in data (McLeod, 2001).

What counts as a theme?

A theme captures something about the data in relation to the research question and represents some level of patterned response or meaning within the data set (Braun and Clarke, 2006). One important question is to understand what is to be classified as a theme. In qualitative analysis, there is no fast answer to the research question of what proportion of the data set needs to be displayed evidence of the theme for it to be considered as a theme. A theme is not something that many data items give a significant consideration to, rather than a statement or sentence or two. Nor is it something that is given sufficient space within data sets and little in others, or for it to appear at very little instances within the data set, that is, a theme could either appear in a relatively small part of the data set or might appear in a considerable large part of the data set

(Braun and Clarke, 2006). Therefore, the researcher's judgment is very vital in determining what is a theme is. Hence, the uniqueness of the themes generated by the researcher is not quantifiable but dependent on whether it captures information related to the research question of the study.

5.1 Identification of themes

Thematic analysis allows the researcher flexibility in terms of capturing or determining the themes and prevalence in different kind of ways. What is most vital is how this is done when conducting the analysis. Wilkinson (2000) explained that there are several ways of presenting prevalence in thematic analysis that does not provide a quantifiable measure. Examples include: 'the majority of participants' (Meehan et al., 2000, p.372), 'many participants' (Taylor and Ussher, 2001, p.298), or 'a number of participants' (Braun et al., 2003, p.249). These examples of descriptors work basically to suggest that a theme does exist/existed within the data set to convince the reader that the researcher is reporting truthfully about the information contained within the data. Furthermore, thematic analysis can be used to provide a detailed account of a particular theme or groups of themes within the data. Themes in thematic analysis can be identified in two ways namely: inductive/bottom up approach (Frith and Gleeson, 2004) or in a theoretical way/top down approach (Boyatzis, 1998; Hayes, 1997).

5.1.1 Inductive Thematic analysis (bottom up approach)

The inductive approach shows that the themes have a strong link to the data (Patton 1990) in the sense that it bears some similarities to the Grounded theory. Thus, if data is collected for the research either through focus groups or interviews, the themes identified may not be linked or bare little or no similarities to the research questions that were asked to the various participants. Hence, the process is not driven by the researcher's theoretical interest in the research area or topic. Furthermore, an inductive thematic analysis involves coding the data without trying to fit it into the preexisting analytical presumptions/coding frame of the research, which makes it data driven (Braun and Clarke, 2006).

5.1.2 Theoretical thematic analysis (top down approach)

The theoretical thematic analysis tends to be driven by the researcher's analytical or theoretical interest in the research topic. This form of thematic analysis provides a detailed analysis of some of the parts of the data. That is, the researcher tends to code several specific questions that relate to the research topic. This research study would take the theoretical thematic analysis approach as the research questions relates to how the social, environmental and economically themes have played out in previous studies/literature in the area of unconventional oil and gas (UOG) in order

to expand or generate sub themes to help shape and develop the research interview questions for the data collection process of this study.

Boyatzis (1998) explained that in thematic analysis, themes could be identified at either one of the two levels namely semantic level or at the interpretive level

5.1.3 The semantic approach

The semantic approach involves identifying the themes within the surface meanings of the data, whereby the researcher is not looking for anything beyond what has been written or what a participant has said. Thus, the thematic analysis process will involve a progression from description, that is, the data is organised in a way that it shows the patterns in semantic content, then summarises the data to interpret it by trying to theorize the importance of the patterns and its implications and meanings (Patton, 1990), especially in relation to previous literature (Frith and Gleeson, 2004).

5.1.4 The interpretive approach

The thematic analysis at the interpretive level goes beyond the content of the data itself, as it identifies and examines the underlying assumptions, conceptualisation and ideologies which are theorised to inform the semantic information of the data. Hence, interpretive thematic analysis entails the development of themes through interpretive work, with the analysis produced not in descriptions but by what is already theorised. Burr (1995) suggests that such thematic latent analysis comes from a constructivist paradigm, which overlaps with some form of discourse analysis, commonly referred to a s thematic discourse analysis (Taylor and Ussher, 2001; Singer and Hunter, 1999). Such a case would mean broader meanings and assumptions are theorised as underpinning what is shown in the data.

Braun (2005a) described six phases of thematic analysis as seen in Table 5 below. The researcher carried out a theoretical thematic analysis following these six phases.

Table 5 Phases of thematic analysis

Phase	**Description of the process**
1.Familiarising yourself with your data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas
2.Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code
3.Searching for	Collating codes into potential themes, gathering all relevant codes to

themes	each potential theme
4.Reviewing themes	Checking if the themes work in relation to the coded extracts and the entire data set, generating a thematic 'map' of the analysis
5.Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme
6.Producing the report	The final opportunity for analysis, selection of vivid, compelling extract examples, final analysis of selected extracts, relating back the analysis to the research question and literature, producing a scholarly report of the analysis

Source: Braun, 2005a

In phase one, the researcher collected data by conducting semi-structured interviews. The data was transcribed in order identify themes by conducting thematic analysis on the transcribed data to generate a transcript in its truest form. At phase two, the researcher created codes using NVivo software in order to identify certain attributes, thereby organising the data into meaningful themes that are theory driven. The third phase involved sorting the different codes into the identified themes using mind map within the NVivo software. At the fourth phase, the researcher reviewed and refined the themes and the themes that do not have enough data to support the theory were disregarded. This is the stage when the researcher had a fairly good idea of what the different themes are and their suitability for the overall storyline relevant for the study. At phase five, the researcher had a refined satisfactory thematic map and the overall definition and name for each theme was produced. The last phase six produced a scholarly written report of the analysis carried out within the study.

The six phases explained above was utilised by the researcher in order to complete the thematic analysis process of this study. For the purpose of this study, which takes a theoretical thematic analysis approach, the initial themes were generated from the research topic and research question. The research topic entails investigating the feasibility socially, economically and environmentally extracting unconventional oil and gas in the United Kingdom and three research questions were developed followed this and can be seen below:

i. The storyline for UOG development appear to have shifted from a local level to the national level? How has this influenced the decision-making process surrounding UOG in the UK development?
ii. The UK National Planning Policy Framework (NPPF) entails achieving a set of objectives to ensure sustainable development while taking into account the local

circumstances. How has this affected support for UOG development and its implications for granting planning permits applications and decisions?

iii. Does UOG development have a role to play towards the implementation of the UK's transition to Net Zero Strategy and its implications for meeting the climate change target of 2050?

The fracking discourse in the UK resulted to lack of trust in the decision making process surrounding the subject on how the decision making power appeared to have been taken away from local planning authorities to the national government. Issues like lack of communication, overturning of planning permits decisions, lack of public engagement and dissemination on the risks and benefits associated with UOG development are a few of the concerns of the local residents. Social factors that also arose from the shift in planning decision making process from the local authority resulted to a profound effect on the local residents which led to anxiety, depression, stress and a feeling of marginalization. These residents especially in areas like Lancashire county continue to have a lack of confidence in the UOG companies, regulators, distrust of the council officers and even changed their perception of the police.

The UK's National Planning Policy Framework (NPPF) details that planning policies and decisions should enable growth and business in rural areas. The proposed fracking sites are located in countryside of England known for agriculture and tourism. The local circumstances of such areas should be taken into consideration when issuing permits, as UOG development appears to undermine the socio-cultural identity of these areas. Rural tourism, leisure developments, agriculture will all be affected by fracking related activities in such areas. Anti-fracking residents were concerned about the lack of sensitivity to their surroundings in the planning policy decision making process as their local context were not taking into consideration when permits were issued to the UOG companies. Therefore any planning decision for development in such rural areas should be sensitive to its surroundings and should not have impact on local roads, nor exploit opportunities to make their location and socio-cultural identity more sustainable.

Net zero cannot be achieved without taking into account oil and gas production as the oil and gas industry accounts for 42% of the global greenhouse gas emission (UK Gov 2021). Therefore, meeting such a target will require compromising the core business of such an industry. In order to meet the climate change target of 2050, the UK government is looking at focusing on energy security through higher dependency on renewable energy (IEA, 2021). Thus, diminishing the role of oil and gas in general. Fossil fuel lobbyists believe that this is

unrealistic and that phasing out oil and gas can destabilize energy supply. They rather suggested a gradual phase out as natural gas is seen to be the cleanest fossil fuel necessary to reach net zero. Others reiterated on the use of oil and gas for carbon capture usage and storage (CCUS), also in the production of materials used in the production of wind turbines.

Within the context of the research topic, three major themes was initially identified (*social, economical and environmental factors*). This can be seen in the map below in Figure 19

Figure 19 The three main themes of the study

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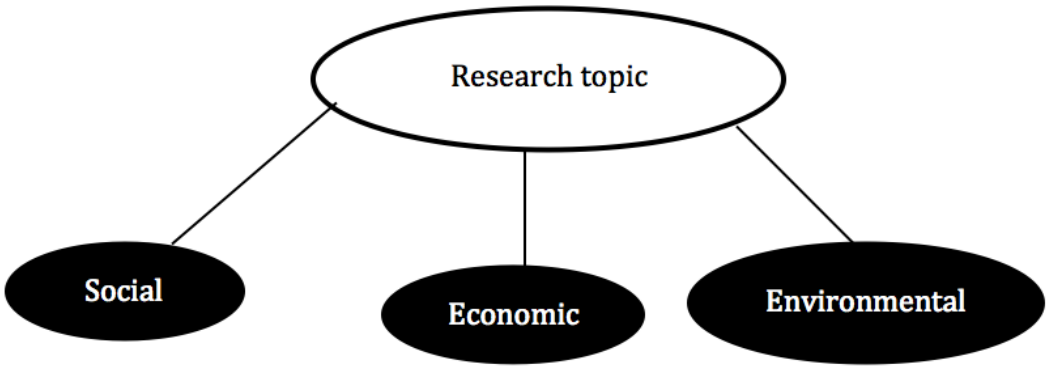


Source: Author generated

5.2 The environmental theme

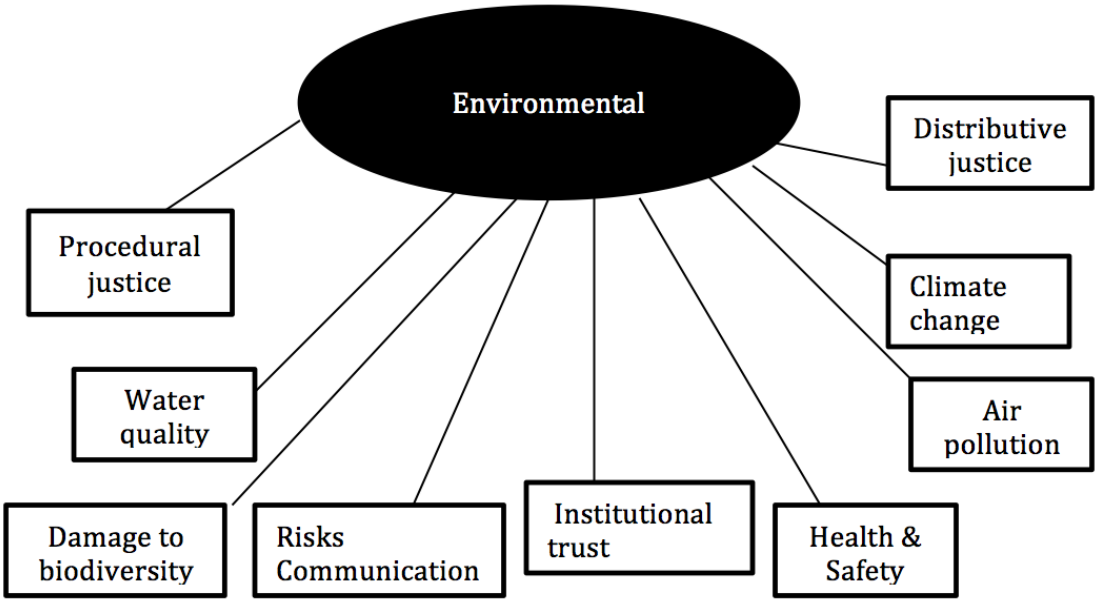
The UK government has its climate change target set at 80% reduction by 2050 (CCC, 2008). The UK government is also committed to increase the share of final eneergy consumption from renewable sources to 15% by 2020, as part of the wider European Union renewable energy directive (European Parliament, 2009). The threat of fugitive methane emissions (Howarth et al, 2011a), the potential toxity of fracking fluids (Chen et al, 2014; Colborn et al., 2011), water quality, have all exacerbated the scientific concerns over the negative climate impact, health, air quality, damage to biodiversity, etc on the subject of UOG development in the UK. The UK governmant tasked the Environment Agency (EA) with environemental permitting regulations. Thus, all exploring and commercial UOG developers must consult the EA for permits in order to protect water sources, approve hydraulic fracturing chemicals, treatment and disposal of mining waste and treatment of all naturally occurring radioactive materials (Environment Agency, 2014). Another debate surrounding UOG development is the issue of siesmic activity resulting from fracking. In 2011, the UK government issued a suspension of fracking activities at

Lancashire in the North of England. Following the BGS studies, the suspension was lifted allowing Cuadrilla and IGas to continue their exploration activities, both of which continue to trigger organised local protests by environmental NGOs, anti-fracking campaigners like Greenpeace, Frack off etc (Cotton et al., 2014).
Cotton et al (2014) also confirmed this in his analysis carried out on shale policy, that the participants in his study identified some sub themes when interviewed on the subject on the environmental implication of UOG development in the UK. These sub themes includes health & safety concerns, risks communication, institutional trust, damage to biodiversity, procedural justice, distributive justice, air pollution on shale policy in the UK (Anandarajah et al., 2012; Cotton, 2017; Williams et al., 2017).

Environmental anti-fracking groups such as Greenpeace, Frack off have been on the frontline in the protests against fracking in the North of England, who now have their numbers increased due to awareness and interests of the local communities on the environmental implications of UOG development. These anti fracking groups and people from nearby towns and villages stood shoulder to shoulder at various protests to frustrate the developers attempts to extract oil and gas beneath the British countryside. Concerns such as climate emergeny and the impacts of fracking on local communities drove people to stand in the way of the UOG developers. It was said that fracking will bring down energy bills by the UK government, but these groups disagreed by explaining to the local residents that with the way the energy market works, it means that any gas from fracking will definitely be sold to the highest bidder. Therefore, this will not help in bringing down or reduce energy bills in the United Kingdom as suggested by the government.

Those residing in close proximity to the fracking sites said they do not want drilling in their local area and various attempts by UOG developers were met with strong local protests and oppostions. There were even instances where some individuals were jailed for peaceful protesting against Cuadrilla trucks but were later released on appeal. Such individduals were believed to have been the first environmental protesters to receive prison sentence since 1990s. In places like Scotland, fracking was banned in 2015 and 2018, while Wales refused to support any applications for drilling licenses. England eventually placed a moratorium on fracking in 2019 following the lack of scientific evidence that fracking operations could be carried out without inducing tremors and other environmental risks. This resulted to a grassroot victory for environemental anti-fracking groups and the local communities.

Figure 20 Environmental theme and sub themes



Source: Author generated

5.3 The social theme

Fracking operations continues to generate controversies worldwide and has given rise to diverse grass root protest both locally and internationally. Thus resulting to a great concern for the policy makers in securing public support for UOG development in the UK. (Cameron, 2013; Obama, 2014). In 2013, the Office of Unconventional Oil and Gas (OUOG) was set up to oversee the development of unconventional energy resources in the UK. One of its major objective was to support engagement., that is, to help the people understand the facts about UOG development and what it could mean if it is implemented in the communities of the people (DECC, 2013b). This resulted in the environmental risk assessment proposed, which would provide a detailed picture of the risks and impacts in order to provide sufficient information for effective engagement with the local communities (DECC, 2012). In this regard, public engagement would imply providing the publc with the scientific risks and benefits of fracking. Cameron (2013) suggested that the neighbourhoods can see the benefits of fracking and could not understand why fracking was not getting enough support.

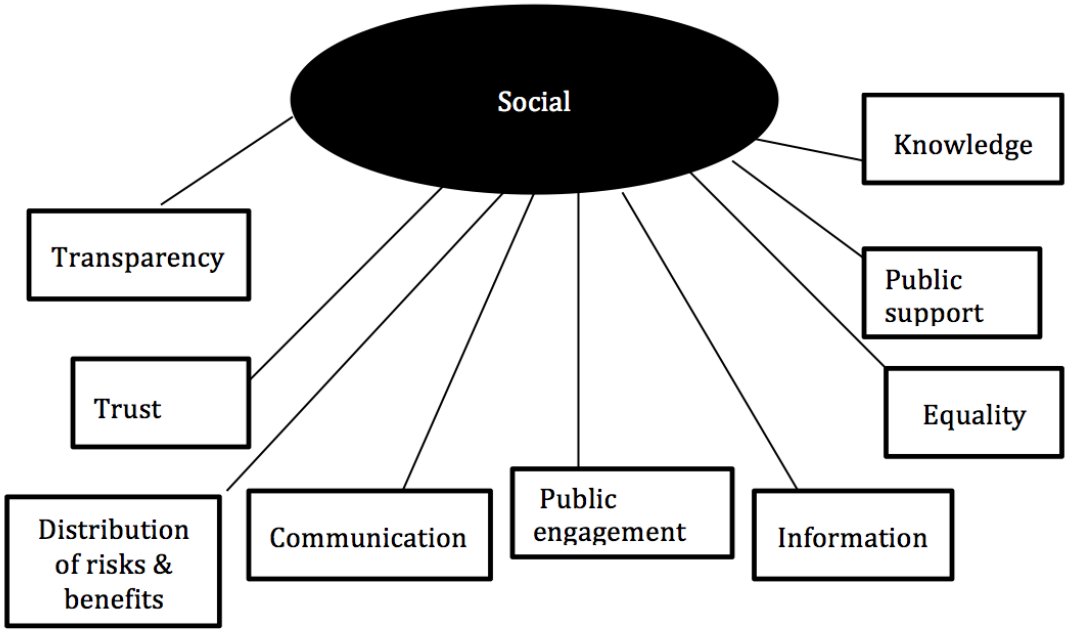
The Royal Scoiety and Royal Academy of Engineering (2012) study was at the request of the UK government to report on the health, safety and environmental risks associated with UOG development. The report detailed that hydraulic fracturing can be used to extract shale gas and

can be managed effcetively as long as operational best practices were implemented and enforced through regulations. Thus, bringing about the policy narrative, in which the sole barrier to achieving public support is seen as the failure of the public to recognise the benefits of UOG and trusting the UK governement commitments to been able to manage and mitigate any frcaking related risks (Hajer, 1996; Cameron, 2013).

Williams et al (2017) established that it is only by the public understanding the science of fracking risks and benefits and how it is been communicated to the public can UOG gather sufficient support in the UK. Furthermeore, it is assumed that the public's unease about fracking is caused by lack of sufficient knowledge and understnading of the technology and that the best way to overcome this is through the provision of accurate communication of the detailed information of fracking to generate public support. A good policy on the subject of fracking, would suggest that the government should be willing and able to recognise, encounter and accommodate diverse public views on fracking. This is as a result of the public complaining about lack of inclusiveness and lack public engagement in the decision making process concerning them. To promote UOG development, the UK government developed proposals that would provide the local authorities with monetary incentives such as a 100% business rates for extraction activities that can might impact negatively on the the local communities and its population (Cotton, 2014).

The Conservative government also launched a consultation document on the Shale Wealth Fund, which would provide funding for the affected communities beyond funding provided by the Onshore industry (HM Treasury, 2016; UKOOG, 2016). Thus local communities would receive from the revenue generated from UOG development (£100,000 per well site) during the exploratory phase. Furthermore, if the site produces commercially, 1% of its total revenue will be made available to provide compensation/benfits for the host communities (HM, Treasury, 2016). To this end, those communities not located close to where the fracking activities would not benefit from such benefits, hence would suffer transport related issues like congestion, traffic (Ricardo Energy & Environment, 2016), noise pollution (HPS, 2016) as heavy duty equipments would have to be transported through such routes. This brings about the inequality in the distribution of the risk and benefits of fracking (Whitton et al., 2017; Cotton, 2017). Other concerns idnetified as sub themes includes, transparency, lack of communictaion, awareness, lack of the trustworthiness of the institutional actors (UK government, its agencies, oil and gas developers) (Boudet et al., 2014; Cairney et al., 2015; Whitton et al., 2017; Stedman et al., 2016) are the sub themes the have been identified as concerns of the public on UOG development. These identified sub themes can be seen in the map below.

Figure 21 Social theme and sub themes



Source: Author generated

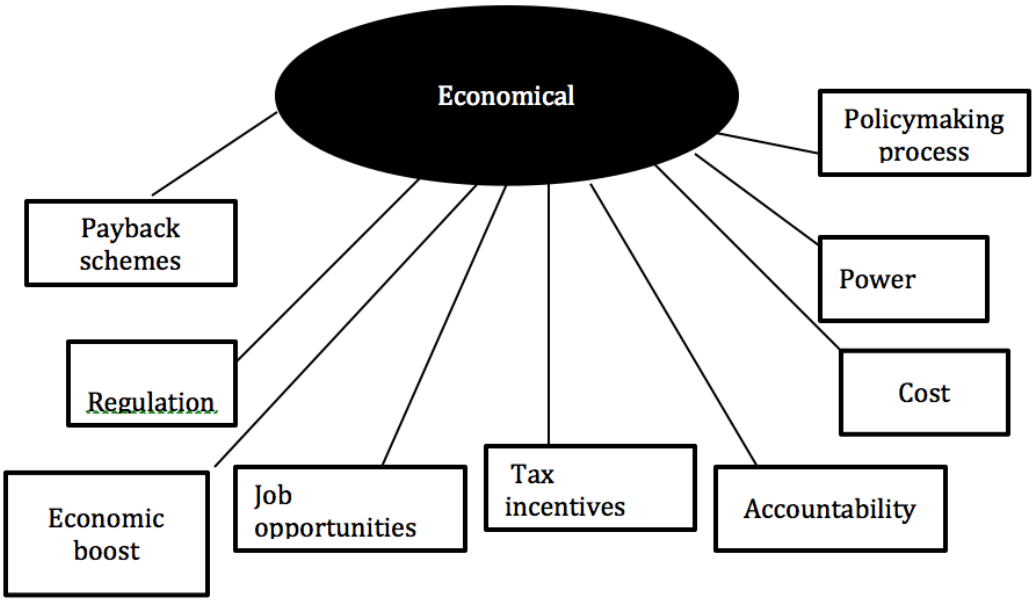
5.4 The economical theme

A number of sites was identified in UK which had the geological characteristics that indicate the presence of shale gas. These includes the Midland Valley of Scotland which lies between the Highland Boundary Fault and the Southland Upland Fault and the Bowland shale area and Hodder and Weald basins in England (BGS, 2014). Scotland contracted an Independent Expert Scientific Panel on UOG development. An extensive consultation was undertaken and a report was drawn up to shown that there could be potential for economic impacts in terms of job opportunities, gross value added, taxes paid all from developing and investing in UOG (Independent Expert Scientific Panel, 2014; Cameron 2013). Also reported was the impacts of UOG such as siesmic activity, climate impacts, public health, water contamination and social impacts that would need to be taken into consideration which recommends consulting the local communities about the implications of UOG development. The above listed impacts, relays the sub themes identified within fracking related literature from the stakeholders. KPMG (2016) report showed the findings of the economic assessment detailing the UOG development under various scenarios, the impacts of UOG in Scotland on key sectors and groups (Institute of Directors, 2013; EY, 2014) that would be affected by it. Lastly it detailed the potential for community benefit schemes or payments, supply chain, skills training and development (KPMG,

2016). Despite its potential economic benefits, public support remained low due to fear of seismic tremors, health and safety, cost to tax payers, transfer of powers to the national government from the local councils etc (Bomberg, 2017; Clarke et al., 2015; Andersson-Hudson; 2016; De Silva et al., 2016).

Other factors that were taken into consideration when discussing the economic impacts of UOG development includes house prices inflation (OECD, 2016), road transportation (Ricardo Energy and Environment, 2016), regulatory cost (DECC, 2015), health related costs (Independent Expert Scientific Panel, 2014; HPS, 2016). After the conclusion of the public consultation 'Talking Fracking' that received over 60,000 responses; SEA Environmnetal Report; 2019 consultation, the Scottish government decided not to invest in fracking, thus instituting a moratorium for UOG development in Scotland (Scottish Government, 2016; 2017; 2018; 2019) and this was fulled by pro-independence activitists and campaigns in the Scottish National Party (SNP), although the then Energy Minister Fergus Ewing showed some reservations. This confirmed the moratorium which later led to a court challenge with oil and gas company Ineos. Following this incident, the Scottish government won but the court ruling meant the moratorium did not automatically amount to a formal ban on fracking (Scottish Government, 2017). On the the February 2018, a finalised policy of no support for decided upon which would be reflected in the Nation Planning Framework under the Sctland Act 2019 (Scottish Governmant, 2019).
In the UK, the power of the incumbent government plays a vital role in the energy sector and has the power to constrain or fast track the development of UOG and renewable energy (Andrews-Speed, 2015). Thus the nature and role of institutional policy or government policy will be highly dependent on the prevailing political party in government. Investing and developing UOG as a homegrown source of energy supply, could add to the diversity of our energy sources and help support our energy security economically (Cameron, 2013). The UK government announced £1.6 million shale support fund in a written ministerial statement and the creation of a shale brokerage service through the Ministry of Housing, Communities and Local Government (MHCLG) (UK Government, 2017). Despite the propaganda of the payback packages to the local communities, uncertainties and protests on the subject of fracking lingers due to concerns relating to the affordability of the energy, industry behaviour (as the public viewed the UK government as been driven by greed and profit) (Williams et al., 2017; Boudet et al., 2014; Partridge et al., 2017).

Figure 22 Economical theme and sub themes



Source: Author generated

In summary, the storyline around UOG has split stakeholders into two main groups which includes those that support hydraulic fracturing and those that are against the method for UOG development in the UK. The group that support fracking are mostly the UK government, some political parties, oil and gas companies, and some individuals with vested interests. Those against the method are Non Governmental Organisations(NGOs), Environmentalists, some poilitical parties and members of the local communities where the proposed fracking sites are located.

One of the primary factors for the UK Governments support for fracking is the discursive construction of unconventional oil and gas as a "clean" (lower carbon than coal), "transition" or "bridge" fuel (Cotton et al., 2014). The UK government pro-shale measures include policies that would include community payback schemes, tax incentives, tightened regulations for the United Kingdom Onshore oil and gas industry (UKOOG) (HM Treasury, 2013a). Despite the advantages and benefits proposed by the UK government, there have been site-specific public oppositions, widespread criticism from the anti-fracking NGOs, groups and some political parties, which has led to a further decline in the support for UOG development in the UK (O'Hara et al., 2014). The incident of seismic tremor occurring as a result of fracking related activities is one of the major concerns by the local communities. The latest of such incident was the tremor that occurred at the site near Blackpool in Lancashire as a result of exploratory

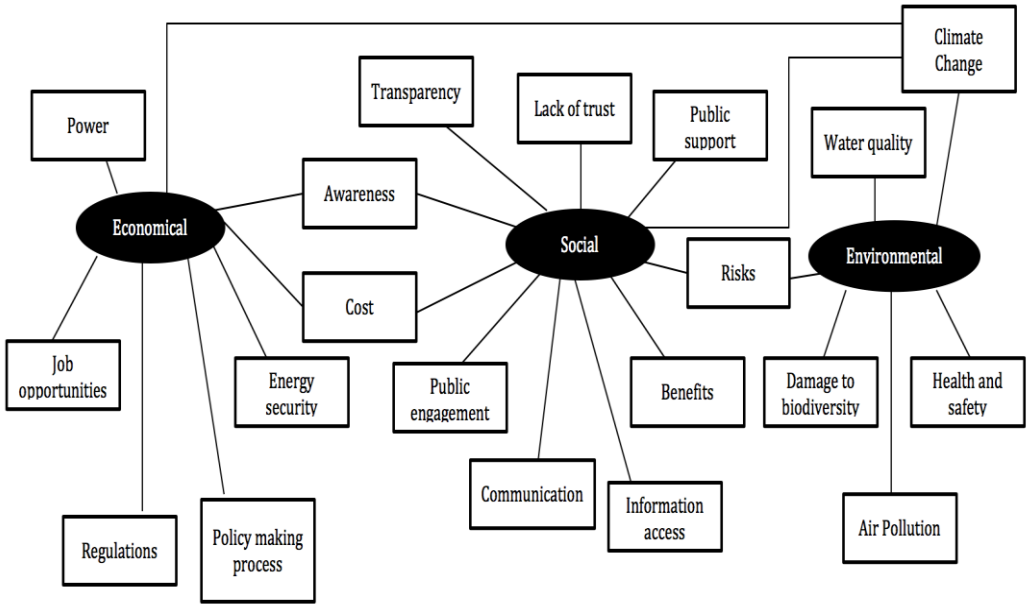
activities by a fracking firm Cuadrilla. A Conservative MP for North East Derbyshire said; that the Onshore Industry had signed up to the seismic regulations years ago and informed the government that they would operate within the limits, but such incidents shows and proves that fracking is not going to work in the UK and the fracking firms should give up on UOG development in the UK (UK Government, 2019; Guardian, 2019).

The Oil and Gas Authority (OGA) is the government body that regulates all oil and gas activities in the UK. Thus, as UOG development is still in the exploratory phase, all the prospective developers would have to follow all the regulations, verifications processes and guidelines set by OGA and its associated bodies in the oil and gas industry. There have been uncertainties about the social, environmental and economical, including health, impacts of UOG development in the host communities where the sites are located. These resulted in the identification of sub themes that includes members speaking and protesting about *air pollution, water quality, waste water management, noise pollution, traffic, cost implication, climate change, lack of public engagement in then decision making process, lack of access to information on fracking, lack of trust in the government, environmental injustice,* health and safety, risks, threat to biodiversity, *fear of seismic activity, lack of communications, power shift from local councils to national government* etc. (Cotton et al., 2017; Williams et al., 2017; Bomberg, 2017; Whitton et al., 2017).

Furthermore, it is only by re-localising the scale of fracking governance can political equity be ensured, procedural and distributive environment injustice be restructured (Cotton et al., 2017). Thus, the development of UOG affects both the pro-frackers and the anti-frackers stakeholder groups, especially when it has to do with environmental justice. Which is why the uneven distribution of the risks and social benefits on the subject on fracking must be balance against the economic benefits it brings to all the stakeholders involved. The UK governments National Planning Policy Framework (NPPF) details achieving sustainable development detailing economic, social and environmental objectives which is supposed to include local circumstances when making planning decisions (UK Government, 2020) but there are narratives suggesting the local circumstances have been bypassed or ignored in some cases where appeals have been granted by the central government (which consist of majority of the Conservative government) thereby overturning decisions made by the local authorities. These have resulted to anti-fracking communities and groups been on the media because of protests at the various fracking sites due to opposing UOG development. Others spoke about lack of public engagement in the decision-making process surrounding UOG development. Petts (2008) suggested that the issue is not about building trust amongst the few groups of selected representatives from each of the stakeholder groups to foster a growth relationship or understanding between the government and the public but are the selected groups views to be trusted as the views of the wider population in general?

The argument for or against fracking is still on going as the moratorium is still in place as at the time of this study, with all decisions about UOG still pending as a ban is not presently in place. This brings into consideration the theoretical thematic approach utilised in identifying themes from the literature in order to identify the social, economical and environmental implications of UOG in the UK from the research question and the sub-themes that have also been identified for analysis in order to develop the research interview questions for the data collection process in this study. This can be seen in the Figure 23 below taking in account the identification of three main themes and sub themes from UOG literatures in the literature review chapter of this study and also deatiled in the thematic analysis narrative in this chapter as indicated above. Figure 23 below shows the mapping of the main themes and the sub themes that was identified in the literature above.

Figure 23 Thematic analysis mapping of the main themes and sub themes



Source: Author generated.

Key

Main themes

Sub themes

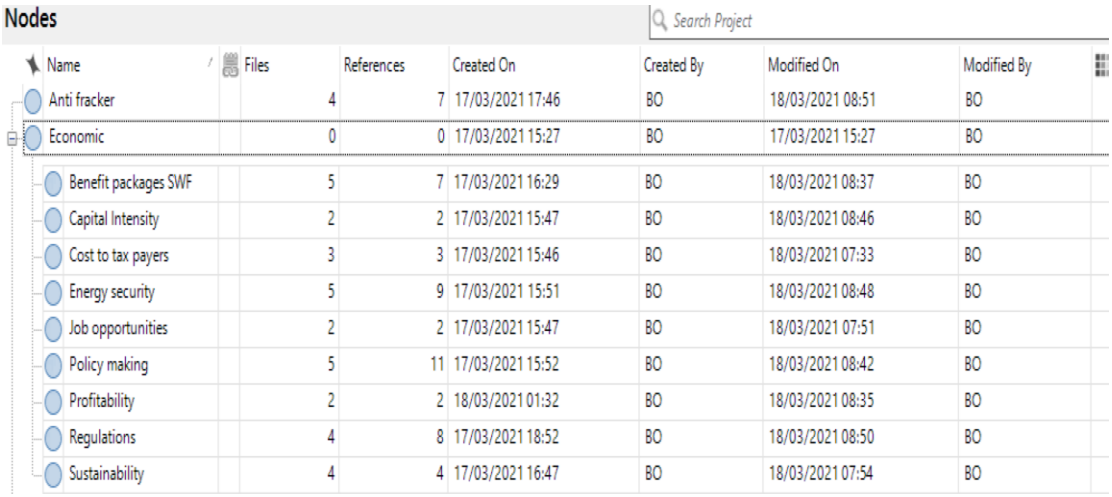
In order to properly identify the themes within the fracking discourse, the researcher used theoretical thematic analysis to identify the social, environmental and environmental themes. This was achieved by reviewing UK government reports, Scottish government reports, licensing and local authority publications, industry guidance publications, political party manifestos, academic papers and anti-fracking petitions. This was done primarily to inform the design of the research interview questionnaire. A breakdown of the number of documents analysed can be seen in Table 6 below.

Table 6 Breakdown of the Number of documents and document types analysed

Documents types	**No of documents (Total=96)**
United Kingdom Government Reports	20
Scottish Government Reports	9
Licensing, Local authority publications	4
Industry Guidance publications	7
Political Parties (House of Commons) manifesto	11
Academic papers	42
Anti fracking petitions	3

Figures 24, 25 and 26 below shows how the themes and sub themes are represented in nodes and how many times they appear as themes within the literature in the table below using the NVivo software.

Figure 24 Economic theme and sub themes



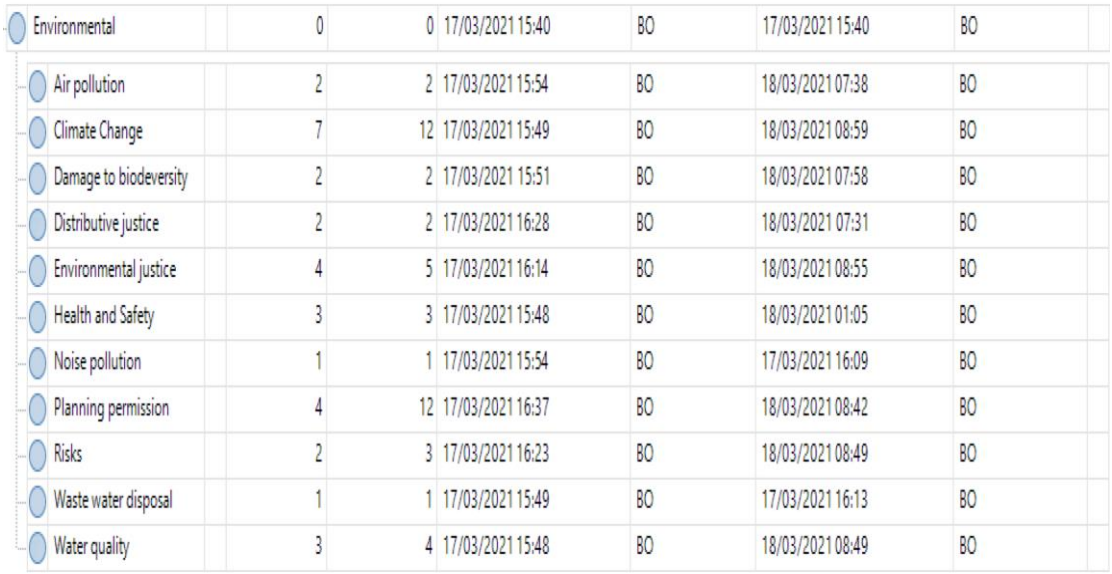
Nodes

Search Project

Name	Files	References	Created On	Created By	Modified On	Modified By
Anti fracker	4	7	17/03/2021 17:46	BO	18/03/2021 08:51	BO
Economic	0	0	17/03/2021 15:27	BO	17/03/2021 15:27	BO
Benefit packages SWF	5	7	17/03/2021 16:29	BO	18/03/2021 08:37	BO
Capital Intensity	2	2	17/03/2021 15:47	BO	18/03/2021 08:46	BO
Cost to tax payers	3	3	17/03/2021 15:46	BO	18/03/2021 07:33	BO
Energy security	5	9	17/03/2021 15:51	BO	18/03/2021 08:48	BO
Job opportunities	2	2	17/03/2021 15:47	BO	18/03/2021 07:51	BO
Policy making	5	11	17/03/2021 15:52	BO	18/03/2021 08:42	BO
Profitability	2	2	18/03/2021 01:32	BO	18/03/2021 08:35	BO
Regulations	4	8	17/03/2021 18:52	BO	18/03/2021 08:50	BO
Sustainability	4	4	17/03/2021 16:47	BO	18/03/2021 07:54	BO

Source: Author generated

Figure 25 Environmental theme and sub themes



Environmental	0	0	17/03/2021 15:40	BO	17/03/2021 15:40	BO
Air pollution	2	2	17/03/2021 15:54	BO	18/03/2021 07:38	BO
Climate Change	7	12	17/03/2021 15:49	BO	18/03/2021 08:59	BO
Damage to biodeversity	2	2	17/03/2021 15:51	BO	18/03/2021 07:58	BO
Distributive justice	2	2	17/03/2021 16:28	BO	18/03/2021 07:31	BO
Environmental justice	4	5	17/03/2021 16:14	BO	18/03/2021 08:55	BO
Health and Safety	3	3	17/03/2021 15:48	BO	18/03/2021 01:05	BO
Noise pollution	1	1	17/03/2021 15:54	BO	17/03/2021 16:09	BO
Planning permission	4	12	17/03/2021 16:37	BO	18/03/2021 08:42	BO
Risks	2	3	17/03/2021 16:23	BO	18/03/2021 08:49	BO
Waste water disposal	1	1	17/03/2021 15:49	BO	17/03/2021 16:13	BO
Water quality	3	4	17/03/2021 15:48	BO	18/03/2021 08:49	BO

Source: Author generated

Figure 26 Social theme and sub themes

Pro frackers	5	11	17/03/2021 17:46	BO	18/03/2021 08:57	BO
Social	0	0	17/03/2021 15:27	BO	17/03/2021 15:27	BO
Access to information	5	9	17/03/2021 15:52	BO	18/03/2021 08:53	BO
Accountability	4	4	17/03/2021 16:22	BO	18/03/2021 07:34	BO
Change	1	1	17/03/2021 15:50	BO	17/03/2021 17:29	BO
Community opposition	1	4	17/03/2021 15:50	BO	17/03/2021 17:57	BO
Equality	1	2	17/03/2021 16:25	BO	17/03/2021 16:42	BO
Governance	2	7	18/03/2021 07:46	BO	18/03/2021 08:39	BO
Informed consent	1	1	17/03/2021 15:49	BO	18/03/2021 07:20	BO
Procedural justice	2	3	18/03/2021 07:32	BO	18/03/2021 08:18	BO
Public engagement	6	8	17/03/2021 15:50	BO	18/03/2021 08:41	BO
Public support	4	7	17/03/2021 17:22	BO	18/03/2021 08:19	BO
Transparency	2	2	17/03/2021 15:52	BO	18/03/2021 08:05	BO
Trust	4	5	17/03/2021 15:50	BO	18/03/2021 08:58	BO
Use of the technology	3	4	17/03/2021 15:53	BO	18/03/2021 08:58	BO
UK Government	7	16	17/03/2021 17:47	BO	18/03/2021 09:01	BO

Source: Author generated

5.5 Chapter Summary

The chapter defined thematic analysis, how themes are identified and the four types of thematic anlysis. These are inductive thematic analysis, theoretical thematic analysis, semantic thematic analysis and interpretive thematic analysis. The research study adopts a theoretical thematic analysis to identify the three themes from 96 documents secondary data reviewed to inform the design of the primary data research interview questionnaire.

The next chapter is the data is the data presentations and findings. The chapter codes and analyses the primary data collected using theoretial thematic anaylysis and NVivo software to present its findings

CHAPTER SIX
DATA PRESENTATION AND FINDINGS

6.1 Introduction

This Chapter analyses and presents the data collected using semi-structured interviews. The interviews were conducted to provide the views and experiences of the targeted research participants concerning unconventional oil and gas development (UOG) in the United Kingdom (UK).

Therefore, this Chapter focuses on the four key aspects that emerged from the data analysis in relation to the research study's aim and objectives. These include research participants' views regarding the contextual motive for unconventional oil and gas development in the UK, research participants' opinions on the mechanisms hindering unconventional oil and gas development in the UK, research participants' reflection on the decision making process in the UK, their overall assessment on the prospective transition towards renewable energy net zero carbon emission in the UK.

The data within this chapter has been presented in such a way that the views and experiences of research participants are fully integrated in the overall analysis process of this study. A tabulated quotation are used to provide the detailed accounts of the research participants' views and experiences while also illustrating the similar views and diverse views of the research participants with regards to UOG development in the UK. The interviews conducted served three purposes:

1. Understanding the discussions concerning unconventional oil and gas in the UK;
2. Understanding why the support for UOG development in UK was so low;
3. Assessing the critical factors to be considered towards facilitating public engagement in decision-making process in the UK.

The next sections from 6.2 to 6.5 present the findings from the semi structures interviews conducted.

6.2 Motives for facilitating unconventional oil and gas development in the United Kingdom

This section explores the motives promoting the need for unconventional oil and gas development in the UK. The participants identified the socio-economic driver towards UOG development in the UK and this includes three main categories: energy security, job creation, and economic boost.

The Table 3 below is from Chapter 4 (demographic profile of the participants) and is reintroduced here for easy navigation when discussing the data findings.

S/N	Participant Pseudonym	Gender	Form of Interview	Profession	Years in profession
1	FRAC001	Male	Zoom	Civil servant	15
2	FRAC002	Male	Zoom	NGO	10
3	FRAC003	Male	Zoom	NGO	9
4	FRAC004	Male	Zoom	MP	8
5	FRAC005	Male	Zoom	Oil and gas regulator	25
6	FRAC006	Female	Zoom	Civil Servant	8
7	FRAC007	Male	Zoom	MSP	22
8	FRAC008	Male	Zoom	MP	15
9	FRAC009	Male	Zoom	Oil and gas regulator	12
10	FRAC010	Female	Zoom	MSP	5
11	FRAC011	Male	Zoom	Senior member anti-fracking protest group	12
12	FRAC012	Female	Zoom	Journalist (Editor in Chief)	20
13	FRAC013	Female	Zoom	Civil servant	16
14	FRAC014	Male	Zoom	Chemical Engineer	15
15	FRAC015	Female	Zoom	Geoscientist	14
16	FRAC016	Male	Zoom	Geoscientist	10
17	FRAC017	Male	Zoom	Oil and gas	12
18	FRAC018	Male	Zoom	Oil and gas	15
19	FRAC019	Female	Zoom	Civil servant	19
20	FRAC020	Female	Zoom	Senior member anti-fracking protest group	12

6.2.1 Energy security

This section presents how energy security was perceived by the research participants as one of the necessary reasons for UOG development in the United Kingdom

Table 7 Energy security as a motive for unconventional oil and gas in the UK

Research participants	**Themes based on Researcher's interpretation**	**Quotations**
FRAC020	Energy independence	*"Unconventional oil and gas exploitation would help reduce the reliance of high volume of fracked gas we have been importing from other countries and enable the UK to become a net exporter by supporting the offshore industry"*
FRAC018	Current supply of oil and gas from conventional means is insufficient	*"The oil is in depleting state and there is the desire to remain relevant in the industry and of course, provide sufficiency. We have been looking at how the oil at the shallow end of the earth is being exploited using the hydraulic method to provide energy sufficiency".*
FRAC017	Organisational strategy	*"We live in a dynamic business environment where the impact of change is so huge and all organisations try to respond to this impact in order to become very profitable. Every organisation deserves to grow and fracking is a strategy of creating an alternative source of energy as compared to the fossil fuel extraction offshore that has a large span that happened that may be, right about 40... 49 years".*
FRAC016	To increase oil and gas productivity	*"I think as the industry saying goes, at some point you have to squeeze the bag once you have finish getting what you can get there will be need to delve deeper into more*

		sophisticated technology to increase productivity. I think that's where hydraulic fracturing falls into this category. So in that sense, it's just increasing output from the reservoir and I think a plus for technology".
FRAC014	Revenue for the host community and the government	*"So I know it would create quite a lot of a lot of revenue for even here in the UK also revenue for the community that is having that's that the fracking is taking place in that particular community. There is development in terms of that".*
FRAC013	To provide raw materials for other industries	*"Why are we creating a fuss? If we are going to be upset about fracking, and let's be upset about so many other things, right, as long as we, because we need this oil, we need the we need the raw materials, we need the reserves, we need the crude oil".* *"Why can't we do it because it benefits the country economically, we're better off for it, and nobody's died".*
FRAC008	Energy security	*"I think that we should be looking at every available avenue so as to increase our energy security, and our independence from our reliance on countries like Russia, and the Middle East, producing our oil supply".* *"…economically, of course, it provides jobs. And anything that provides jobs creates jobs is in my view, a good thing, because at the end of the day, you provide jobs, it gets more money in people's pockets, it provides security and a sense of dignity for that individual and that family, and it has a knock on effect of increasing, increasing the prosperity of the community in which that investment is taking place".*

FRAC007	Cost advantage and rural development	*"...the major advantage from fracking onshore is that of security of supply".* *"There are also other advantages from factors one is cost advantage because potentially it is cheaper than other sources of energy. And also there will be a potential economic benefit from fracked gas because you create a new industry of onshore, some of it might exist in our historically deprived communities. And you could ever create jobs plus the opportunity for community benefit schemes from fracking".*
FRAC006	Net exporter and domestic use	*"So using it first of all, for domestic use, but then eventually if they continue to produce like US to become a net exporter. So when we think about job creation, when we think about energy security, when you think about a revenue source, and UK become a net exporter, we see just the great benefits that are there".*
FRAC001	Income generation for the local community	*"...so there'll be more jobs created for the community where it's going to be done. So there'll be more money, more people employed".*

Source: Author generated.

From the table above, the research participants categorised the motive for unconventional oil and gas development in the United Kingdom as either: to meet the energy supply, revenue generation, urbanisation, provide raw materials for other industries.

In summary, it can be seen that whatever the purpose for unconventional oil and gas development in the United Kingdom was, it was intended to address and support the depletion oil and gas production in the UK's offshore industry and to either reduce or reliance on the importation of oil and gas from other countries at a higher costs. A further insight on this theme is briefly discussed herein: Two of the research participants asserted:

"I'm very much in favour, but I think we have to follow the signs, we have to follow the advice from those experts that are already in the field. I think that we should be looking at every available avenue so as to increase our energy security, and our independence from our reliance on countries like Russia, and the Middle East, producing our oil supply". (FRAC008)

"I believe that in terms of economical as I mentioned, there beliefs to squeeze the barrel, you know, where you deal with what you can easily recover, there might be need to push further. And that's where unconventional oil and gas exploration comes in. So, things of the economics I believe that it's more profitable for the companies to be able to pay more than its actually obtainable using ordinary, and existing techniques. So in that sense, it is more economical, there's more profit coming in". (FRAC016)

However, one of the research participants took a slightly different perspective on the cost implication associated with unconventional oil and gas development in the UK. The participant explained:

"if you look at the US, we understand that some of these operations, which takes considerable engineering expertise, considerable funding to get started, when the price of oil and gas decreases, or we have a situation that is not able to be written into the mathematics of whether our project is economically feasible or not. And the price of oil such as a pandemic, which we are undergoing, and the price of oil and gas decreases because people are moving less with less movement, they need less fuel, less fuel is the less need for oil and gas, we see that it can create distabilising effects monetarily, and when these operations, for these operations to flourish, the price of oil and gas has to be at a certain limit. Once it comes below that limit, these projects are no longer economically feasible; it means that we need to shut in these wells. These wells are not long producers as conventional oil gas reservoirs that would last for up to 30 years on production. These actually last one to two years, sometimes in best-case scenarios; they can last for 5 -10 years. So they're not long producers. So once we shut in that well, also, we begin to also change the geomechanical sub structure, which

will then mean, if the prices go back up, I need to actually go and redo this hydraulic fracturing operation". (FRAC006)

Some of the decision and policy making community (consisting of some the research participants) surrounding the development of unconventional oil and gas in the United Kingdom also had strong reasons to believe that the one of the key motive towards UOG extraction in these local communities would bring about development by means of urbanisation and industralisation in these rural areas. As a member of parliament put it:

"…and also there will be a potential economic benefit from fracked gas because you create a new industry of onshore, some of it might exist in our historically deprived communities". (FRAC007)

The interviewees, particularly the policymakers appear to be clear in their perception that the motive for unconventional oil and gas development in the United Kingdom would have potentially strengthened the UK's energy supply and provide energy security in the country. Emphasis was made about onshore oil and gas supporting the offshore industry, providing raw materials for other industries and renewable energy

6.2.2 Job creation

The research participants views that another essential motive for unconventional oil and gas development in the United Kingdom is the job creation theme. The Table 8 below includes the research participant's views resulting from analysis of the interview data.

Table 8 Job creation as a motive for UOG development in the UK

Research participants	**Themes based on Researcher's interpretation**	**Quotations**
FRA001	Job creation	*"Fracking is going to produce more jobs, obviously. So there'll be more jobs created for the community where it's going to be done. So there'll be more money, more people employed".*
FRAC006	Social economic development	*"So yes, the benefit is huge, but also in what situations could it help drive the economic moving? So if it was the come about? When you think about the social part, yes, job creation is always good. When people have jobs, they feel empowered, the quality of life improves".*
FRAC008	Social economic development	*"…economically, of course, it provides jobs. And anything that provides jobs creates jobs is in my view, a good thing, because at the end of the day, you provide jobs, it gets more money in people's pockets, it provides security and a sense of dignity for that individual and that family, and it has a knock on effect of increasing, increasing the prosperity of the community in which that investment is taking place".*

FRAC013	Job creation	*"Yes, I do think that it provides opportunities to hmm maybe not communities, but definitely to, to people, you know, from companies, people get jobs from it, people to get paid from it. So like I said, I feel like it has this benefit".*
FRAC014	Job creation	*"...it's quite a positive in terms of, because it brings, it creates more jobs where ever the project is taking place it helps the economy".*
FRAC015	Job creation and added value	*"Economically, the implication is it has to be positive. It can be an additional, add additional value to the conventional oil and gas the existing one. Because, I mean, yeah, it can. Employment wise, it can create employment".*
FRAC017	Job creation	*"...the social implication because if it is well implemented there is tendency for growth in the oil and gas industry, there is tendency for employment creation".*
FRAC0018	Job creation and improved standard of living	*"Economically, we expect to create huge pull of jobs to the United Kingdom and because we are employing and there is a tendency that the components would also be enhanced. And because we are employing, we hope that it would have in general, improve the livelihood those communities where these activities take place".*

Source: Author generated.

From the table above, from the researchers observation and interpretation, the research participants categorised job creation as one of the motive for unconventional oil and gas development in the United Kingdom. Contrarily to the above opinions, some other research participants do not believe that UOG development would create an avenue for the more employment in the local communities as cited by these participants.

"They want to frack in, in Lancashire. Well, the classic one was the first hole that they drilled at Princehall (appraisal). It took five guys two weeks. laughs . It does not it does not supply job. It has been shown that for every single for every one job that fracking creates, onshore in America, well, certainly in America, in Australia. It costs nine jobs in agriculture and tourism. So it just doesn't stack up. Like I said it does not; for every one job that fracking generates, it costs nine jobs in the local community. So they, they had the labour intensive part, bear in mind of the fracking process at Preston new road, the actual drilling of the well, the fracking of it, I mean, once it goes to production, that's far less labour intensive because you're working with the gas come up out of the ground, actually drilling to reach that gas and all the construct the pads and etc, etc, etc is the labour intensive parts of it. They created 64 jobs only". (FRAC002)

"So economically, they claimed it was going to create 1000s of jobs that were just a lie, a total and utter lie, once a fracking site is up and running. Maybe half a dozen people are there to monitor it; most of them are security guards. But Blackpool is a very depressed area with lot of social problems. So it's a very, very attractive story to say we're going to bring lots of jobs to the area but I'm frequently a total lie and not borne out by the facts of environmental evil". (FRAC003)

While some research participants spoke about how UOG development in the United Kingdom undermines social justice and how the UK government needs to be looking at investing in technologies and industries that are sustainable. This participant asserted this below:

"In terms of social impacts, I think, again, I would I would say that investment in oil and gas is actually a huge distraction from the creation of, of long term sustainable jobs that we need to see. We need and you know, we know that communities, thinking about the central belt in Scotland, the old mining communities when the mines were closed, there was no plan there was no plan to replace those jobs. 1000s of people who lost their jobs when all the pits closed? And I think what we what we need to make sure with oil and gas is that we don't repeat the same mistakes that we have bring very clearly in place, a plan that has the investment into job creation in it for the post of oil and gas future. So I think, you know, at the moment, spending money on make on extracting more oil and gas is actually bad for, for, for social justice, it's bad for Social equity, because it's means, it means that we are not spending that money on creating jobs in the in sectors in industries that are going to long outlive the oil

and gas industry. So, so I suppose that those are some of the high level points around the social, social impacts". (FRAC010)

"I do not believe. I have not seen any jobs created. There was no job created when this company applied. None came in since before the moratorium. I do not believe it, there was no need to I think we are getting more jobs out of green training, which is what we are focusing on. We are training the staff here into green, into green energy, hydrogen geothermal to enjoy better opportunities". (FRAC011)

6.2.3 Economic boost

Table 9 Economic boost as a motive for UOG development in the UK

Research participants	**Themes based on Researcher's interpretation**	**Quotations**
FRAC005	Profit marginalization	*"You can very quickly ease into that, what I call that profit margin, which is that bonus on top, that means homegrown gases is better".*
FRAC006	Revenue source	*"Well, it's quite mixed. And when you say it's quite mixed us because the potential for new key is limitless. And when I say although I say the word limitless, it's not like it is a finite commodity, mind you, but in terms of when we see that the US was a net importer of gas. And now it has become a net exporter. The UK has the possibility to follow that same model. So using it first of all, for domestic use, but then eventually if they continue to produce like US to become a net exporter. So when we think about job creation, when we think about energy security, when you think about a revenue source, and UK become a net exporter, we see just the great benefits that are there".*
FRAC007	Industralisation	*"And also there will be a potential economic benefit from fracked gas because you create a new industry of onshore, some of it might exist in our historically deprived communities".*
FRAC008	Economic boost	*"I mean, I think we're looking at everything right now, especially the economy in*

		the shadow of the coronavirus pandemic with GDP UK to grow now, I think at a rate of 7.25%. But of course, that's not continued to grow. So in terms of keeping the UK economy growing and maintaining our position in the EU as the fifth largest economy in the world, we have to be looking at all forms and all the ways of increasing productivity in the country, boosting the economy. And one way of doing that, I think, is to invest in unconventional oil and gas extraction".

Source: Author generated.

The above quotations from some of the research participants highlighted the proposed economical benefit of UOG in the UK. While other research participants believe that it was more of a political agenda by the UK government to make more money from the fracking companies despite the potential risks it poses to public health and the environment.

" ...I mean, my own belief as to why fracking really came to this country was in 2010, you may remember when the coalition government was, was elected. It was well reported that as Labour party left office, they left the note on the on the table saying sorry, there's no more money, which was pretty much literally true. I think when the Conservative government came in; they needed a lot of money very quickly. And they sold huge numbers of fracking licenses and brought huge sums of money in and it was that they needed that money. And it was only when those licenses have been sold, that the problems suddenly became more and more and more widely reported, because until then, nobody really looked at fracking and only when it was imposed, without asking us whether we would be prepared to accept it. That people suddenly started saying 'hang on', this just doesn't work well, by then it was too late for government and so hence the lies started there was a no . None of what these people is saying is true, is true. Unfortunately, time has shown that everything that all the warnings that we gave are what happened". (FRAC002)

6.3 Mechanisms hindering unconventional oil and gas development in the United Kingdom

This section explores the various mechanisms designed to hinder unconventional oil and gas development in the United Kingdom as perceived by the research participants. From the fieldwork, it was observed by the researcher that the research participants perceived three categories – public engagement, structural and institutional framework (infrastructural Act), socio-cultural impacts and environmental impacts as the main mechanisms hindering unconventional oil and gas development in the UK.

6.3.1 Public engagement

A good number of the research participants (15) felt that lack of public engagement in the policy decision-making process is one of the key themes that facilitated their decision on UOG in the UK.

Table 10 Public engagement as a mechanism hindering UOG development in the UK

Research Participants	**Themes based on Researcher's interpretation**	**Quotations**
FRA018	Stakeholder engagement	*"Prior to COVID-19, we had engaged stakeholder engagement, face-to-face engagement. We sent surveys; we deployed community survey and other ways to reach the stakeholders involved. However, this has not met the expected level of achievement because of social cultural factors, which I'm sure we would talk about as we progress".*
FRAC003	Lack of public engagement	"*I probably heard about it first around about 2014. A local man used to work in the oil and gas industry was very concerned about the fact that the industry was planning to, to embark upon a huge campaign in the UK to introduce fracking, wherever the geology allowed it. And of course, the government is fully in favour of exploiting that resource. So the more I heard about it, the more I was concerned about potential air pollution, soil pollution, water pollution, and seismic activity, all of which I was very concerned about because I live in the countryside, and also worried about the traffic implications as well".*
FRAC004	Public consultation	*"I know there was an extensive consultation that the Scottish Government undertook in*

		relation to fracking. I know that the consultation was overwhelming in terms of its feedback, and it was overwhelming in terms of the feedback against getting moving ahead with, with fracking, I would suspect without any background knowledge that the UK Government have also sought not to frack. And as they have also done a consultation in terms of not fracking, and in England, but I couldn't say with all certainty".
FRAC005	Lack of information sharing, and understanding of the fracking technology	*"I think this has potentially been a lack of useful information coming out, you probably know that. The first shale gas well, was drilled in 2011. And then it resulted in seismic activity. And that was, that was a Preese Hall that basically woke everybody up to the fact that there was this thing called shale gas that was going on".* *"Because most people only knew about fracking because they'd seen some snippets of a some clips rather of what's it called now is called Gaslands. And it was it was propaganda films that came from made in the US about the supposed, negative effects of the shale gas industry. And it used all different techniques to scare mongering".*
FRAC006	Lack of public engagement	*"it has not been very broad or encompassing. Why? Because we know from recent studies within the last 10 years and last, that a lot of Public Engagement did not go on. And it's actually highlighted as a new recommendation if hydraulic fracturing operations were to continue. So it has been limited".*
FRAC007	Public consultation	*"It has to go through the normal consent process, which involves consulting with the local public and opening to objections. I think if I recall rightly, at the time when*

		fracking was being proposed, in sites in England, there was quite a broad consultation process and the then Department of Energy went through to seek public opinion. Again, if I recall correctly, public opinion was quite divided on the matter".
FRAC008	Lack of public engagement	*"Well, I mean, they do the usual so that they go through the usual planning procedures. So a lot of it is actually dealt with at a local authority level. I mean, obviously, the final decision rests with the government. It is the government's decision whether or not unconventional oil and gas extraction should take place".*
FRAC009	Lack of public engagement	*"Most of that was done by BEIS, I think. So Government department, and I know they both regular surveys, and number as a variety of engagement events. The Environment Agency, then, for those for things, like permits, that we issue that are statutory consultation requirements case, there is a, in effect, an agency website, where permit draft permits, go for consultation, and anybody can, can come in on that send comments".* *"the final permit, when that is issued is available for people to inspect, read and understand. In terms of wider public engagement, then we publish research reports, some 19, published research reports, and there are there have been public engagement events in particular locations where hydraulic fracturing was likely or about to take place".*
FRAC010	Lack of information	*"I think, there was actually very poor information. And I think that that's, that's driven in in different in different ways. I think it is, it is not in the oil and gas company's*

		interests, for all, all the information, all of the risks or the consequences of their activities to be widely discussed and widely understood".
FRAC011	Lack of public engagement	*"I think they relied a lot on the companies to be honest to get the message out and in local communities. And we know that the PR companies were employed by the companies with assistance from their view to, I think it was the only company attempting to do any form of that was Ineos, which is they have their own strength anyway".*
FRAC012	Lack of public engagement	*"I'm not aware that the government did any kind of consultation work, the public engagement work. That's what you mean by public engagement, really. The government, at one point, sort of 2014, 2015 said that it was going all out for shale. They said that it would be good for the balance of payments; they said it would be good for jobs. And it would help the UK energy security".*
FRAC013	Lack of information	*"Well, yeah, like I said earlier, I don't trust the government, and I do not trust politicians. So I feel like they will do whatever goes with their agenda. But maybe in terms of the risks, they may not be as outspoken about what the risks are, and about what the strengths are..."*
FRAC014	Public engagement	*"so, mostly the UK government really engaged the community based on the level of being more transparent, accountable and they have made things more accessible in terms of getting the right information, when required".*
FRAC015	Information sharing	*"You can check online to get information and I think there is designated office too that you can also get information".*

FRAC016	Information sharing	*"In the gov.uk websites, articles and journals, information about fracking can be found, that is, the public domain and I heard the oil and gas regulators like the have held sessions to answer questions about unconventional oil and gas development in the UK in areas like Lancashire. Also I believe there was a public consultation in Scotland about fracking which later resulted in a ban, so..."*

Source: Author generated.

The research findings give a definite attention to some of the comments made on this theme. Accordingly, the research participants were of the opinion that public engagement platforms could be utilised in the decision making process towards the development of unconventional oil and gas in the United Kingdom, particularly as this was supposed to be a new technology that would be socio-economically beneficial to the UK energy industry. From the Table 10 above, there appears to be variations on whether there was proper public engagement and at what level? A few other participants presented public engagement on this subject of hydraulic fracking as:

"Well in the beginning it was done

by instructing local government that they had to be supportive. So it was hard to fit against development because all the conservative politicians were in support of it. All the supposedly neutral bodies like Public Health England were facilitating fracking. Then towards the end national government was making statements and putting out propaganda about how we needed fracking. But they never said anything about the risks, only made up benefits". (FRAC019)

"So I think the regulatory authorities did do a good job with shale and I think that, that there are very significant lessons to be learned there by any industry that wants to do work that could impact people or the environment. And I think it's around the messaging. And I think that they need to fill that gap. The oil and gas industry didn't step in to fill that gap at the beginning. They didn't provide the public with, to my mind, adequate proportion and balance information on shale gas, what the risks were, how they were going to mitigate them, and their commitment to the communities in which they were operating. And as a consequence, wherever there's a vacuum, something will rush in to fill it. And what, what came in to fill, it was information from people who were significantly opposed to particular industry. And there was a certain amount of there wasn't a lot of rigor over the quality of the information going out. So it was generally a platform for people that wanted to make political statements and get their own agenda across without necessarily providing the evidence to back up what they were saying". (FRAC005).

6.3.2 Structural and Institutional framework

This section explores the opinions of the research participants that felt the institutional nterventions in form of regulatory schemes and policy design have been an enabling mechanism facilitating unconventional oil and gas development in the United Kingdom.

Hence, this was a theme that was perceived by the research participants with regards to UOG regulatory systems in the UK. When it came to policies, the research participants strongly believed that the UK energy policy provided the grounding and rationale for the required enabling environment such as the regulatory frameworks and private participation (oil and gas companies). The institutional design referred to by the research participants in relation to the mechanisms hindering unconventional oil and gas development in the UK are outlined below in Table 11.

Table 11 Structural and institutional framework as a mechanism hindering UOG development in the UK

Research participants	**Themes based on Researcher's interpretation**	**Quotations**
FRAC003	Local democracy	"*Well, I was never consulted about whether fracking should be brought to my area at all. It was just, you know, got to hear what was planned. And we, at every level of local government here from Parish council up to County council, we rejected it. And as I said earlier, we were overruled by national government, despite the fact that they'd said that they were very keen on local democracy, clearly, clearly that wasn't provided consultation".* *"And the government was completely ready to it and overrule the democracy in order to in order to approve fracking at the site of the dictate going Preston new road. So my view is, frankly, that the government, the Conservative government, is totally in the pocket of the industry*"
FRAC003	Regulatory framework	*"I have had some dealings with Health and Safety Executive, and various others as well. And frankly, as an ex civil servant myself, I know that they're understaffed and under resourced. And as things stand, they cannot properly regulate an industry such as fracking, especially if it grows, experts*

		exponentially as was planning to start with". *"The regulators, we're just trusting them to basically self regulate, and we can't have self regulation in any industry, and certainly not one is making as big an impact as, as fracking would".*
FRAC007	Planning consent	*"So I think if I remember correctly, the UK government took a decision that it would essentially go back to state and essentially, matters of consents in planning are devolved to local authorities after to improve planning consent. But of course, ministers both in Scotland and the UK level, do have an overriding power over planning applications power to call in applications and power to override local planning decisions".*
FRAC008	Energy policy	*"Well, I think what Brexit does is it gives us the freedom to take decisions on these matters in a way that we simply didn't have before when many environmental considerations had to be taken as a result of our membership of the European Union".* *"So I think that what Brexit allows us to do is yes, take very seriously the environmental considerations when planning considerations for development and molded in a way that best suits Britain, instead that best suits the 27*

		other nation states with wildly differing views on, on the environment with wildly differing economies, and priorities and construct".
FRAC010	Policy document and statement	*"the Scottish Government is in the process of reviewing some of its some of its policies and procedures in this area, because energy is not a devolved issue. We don't we actually, that was the Scottish Government is quite often not party to quite a lot of other discussions that take place at the UK level. I would have hope that there is significant political and community pressure to, to drive revenue of some sort, but whether, whether it will actually happen under the current UK government".*
FRAC002	Regulatory framework	*"As long as you believe the spiel about, about tighter regulation and inclusive monitoring. We were constantly being told that we had got gold standard regulation. That's what the, what the government constantly said, we've got gold standard regulation, and we have not, it was a lie; close monitoring was a lie".*

Source: Author generated

Table 11 has demonstrated that the United Kingdoms regulatory framework, energy policy, local democracy, planning consent regime, policy document and statement appear to be the main instrument facilitating unconventional oil and gas development in the UK. Energy policy framing has facilitated the UK government's alignment towards unconventional oil and gas development where the former Conservative government Prime Minister David Cameron stated:

"You had David Cameron, who was the then Prime Minister turning around and saying Britain can't afford to miss out on shale gas, and communities just have to bear the brunt, while at the same time attacking wind power and that Britain was open for the Business of shale gas. Cameron also went against what the majority of the analysts were saying that shale gas won't lower energy bills". (FRAC005)

Following this, the research participants reiterated about the incumbent Conservative government still in support of UOG development and therefore making energy policies that align with their political agenda in the oil and gas industry. Such sentiments was captured in a comment by some of the participants including key policy makers:

"There are also other advantages from fracking one is cost advantage because potentially it is cheaper than other sources of energy. And also there will be a potential economic benefit from fracked gas because you create a new industry of onshore, some of it might exist in our historically deprived communities. And you could ever create jobs plus the opportunity for community benefit schemes from fracking". (FRAC007)

Contradictory to the above statement *(FRAC007)*, as put forward by *FRAC019* and *FRAC012* below, was the perception that the Conservative government would make policy and override planning decisions to suit their political agenda for unconventional oil and gas development in the UK:

"Well in the beginning it was done by instructing local government that they had to be supportive. So it was hard to fit against development because all the Conservative politicians were in support of it. All the supposedly neutral bodies like Public Health England were facilitating fracking. Then towards the end national government was making statements and putting out propaganda about how we needed fracking". (FRAC019)

"…Or it might be a slight development in government thinking is that nothing will happen all naturally until after the COP26 climate conference in Glasgow; because it would just be too embarrassing. Its, its bad enough having to decide whether to have a coal mine in Cumbria can't see them lifting moratorium until after COP 26. It's really interesting". (FRAC012)

Integral to this section was the research participant's opinions on the oil and gas regulatory framework for the onshore industry. Some participants are of the opinion that the exploitation of unconventional oil and gas in other countries have been quite successful because their regulations are not as stringent and strict as that of the United Kingdom, hence the UK government have been importing fracked gas from such countries for domestic use in the UK.

"I think that's the issue, I think, because they've seen fracking take place in parts of the world where the regulation hasn't been as strict as we would have it here in the UK, or indeed, across Europe". (FRAC008)

While other participants believe that unconventional oil and gas can be exploited here in the UK if an oversight regulatory body is created to solely monitor and regulate the activities of the onshore oil and gas industry. This research participant reiterated that:

"whether you live in, in Wales, whether you live in Scotland, whether you live in England, in Northern Ireland, these policies can also change. So if we have one regulator to cut across the entire UK, United Kingdom, then we can see some sort of unity in the government's approach, so I think that will be complex, and their sole mandate will be to independently monitor fracking sites. How much oversight as I said, we don't know. But also definitely community and public engagement also be a legal requirement of the government, the energy agencies of the government, and also by the operator. It is a legal requirement". (FRA006)

6.3.3 Socio-cultural impacts of unconventional oil and gas development in the United Kingdom

The research participants demonstrated through protests, opposition, rallies, resistance to change about their views on unconventional oil and gas development within their community, as been an intrusion, imposition on their traditional way of life and livelihood. These include themes like cultural identity, resistance, change, and industrial history. Research participant's views on this subject area from the interviews conducted are highlighted in this section.

Table 12 Socio-cultural impacts of unconventional oil and gas development in the UK

Research participants	**Themes based on Researcher's interpretation**	**Quotations**
FRAC002	Cultural identity	*"I was standing on the roadside at the site at Preston new road probably three or four times a week for the best part of three years until the moratorium came in. And the attitude of the staff, of the contractors, of the security guards. Was you know, basically total and utter disrespect for the community and Cuadrilla's logo was putting Lancashire first, can you believe that was their official logo? They said that to totally lie. And they clearly had no interest in the community or our welfare or our best interests".*
FRAC009	Industrial history	*"I think we've partly forgotten that a lot of the UK, a lot of being have got an industrial past. Even in places that look quite rural now may have had your mining industries in the past that people forgot forgotten about. Or maybe they are remembering those, those things again. Maybe they just, just don't want that kind of disruption at this time".*

FRAC003	Cultural identity	*"So you know, the road mainly used by cyclists and horse riders, so an obvious impact on the community. And when we had the public inquiry the, the barrister representing Cuadrilla was being told by a local person that we that we ride our horses on that road that's that's where we hack our horses and her response was; Why can't you go on another route? And she said, Well, why should we. Why should you a company from outside here comes in and start uprooting our traditional lifestyle and imposing your own restrictions on it, making it more dangerous".*
FRAC002	Relocation	*"Simply because I lived in as I said, I lived in Roseacre, a beautiful area to live into a lovely Hamlet, we had 16 houses and four farms. That was it, it was just a place to live. Because of the threat of fracking, and so on the way everything went, I ended up having to sell my property. Well I ended selling my property, as I said, I no longer wish to do their things to what they did. My property value has decreased by 40,000 pounds when I came to sell it".*
FRAC012	Opposition and protests	*"…anti fracking groups are also not particularly active unless there is the prospect of a site in their area. And so the one in, for example, in Nottinghamshire, where there's a planning application coming up next week, they are still active because they are trying possible to oppose the application"*
FRAC019	Resistance and division within the community	*"Socially communities were divided by misinformation. The stress makes it so impossible to forget, the question of fracking is always hanging over everything".*

Source: Author generated

Contrary to the above research participants view, a research participant explained that the oil and gas company could have done better from the beginning in order to carry along the members of these communities. The research participant cited a company in Cornwall that has incorporated the traditional values of the local community with their company's objectives.

"...and it is a Geothermal energy project, which looks like it's going to be really successful. But the important lesson to take away from it is the fact that right from the very beginning, they engaged with the community. And they effectively gave the community a sense of ownership. Okay, to the point where they're even flying the Cornish flag from the top of the drilling rig, it's really, really engaged with the community, the community, now believe that project to be part of their cultural heritage". (FRAC005).

The local communities where fracking onshore was to take place are situated in the countryside in the UK where tourism and agriculture are their main source of livelihood as explained by a research participant below. Thus, the intrusion of UOG developments would not align with the way of life of such communities.

" Francis Egan, who at the time was The CEO of Cuadrilla said it was Cuadrilla intention to turn that area into the largest onshore gas field in Europe. Well, that doesn't sit with agriculture, tourism or any form of social development". (FRAC002)

Research participants even spoke about having PTSD till date and their community is still divided on the issue due to what was called small astroturf group (some members of the same community) created within the community to cause disputes and disrupt the grass root campaign against fracking. It sole purpose was to divide the community as explained below:

"...but we know of people's houses being targeted. On both sides, to bridging the other side, it wasn't it wasn't one side more than the other, I think it was just people just obsessed with it. To the point and it's such an intense thing, particularly on the ground if people were knocking on and protesting, which was slightly different from what we they clearly network and lobbying, taking the message to Westminster. But I saw some people that really you could see their illness PTSD, top level stuff going on, and still is on now, to be honest, there's still people still getting their lives back. And you know, and you can see the impact over 10 years is impacted my life is my job now, its different from 5years ago". (FRAC011)

Even the UK police authority was cited as been in support of hydraulic fracturing as it was suggested that they worked hand in hand with the security agents of the oil and gas companies by helping to facilitate the industry and not facilitating a legitimate protest in one of the local communities as described by the research participants. In this case a research participant illustrated how they even got arrested during one of the protest in the proposed fracking local community.

"There was one incident in Yorkshire, a different fracking company, but the police, because, because the lorries kept being waylaid by protesters. The police were actually on the lorry as it arrived. It was like it is like a scene from the western where the police were, on the one hand, claiming that they were totally neutral, and only protecting the community. And the truth of the matter was they're very clearly not protecting the community at all. And in fact, stopping protests wherever they could. I mean, it's, it's I mean, I've been arrested, this would be a surprise to you. I took part in a lock on outside the site, and the lay in the rain for 13 hours to stop the lorries coming in. And I was arrested". (FRAC003)

This finding is quite significant given the attitudes of anti-fracking protesters and the UK police authority in the media. It is easy to interpret why the anti-fracking protesters feel agitated at the thought of been arrested due to causing obstruction to the movement of heavy vehicles with equipments on the roads that led to the fracking sites. By law the UK police duty is to protect and lives and property while maintaining law and order and if in the process, an arrest is warranted, then that would be the case.

6.3.4 Environmental impacts of unconventional oil and gas development in the United Kingdom

The extraction of unconventional oil and gas in the United Kingdom has spanned over the last couple of years with the environmental concerns more loudly spoken about than other implications. Concerns ranging from climate change emergency, public health and safety, seismic activities (leading to tremors/earthquakes), water pollution, air pollution, soil pollution, traffic congestion, threat to agriculture, threat to biodiversity, noise pollution etc. This section highlights the research participant's views on the environmental impacts of UOG development in the UK.

Table 13 Environmental impacts of unconventional oil and gas development in the United Kingdom

Research participants	**Themes based on Researcher's interpretation**	**Quotations**
FRAC001	Water pollution but more research needs to be carried out on this	*"I think the first thing is that it might be unsafe, or we do not have enough details to tell us how much effect it has on the environment".* *"So I think at the moment, I think it's a bit unsafe, because it pollutes the water table, and it could cause at earthquakes, apparently, depending on if it's close to a fault line. So I think at the moment, there's not enough research being done on it".*
FRAC002	Global warming	*"That is a lie. It does ruin the environment; that is absolutely true".* *"No it is antisocial, it spoils that the environment it spoils countryside or whatever. I'm talking about this area because that was what I was involved in".* *"So it does not help in terms of reducing global reducing emissions, it creates emissions. An awful lot of current global warming is down to fracking because they're releasing methane".*
FRAC003	Bad for agriculture Earthquake	*"And likewise, if the soil and the air and the water is polluted, that would be very negative repercussions for the agriculture industry".* *"Well, there was an earthquake in 2011, which I was completely unaware of. So I can't*

		I can't claim that I was directly affected in that way".
FRAC004	Climate Change emergency	*"…in terms of the environmental aspects, and this is probably key in the discussion. And certainly now more than that, perhaps was in 2013, as the climate changes, as fear is real, and we need to have a plan to combat it".*
FRAC005	Exporting environmental problems/responsibilities	*"Here is some people might say, well, if we import gas or hydrocarbons from overseas, you know, are we not just we're not just pushing the environmental problem onto them"* *"From that, see you it's whether you import, whether you import oil or gas from the Middle East, or whether you use coal from underneath our own feet, is potentially worse for climate change in terms of carbon emissions than than burning homegrown gas".*
FRAC006	Climate Change emergency	*"We also have some historical case histories, which have shown how without proper planning, it has created environmental disasters. So my own is that yes, all operations have its risks, hydraulic fracturing is one of them".* *"No, in no way will it meet the climate change agenda".*
FRAC007	Risks to property Water contamination Earth tremors Climate Change emergency Traffic congestion	*"And there's a second range of concerns, which is around the broader negative impacts of fracking. So, for example, the risks in terms of earthquakes, the risks to property on the surface, the risks of contamination of the water source. And whilst I think some of these concerns have, perhaps been overinflated in the past, by opponents of fracking, nevertheless, there are many concerns that exist, and where fracking has been*

		conducted elsewhere in the UK, in England, I think there have been legitimate issues raised about the impact of earth tremors on the surface, the higher than was originally predicted". *"People were concerned, for example, that fracking would involve a large number of additional vehicle movements. In terms of the transportation, we have issues with congestion. The local roads may have a road safety aspect, clearly there climate change implications with additional emissions from transportation".*
FRAC008	Overstated risks to public and environment	*"I know that there are risks but in many places I have seen the risks are overstated. And I think if managed and dealt with properly, then fracking, as I said, gives us another avenue to exploit in terms of utilising our energy supply and our energy independence and thereby energy security of the United Kingdom. In terms of the impact on the public, what was there, it's even environmental".*
FRAC011	Traffic congestion Air pollution	*"And but I think at the end of the day, if you are building two hectare sites in the middle of a rural area, with 1000s of trucks coming on board and everything else, they're going to have environments impacts, its as simple as that".*
FRAC010	Earth tremors Climate Change emergency Water pollution Soil pollution	*"I think I think the the the sort of environmental risks of fracking around sort of local earth destabilization around polluting watercourses around polluting agricultural land".* *"We are in the state of a climate emergency, I think it's very, very clear to me that we*

		need the oil and gas to stay in the ground, we cannot afford to come to continue burning oil and gas and generating the climate changing emissions that are causing catastrophic changes".
FRAC012	Too early to tell; as it was only at the exploratory phase	*"And the environmental implications, I think, is also quite difficult to tell because there's only been two sites or three, three sites, actually, because one of them has been abandoned. Interestingly, there was a site in North Yorkshire where there were plans to frack but didn't happen, it was in existing oil site".*
FRAC013	Climate Change emergency	*"Climate change is a, is a real issue. It's been extremely hot here recently. And I can't help but think that things like this, things like fracking is is not good for the environment. Right, it's affecting the environment negatively. But then again, it's not just fracking, as many other things, as many other things that are affecting it. The offshore drilling is affecting the marine bodies and the ocean and is going to, to cause a rise in sea level. So why are we not worried about that as well"?*
FRAC014	UOG poses greater risks than conventional methods	*"I'll say based on the environmental impacts and effects, I will say, it's not really so much of an effective method, because of the risk it imposes from a personal perspective, I will say more because of the environmental impact it has compared to the normal conventional way of oil and gas, of drilling oil and gas"*
FRAC015	Earth tremors Water pollution Threat to Public health	*"It is serious one, like the tremor I talked about, the earthquake. And then the pollution, even the water both the underground water and the surface water. Some toxic chemical that is been used for fracking can leak. Leakage of the gas into the groundwater and surface water that is dangerous to health, so, health wise, when we're talking about the*

		tremors and it causes, those are it's implications".
FRAC016	Environmental justice	*"Regionally now, how due to public consultation, there was a ban on fracking in Scotland. It's believed that at what point do you draw that balance between making more profits and bringing harm to the environment. I guess that's where the conflict has always been in the oil and gas industry".*
FRAC017	Earthquakes Environmental degradation	*"Concerning the finding that people attribute seismic activities like a earthquake to the activities of fracking. Beyond that also, fracking creates environmental degradation"*
FRAC018	Assumed fears/harm to underground water Earth tremors	*"We do not know how it will impact on the environment. Nevertheless, there are fears that this process would cause harm, condemns underground water, there are fears that it could lead to earthquakes or earth tremors. So there are lots of fears looking at it from an environmental perspective"*
FRAC019	Threat to tourism Threat to agriculture Threat to public health (stress)	*"Utter destruction. Well you have to understand that in North Yorkshire the economy relies on tourism and agriculture; both incompatible with fracking. So it threatens everything. The fracking industry would have been destructive in every way. Socially communities were divided by misinformation. The stress makes it so impossible to forget, the question of fracking is always hanging over everything. Environmentally it would have been ruinous".*
FRAC020	More research needed	*"There are claims that it is detrimental to the environment but it has not been scientifically proven that UOG is dangerous to public health".*

Source: Author generated

The research participants in Table 13 highlighted their views on the implication of UOG development in the UK as can be seen above. Other research participants included that:

"*Does the social and environmental risk mean that we should take our view of it just right now? I'm not sure, this is complex, the energy transition, and that vacuum is, is really close to the heart. Because as it stands, all these wind farms that we see being set up in the UK, in in different European countries in the US and so forth. You would remember that Texas earlier this year had a blackout right? Their wind farms froze; the weather condition in Texas is a warm state. The weather conditions went freezing and it stopped the wind farms from operating, therefore, they have no source of energy. So what do you use, and Texas was in turmoil because of its people died, because of it, they did not have energy to heat their houses in a time when they have experienced unconventional, natural essentially disaster. Texas, you would remember is actually the heart oil and gas". (FRAC006)*

Research participants (FRAC005), (FRAC007) and (FRAC009) were in agreement and expressed their views on the importation of fracked gas by the UK government and how it means the UK is exporting its environmental problems and responsibilities to countries with less stringent regulations, even though the UK's geology geography is one of the reason why fracking should not be done in the densely populated countryside:

"If we don't frack here, we import fracked gas, potentially, what we're doing is we are importing fracked gas from other countries, which are much lower environmental standards than we do. And therefore, we are effectively exporting our environmental problems to other countries that may be poorer countries. So that is one of the arguments for why we should do fracking. But if we have a relatively sophisticated and energized population, and we are a relatively small country, with a relatively dense population, and the reality is, you know, fracking in our geology, in our geography, potentially, is riskier because of the proximity to people's homes, and livelihoods, as opposed to fracking taking place in another country with many wide open spaces, under a smaller population that potentially are less seriously negatively impacted by fracking than it would be if it took place onshore in the UK". (FRAC007)

"If we don't extract oil and gas in the UK and we bring in oil and gas from somewhere else. What is the environmental implication of that? So, to some extent, we are happy offshoring our problems to somewhere else". (FRAC009)

While a research participant (FRAC011) that spoke about the environmental implications of UOG to include traffic congestion and air pollution due to the transportation of heavy site equipments using heavy vehicles; also is of the view that the water table would actually be contaminated, as these fracking sites are not located close to where the drinking water is channeled through. The research participant further added that due to the drilling depth of the wells, the supposed drinking table should not be affected by hydraulic fracturing:

" I still don't buy the argument that is polluted the water table here, because it's so big, I just don't buy the argument some people do. In America, I can see the argument because it's such a shallow track. So you can even see the difference. But if you look at the technical details, here, we're talking 10,000 feet down and into into water aquifers, and nowhere near anything things into the drinking table. But then you've got the residual impacts on the local wildlife from the industrialization is there's got to be impacts in the solar farm will have impacts". (FRAC011)

6.4 Reflections on the decision making process for unconventional oil and gas development in the United Kingdom

This section discusses the research participants view on the decision-making process for UOG development in the UK, illustrating the political and the National planning policy framework (NPPF) in this regards.

Table 14 Decision making process for UOG development in the UK

Research participants	**Themes based on Researcher's interpretation**	**Quotations**
FRAC003	Extensive/robust public consultation	*"Yes, the Scottish Government did a very, very exclusive consultation. About the whole fracking development before they came to a decision to publicly ban fracking in Scotland".*
FRAC004	Political decision	*"...And I was in Business Energy and industrial strategy questions last week, and I believe the Secretary of State was asked the question, and in relation to fracking in England, and he highlighted the fact which, which I don't have any information in disagreement with that. In England, there was of course, there was a moratorium as well. And he indicated there was no desire of a political will, from his perspective, to have that status quo".*
FRAC004	National Planning Policy Framework (NPPF)	*"So I think what we've seen from the Scottish Government over many years is a key focus on facilitating and investment into, renewable technologies. Post-Brexit, I actually think that will face a number of challenges in terms of our ability to coordinate with our European neighbours, in terms of delivery of some of our*

		objectives, remains to be seen what the UK government intends, intends to use it, or anything to all our policy that would otherwise have been there, as a member of the European Union or not to facilitate energy transition".
FRAC005	Election purposes	*"And you might want to consider the issue of given that the current government have made massive political gains in those areas where shale gas has been identified as being the most likely areas to drill for shale gas. So that whole area where the Bowland shale it's is, which is across Lancashire and Yorkshire. Those are a lot of areas where those typically Labour seats went conservative at the last election".*
FRAC006	National planning policy framework (NPPF)	*"…because it is quite complex issue, one of the issues we've seen is that you would want a creation of a new governmental regulator that will deal solely with these type of operations, how much oversight that regulator will have is going to be determined by government".*
FRAC007	Post-Brexit implication	*"I mean, the UK has become a net importer of electricity directly from France, which is mean in the mean deriving of course from the French nuclear power programme. And that arrangement persists post Brexit and I do not think Brexit has any kind of particular impact on that".*
FRAC009	Post-Brexit implication	*"There is an energy source there but equally there is an increasing move towards renewables and is also different energy market in terms of the price of oil and gas. So I think the OPEC and Russian are kind of contingents; are both trying to put everybody else out of business by pumping, is my impression".*
FRAC010	Energy policy	*"So I think there is, you know, developing, developing the infrastructure that we have*

		got around, around renewables at the moment, like tidal energy, I think, I think I do not see an energy policy future, that or a successful energy policy future, should I say, that doesn't require shift and both funding for support for investment, investment in and political will to deliver a much wider range of renewables"
FRAC012	Political decision	*"Now, a couple of weeks ago, there was a statement by an Environment Minister in the House of Lords Lord Goldsmith. And that was really interesting, because it went a little bit further, and it said the government would not support shale gas exploration. You can explore the shale gas without fracking. But it added in the extra bit about consent for hydraulic fracturing, but for the first time, they said that the government would not support exploration of the shale gas"* *"I it's bad enough having to decide whether to have a coal mine in Cumbria can't see them lifting moratorium until after COP 26. It's really interesting".*
FRAC020	National Planning Policy Framework (NPPF)	*"I do envisage that there would have been a review of the planning regime if fracking was to have gone ahead in the UK".*
FRAC016	Trade agreements	*"As the UK is no longer in the EU energy policy might change a lot, depending on the trade with regards to the importation. It all depends on the energy trade agreements".*

Source: Author generated.

While trying to interpret a participants view that the decision to place a moratorium on fracking in England could have been for election purposes to gather votes, the research participants also emphasised that the decision to place the moratorium could also have been political in the sense that the moratorium is just a stalling decision for now because the UK government are aware that it is virtually impossible for operators to demonstrate to the oil and gas authority that they could frack the wells without causing any seismic activity as asserted below;

"…The government effectively set a rule that said that operators can only get permission to do hydraulic fracturing, if they can demonstrate beyond all reasonable doubt that they will not cause seismic activity, they will not cause seismic events. Well, that that slight scientist, somebody will prove to me that the sun will rise in the east. It's just not feasible to do". (FRAC005)

A research participant posed a question about the UK geopolitical situation post Brexit and it's influence on the moratorium decision on fracking decision. This question goes beyond the scope of this study as it involves the G7 countries (Canada, France, Germany, Italy, Japan, UK and the US). This is an area suggested for further research with regards to energy policy going forward after the United Nations Climate Change Conference (COP26) in Glasgow Nov 2021. The research participant asserted below that:

"This moratorium is about; I think people do underestimate how much it has impacted the UK; if we have a Labour government now. What what would have happened to me, and it really ended, but I saw how the geopolitics is impacted here. Has the anti fracking movement in the UK affected our international relations. And this is a question a serious question that I would say this because, we have been impacted by these G7 countries energy policy; are we influencing energy policy, of other countries now". (FRAC011)

Summary of reflections on the decision making process for unconventional oil and gas development in the United Kingdom following the research participants response depicts that, in the case of fracking, the opposition also spanned from the method not being environmentally appealing or friendly and the lack of engagement in the decision making process surrounding it. The Cornwall's geothermal project, which is a form of renewable energy source, had stakeholders like Greenpeace, Friends of the Earth and members of the community supporting the project. This is because this group of stakeholders believe that renewable source of energy are versatile can be easily adaptable due to it being more

environmentally friendly and thereby posing less risk compared to shale gas. They also suggest that the UK government in its journey to meeting its climate change targets should increase its commitments to investing in such sources like the CCUS, geothermal, solar and wind etc as this will help to the reduce the worsening effects of climate change happening. The environmental and health implication of fracking made it less appealing and resulted to the oppositions we saw during the discourse that resulted to the moratorium. These NGO's are of the notion that as the UK tries to switch from fossil fuel to renewables, the transition should be fair and just. Which is why even if UOG was proposed to make the UK more energy secured and improve the economy, the decision making process did not seem fair as the environmental implications outweighed the envisioned benefits outlined by the developers and the UK government.

6.5 Prospects for transition towards renewable energy in the United Kingdom

This section covers the research participant's views towards the transition from fossil fuel to renewables as this one discussion arose multiple times during interview sessions. Discussion of this nature is originally not within the scope of this study but it came up during the conversation as the need for more investment in renewables source of energy than fossil fuels due to the present climate emergency was suggested by the a portion of the research participants.

Table 15 Prospects for transition towards renewable energy in the United Kingdom

Research participants	**Themes based on Researcher's interpretation**	**Quotations**
FRAC002	Solar energy, Wind energy	*"Well, no, we are moving to electrification of cars now. So, the demands for petrol and oil are going to be a lot less. Solar power, wind power is coming in to generate electricity. So, again, the traditionally, fossil fuel fired power stations will gradually become obsolete, I think that what you will see happen is the accepted way of distributing power will change I think the communities will, it will be small communities will have smaller generating plants that generate just for their communities".* *"I think battery storage will come in because obviously there are dangers, particularly this country where maybe you do not get an awful lot of wind, very little sun. And so then you will have battery backup that will last for what several days anyway. Until the wind starts blowing, and the sun starts providing more electricity. Of course, do not forget that it does not have to be sunny for solar power to operate, all you need is daylight".*
FRAC003	Stop subsidizing fossil fuel	*"Now, my view of Britain is it's one of the windiest countries in Europe. So therefore, and of course, surrounded by the sea, it's very obvious to me that right from the start, we should have been to develop renewable industries, tidal, solar, than chasing a*

		highly subsidized industry like fracking". *"Basically, I do not think we are going fall out with Norway anytime soon. You know, the, the argument about Putin turning off the tap is just complete rubbish, utter rubbish and just a blatant lie. And you know what, I think we have the potential in this country to be self sufficient with regard to renewables anyway, not at the moment, obviously, it's going to take time, but the longer we delay the transition from fossil fuels to renewables, the more danger we are in with regard to climate change. We need to we needed to started doing this years ago".* *"Yeah, I am not. I am not naive that we can make the switch overnight. Clearly, we cannot do that. But we need to be moving towards exploiting renewables. And at the moment, we are not doing that. And the other thing as I said earlier, that the fossil fuel industry is still being heavily subsidized by you and I; and that cannot be right. Why are we subsidizing a climate wrecking industry"?*
FRAC004	More investment for renewables	*"And the argument that secondly, certainly I think bears fruit is why you would seek to invest in an industry which was carbon intensive, when you can seek to invest in in other industries, industries, such as renewables, and offshore wind, hydrogen, and even the likes of carbon capture and storage, Hydro Pump storage, all of these things we could and should be investment".*
FRAC007	Gas will still required in the energy	*"So there will have to be a transition, we have already phased out entirely, we are*

	transition mix	*close to phasing out entirely the use of coal in the energy mix, because coal is pollutant of hydrocarbons. But gas, which is relatively less polluted, still; of course, hydrocarbon gas will still be needed. Because we cannot overnight switch every domestic home in the country in the company uses gas to heat unto some source of renewable heat, it simply doesn't make economic sense"*
FRAC010	Gas will still required in the energy transition mix	*"So you know, from my point of view, and that point of view on fracking is; maybe burning gas is better than burning coal or oil. But I do not think that oil and gas should play any medium to long term part in Scotland's, or indeed, the UK's wider energy future".*
FRAC013	Affordability of renewables	*"I am all for renewable energy. I am all for it. I have zero reservations about it. For right now, we have to be realistic, in the future we would do renewable energy, but right now not everybody can afford a Tesla and not everybody can afford solar panels, not everybody can afford wind farms. Yes, I am all for it, I have zero reservations about it".*
FRAC014	Unconventional oil and gas required in the energy transition mix	*"Yeah, it has a very big role to play because most of the conventional techniques, conventional equipments, appliances being used is still kind of is being driven by the oil and gas; like the, the conventional part of the renewable is been driven by the UOG. The raw materials and resources required to develop, whatever is required for the renewable energy, the wind, the wind turbines and all that'.*
FRAC015	Carbon Capture Usage and Storage (CCUS)	*"It is not as if oil and gas does not have a role, it does if it is been captured; that is blue hydrogen, carbon is been captured. Yeah, that is the one that is on ground, it is*

		even more than the green hydrogen because of the cost implication in the production of green hydrogen, but then with time green hydrogen will take over".
FRAC016	Sustainability, Energy demands rising globally, oil and gas still required in the energy transition mix	*"There is that call for balance. We are talking about sustainability. Sustainability is not about; I do not believe sustainability is about eradicating oil and gas. I believe that sustainability is about exploring oil and gas to the extent that is not detrimental to the environmental. I believe that is what sustainability is about".* *"Anyone who think oil and gas is going away is going away, is just deceiving themselves. The world has not gotten to the point of existing without or running efficiently without oil and gas. On the contrary energy demands are increasing. No matter how much we increase renewable energy we would still need fossil fuel. Because the demands are rising, if you can check the statistics, do not just take my word for it. Energy demands globally is rising, so it is not enough to say we would switch to renewables, we need very much, infact, it is the fossil fuel energy we understand even more at this point. So as we are growing our renewable energy expertise to meet the growing demands for energy. The population of the world is not reducing, it is increasing daily as well".*
FRAC018	Interrelationship between fossil fuel and renewables	*"And there is a relationship, we are all talking about how to manage the energy sector and I think they work hand in hand as it is right now. The renewables energy is an option from the fossil fuel, so there is an established relationships; so they both play actively".*

Source: Author generated

In addition to the research participants view on the subject of UOG having a role to play in the UK energy transition mix, some participants reiterated the Climate Change agenda in the UK and stressed the need to stop investing in oil gas but rather renewable energy sources as asserted below:

"The Scottish Government's climate change plan is quite clear. The UK Government have set their plans through the 10 point plan Energy white paper and the like as well, in terms of the direction everyone's travelling upon. And if there's going to be, there's going to be an argument for serious investment. I think that the majority would prefer to see that investment made in sustainable energy resources rather than the likes of fracking, particularly given the concerns which people have about drilling taking place under their homes and the like, so yeah". (FRAC004)

One participant that emphasised on the need for renewables also asserted to the notion that burning gas is more of a cleaner fuel than burning coal, and that the UK is still on the road to a renewable powered future as described below:

"The other thing is, which you probably need to bring out in your work in your PhD is the fact that burning gas is particularly gas that we generate in this country, in the global sense, is actually better than either burning coal, which is we've got a lot of coal, the coal is very dirty fuel it create, it contributes far more to climate change than gas. Well, I'm not saying burning gas is great, but it's, you know, if you have got to generate electricity. And we have got to be honest about that, that, although we are making big gains with renewables, we are not there yet. They do not provide 100% of our needs. And that will be a long while before they do". (FRAC005)

Another interesting discussion with a research participant was about carbon sinking. A country like Norway is more experienced in doing this. The participant stressed the need for a robust plan if we are going to be looking towards carbon sinking and also the cost implication to the taxpayers.

"Again, it's a complex and so one can argue it either way. gas, which is what we usually talk about with hydraulic fracturing, which we need or the EPA has in commercial quantities, is a cleaner fuel than oil. So if we were to say that we will close in all our oil production, and then focus and gas such as a cleaner fuel, we would say, yes, our climate emissions can be reduced in one way. At the same time, we note, it's not just about the oil and the gas in terms

of the zero carbon emissions, it also means that if we will choose really defines or is suited for carbon. So if I produce, for example, five tonnes of carbon, how do I sink five tonnes of carbon? Right, so we still have not treated the appropriate technologies to be able to sink the carbon. Because it does not mean that we just do not produce problem, it simply means that as we produce the five tonnes of carbon, we need to get rid of five tonnes of carbon cost to you. We have not seen the UK have a really good plan as to see how are we going to be able to sink the carbon? Or how are we going to become energy efficient, so that instead of producing the five tonnes of carbon, we may produce three tonnes of carbon". (FRAC006)

The cost implication of renewable energy was another point that was introduced by the some research participants. The need to be more conscious and proactive as the climate emergency is a discussion that is quite urgent with what we have seen recently globally. The research participant (FRA008) agrees with the importance of moving towards the net zero carbon emission targets but includes that unconventional oil and gas development remains vital for our energy needs in the UK. Research participant (FRAC011) is of the view that renewables should be the UK's energy future, but questions the continuous use of hydrocarbons to produce hydrogen, because that would mean having to frack gas here in the UK because of the cost implication, thereby resurrecting the need for UOG development argument again by stating their views below:

"The reason we've learned we are moving to an era, an era of net zero, we want to reduce our carbon emissions, but we will still be very reliant on on oil for much of our day to day lives. And you know, for Let's face it, it will be a very long time indeed, so the majority of people in this country will be able to, for example, afford an electric car. And it will also be a long time before we're able to completely move away from oil or gas turbines, providing heating to huge swathes of rural Scotland rural in rural Britain for that matter. So oil and gas is going to play a very dominant role in our energy supply in the future. And therefore, I think we should be looking at all means of trying to get the most of the reserves that we have in this country, and that includes fracking". (FRAC008)

"If you're going to go down the route of making something out of fossil fuels and trying to capture it from carbon, just capture the carbon and produce the gas. Why are you bothering to make use of the hydrogen in the first place; unless you are going to make hydrogen that are greener? It does not, just does not make economic sense to me. So the same argument is coming up again. Now, we know for well, that we can do with with electrolysis, and water is a

bit pricey at the moment, but you get a good price point. Where I think this country's going and trying to get hydrogen into the gas grid, the whole argument of fracking is going to come back, they are going to say we need to frack we need to explore so we can turn that gas into hydrogen all of this". (FRAC011)

In addition, the prospects for transition towards renewable energy in the United Kingdom in the analysis above, suggests a transition that is most sustainable to the UK economy and is fair to everyone including people working in polluting industries like oil and gas. Anti-fracking stakeholders believe that because of the climate emergency, operations like fracking, which pose huge environmental impacts, will be putting communities and their livelihoods at risk. This is because, at the moment, the livelihoods of most people are tied to polluting industries like fossil fuel e.g. oil and gas workers, factory workers, aviation engineers etc. Thus, where it gets tricky is that, in order to reduce green house gas emission, the oil and gas industry will have to change or shrink completely. This will simultaneously affect the lives of those living and working in such industry. A transition that will reduce the likelihood of this happening is proposed. This is termed as 'just transition' (Greenpeace, 2021; Scottish Government, 2021). A transition that involves moving towards environmentally sustainable economy without leaving the workers in oil and gas industry behind. This is aimed at supporting good quality jobs and decent livelihoods when the reliance on oil and gas eventually phases out and the decision making process for energy policies is fair and just. Three factors to make a just transition include: collaboration, local approach and lastly money. To ensure collaboration, the national and regional government will need to work with local authorities, unions, workers, local groups and other stakeholders. Collaboration will mean ensuring there is transparency and trust for it to work. Secondly, the local approach or local context of the community or region should be taken into consideration. For example, if the UK is to transition to offshore wind energy, solar, CCUS etc, the oil and gas workers in the North Sea should be retrained/reskilled instead of been laid off when the reliance on oil and gas eventually comes to an end. Monetary funding is essential for any development or implementation of any policy. Non-governmental organisations like Greenpeace suggests that for the UK government to support a just transition, the government needs to spend at least £5 billion per year, which is subject to increment as the years goes by (Greenpeace, 2021). The reason is to provide support to the communities that will be affected by the transition towards net zero.

6.6 Chapter Summary

This chapter detailed the analysis and the presentation of the primary data collected using semi-structured interview conducted with 20 participants. The data was analysed using theoretical thematic analysis and coded using NVivo software, where themes emerged from the responses. Four key aspects emerged when comparing the themes identified from the primary data with the themes from the secondary data analysis (such as the economic theme, social theme, and environmental theme) was reviewed using thematic analysis. This chapter detailed the participants views towards the motive for UOG development in the UK; the diverse opinions on the mechanism hindering UOG development in the UK; reflections on the decision-making process surrounding UOG and lastly the assessment on the prospective transition towards a net zero carbon emission in the UK. The researcher tabulated and quoted directly verbatim the participants views for accuracy and credibility purposes on these four aspects from the interview conducted. The researcher discovered that a proportion of the UK population who still supports UOG development from the response analysed despite the potential risks of fracking to the climate emergency that is highlighted within the chapter.

The next chapter is the discussion and development of relevant framework following the findings from this chapter.

CHAPTER SEVEN
DISCUSSION AND DEVELOPMENT OF RELEVANT FRAMEWORK

7.1. Introduction

This chapter aims to discuss the findings produced from results generated in the previous chapter, incorporated into a critical discussion that includes literature that had been set out in Chapters 2, 3, and 4. Finally, based on the findings from the discussion, a framework is proposed in relation to the research study's aim.

7.2 Discussion of the major findings

The discussion is presented under the following key themes in relation to this research study. The first theme identifies the policy and regulation narrative surrounding unconventional oil and gas in the United Kingdom, while the second discusses the level of stakeholder engagement within unconventional oil and gas development in the United Kingdom. The third theme discusses the factors that hindered unconventional oil and gas development in the United Kingdom, while the fourth theme discusses the critical factors that are to be considered if the narrative surrounding unconventional oil and gas were to change in future.

As stated in the early Chapter 1 of this study, the study focuses on England, where the UK government despite the opposition from some political parties, NGOs and then local communities, has significantly promoted the narrative of unconventional oil and gas development using hydraulic fracturing technology (Priestly, 2020). The United Kingdom consists of a devolved government of England, Northern Ireland, Scotland and Wales. As earlier stated, this study falls within the scope of England only, although a moratorium remains in place, while Northern Ireland, Scotland and Wales have halted fracking operations and stated their stance on not proceeding with UOG in the nearest future.

7.2.1 The policy and regulation narrative surrounding UOG development in the UK

The United Kingdom withdrew from the European Union on 31st January 2020, which is commonly own as Brexit (UK Government, 2021). This withdrawal from the European Union, has a potential impact and uncertainty about energy regulation and leaves potential gaps in environmental protection as the UK's framework of environmental law and regulation is based in 15 EU Directives, guiding everything from chemicals, air pollution, water contamination, biodiversity and more, with potential relevance to how shale gas is regulated (European Commission, 2014C). The United Kingdom was formerly a member state of the

European Union, and has a sovereignty to develop and control its energy resources and programs stated in the Treaty of the Functioning of the European Union (TFEU), under which powers are devolved to states unless they are unable to meet the objectives in specific cases (EU TFEU, 2012). In 2014, in respect to potential shale pursuits, the European Commission issues a Recommendation that was a non-binding legal guideline to establish minimum principles for Member States on hydraulic fracturing as can be seen below (European Commission Recommendation, 2014):

(1) Member States have the right to determine the conditions for exploiting their energy resources, as long as they respect the need to preserve, protect

(2) and improve the quality of the environment" with paragraph 2 acknowledging that the "[…] hydraulic fracturing techniques raises specific challenges, in particular for health and environment.

The European Union Recommendation has stressed the need to manage risks to public health and the environment even though the UK has the freedom to develop its policies and practices on energy. The UK's regulation for unconventional oil and gas is situated within the framework of the conventional oil and gas industry. It relies on the laws and policies based in the EU and the UK that has been designed to manage conventional hydrocarbons, as there are some associated unique risks in unconventional extraction using hydraulic fracturing (Hawkins, 2015). Furthermore, the UK onshore industry lacks a robust regulatory framework specific to unconventional extraction, which can be evaluated and monitored. This is in regards to the risks to public health, and the environment. As stated above, EU regulation is more robust and emphasizes on the right of public participation and information access in decision making process on environmental issues. The UK is less transparent and likely less to support its citizens in exercising such rights. Furthermore, potentially preventing citizens form having their voice heard, hence, undermining their right to perceived fairness (Smith and Richard, 2015).

The widespread protest and resistance over proposed UOG development in the UK, highlights the role of having a right to accurate information, informed consent, inclusive participation, public engagement in the decision-making process and the extent to which the regulatory framework has to include and ensure procedural, distributive and environmental justice, protection of the right to live in a safe and healthy environment, protection of property amongst others as discussed in Chapter 2. Early UK fracking policy protected local communities from environmental harm in the wake of seismic risk induced event but these were replaced with planning and pro-industry economic legislation that restricted community powers in the fracking debate decision making process thereby transferring the local

authority's power to the national level. Thereby increasing environmental risks to the host communities (Cotton, 2017). The Principle of Prima Facie political Equality (PPFPE) addresses the interrelationship between procedural and distributive elements of environmental justice (Shrader-Frechette, 2002). Shrader-Frechette's deduced that informed consent and threats to equality are two factors that disrupt environmental justice. Tawonezvi (2017) suggests that impacts of shale gas developments can devastate communities, thus, regulations should not devolve to the developers themselves and that countries should therefore take a more precautionary approach in order to protect their citizens until the national law and international law meets the standard of regulation fit for purpose.

The findings from this study suggest that institutional arrangement and policy are seen as hindrance to UOG development in the UK. In practice, the designing and planning processes are highly debated and the prospect for UOG development remains to be highly politically influenced in the UK. This was suggested by one of the research participants:

"So I think if I remember correctly, the UK government took decision that it would essentially go back to state and essentially, matters of consents in planning are devolved to local authorities after to improve planning consent. But of course, ministers both in Scotland and the UK level, do have an overriding power over planning applications power to call in applications and power to override local planning decisions" (FRAC007).

This deduction is further reinforced when interpreting why the support for unconventional oil and gas development in the UK is so low. Thereby indicating that there needs to be a meaningful understanding on how political decisions were made towards UOG especially in regards to energy policy making. This study also suggests the absence of an onshore regulatory framework to support UOG development in the UK. Regulatory framework serves as a legal requirement and foundation that institutes transparency and responsible management towards any innovation development by further providing institutional mandate, incentives, monitoring and lastly auditing (International Energy Agency, 2011). However, findings from this study also shows that as a result of the low support for fracking in the local communities, the UK government and the oil and gas companies have been met with protests from both the communities and some NGOs, which had led to power shift from the local authority to the national government.

Looking at the onshore wind farm planning regime, the UK government seeks to achieve a manifesto that provides local communities greater decision making power in determining onshore wind applications unlike in UOG applications. Therefore such onshore wind farm applications in England and Wales will require the developers to apply for planning

permission through the Town and Country Planning Act 1990 unlike in UOG where the developers have to apply through the national tiers of the oil and gas regulatory authority. In the case of UOG will be to apply to the relevant mineral planning authority (MPA) for planning permission in order to carryout any onshore oil and gas activities. The need to produce an environmental impact assessment (EIA) is based on the MPA. Should such activities be detrimental to health and well being, the developers will be asked to produce a health impact assessment and also to consult the Director of public health (UK Government, 2021).

One major problem facing the onshore wind farm development despite the high support is that there is a need for the UK government to set a long-term target for onshore wind farm building capacity. The developers here will have to demonstrate that the project will be sited within an area designated for wind development by the local authority within the local plan in the planning process. This will result to many parts of the country been unable to unlock their onshore potential because some of the local plans have a life span of 30years. There is a need for making use of the infrastructures that are presently in place, that way, since wind farms have a lifespan of around 20years, it will be better to repower and replace old machines with newer models rather than embarking on new projects. In the Net Zero strategy report, a target of 40GW offshore wind power by 2030 has been set but not much is said about onshore wind farm (UK Government, 2021). The maximization of both onshore and offshore wind farms will help the UK meet its net zero target on time. This shows that despite the high support for onshore wind farm, the government will rather put in more investments on the offshore wind energy since they hold the deciding power/authority when it comes to making new policies despite the government pushing for local communities participation and having more voice on local development (such as repowering the older onshore wind farm). The local community is given more power but the government is holds the deciding factors concerning such developments as in the fracking discourse. One of the research participants buttress this point in regards to the onshore wind farm application:

"*There has been a quite substantial shift again over the past five years or so, where localism is much more important, local decision making has become more important and has to be respected. And therefore, I think you've seen more of a tendency from governments to respect the views of local communities when it comes to controversial planning applications, and a reluctance from government ministers to intervene, where decisions are taken on very controversial matters that might be seen like this, that have a negative impact on our climate change targets" (FRAC007).*

7.2.2 The gap in the UK regulatory framework

This section discusses the UK regulatory framework and to what extent the Social License to Operate (SLO), accountability, inclusion in the decision making process, environmental justice are adequate to address the social, economical and environmental implications of UOG development in the UK. The United Kingdom's regulation for unconventional hydrocarbons falls under the legal jurisdiction of the conventional hydrocarbons, having limited consideration fro the unconventional extraction (Watterson and Dinan, 2020; Aczel et al., 2018; Hawkins, 2015). Watterson and Dinan (2020) further explained that although the procedures that provide guidance on hydraulic fracturing was updated in 2019, it still remains uncertain whether such are substantial enough policies that either leads to just meeting the minimum requirements or ticking the required box (es) for compliance sake.

There is a need for a more robust regulation to protect the rights of those living and dwelling in the areas proposed for UOG development in the UK. This is because the UK's regulatory regime consists of a process of check and balances to ensure that UOG extraction is strictly regulated and all negative impacts mitigated. This brings about the question of the effectiveness of the regulatory process (es). Partridge et al. (2017) also emphasised that in the evaluation of the risks associated with the UOG sites, the long-term impacts to climate change should be considered together with the responsibility of the current policy makers to the future generations to come. In the analysis of this study, some research participants were of the opinion that their consent was not given for UOG development within their local communities. This brings us to the concept of 'consent' that will be discussed briefly in the next section.

7.2.3 Concept of Consent

The impact of unconventional oil and gas development can devastate lives and communities, hence, the regulation should not be devolved to the developers themselves and that it is better for countries to take precautionary approach in order to protect their citizens until the time when both the national and international law meets the desired standard of regulation that is fit for purpose (Tawonezvi, 2017). This is because a regulatory framework should prioritize local communities, environmental health and environmental quality as wells as inclusiveness and fairness in decision making process and governance (Lockwood, 2010). As discussed previously, the UK is less likely to support citizens exercising their rights, while potentially preventing citizens from having their voices heard and undermining their right to protest (Bradshaw and Waite, 2017; Smith and Richards, 2015). Thus, making it less transparent when compared to the European Union regulation that emphasises the right to information

access in the decision-making process and public participation on environmental related issues (Bradshaw and Waite, 2017).

7.2.4 Change to UK Trespass law (Infrastructure Act of 2015)

The Infrastructure Bill received Royal Assent on 12th of February 2015, under the United Kingdom's governing coalition led by Nick Clegg (Liberal Democrats) and David Cameron (Conservative Party). Cotton (2016) explained that the main purpose of the Infrastructure Act was to encourage construction and economic development by simplifying the planning process. Before this Bill was passed, it was contentious as 99% of those who responded to include for input opposed a key element that changed the Trespass Law; which meant that companies that intended to drill for geothermal sources and hydrocarbons resources would no longer need to gain consent or request permission from the landowners (that is, to notify them before drilling underneath their land) when the drilling activity is at depths greater than 300m (Cotton, 2016; UK Infrastructure Act, Sections 43-48, of IA 2015). In Section 50 of the Act, it specifies that hydraulic fracturing be prohibited at depths less than 1000metres (UK Infrastructure Act, Section 50). This indicates that all mineral rights subsurface below all private property belongs to the Crown; and that all hydrocarbon companies holding licenses could legally frack under these homes without seeking permission from the homeowners. This marked a significant change to the UK Trespass Law, as previously, drilling was by mutual consent but this has changed and would benefit the onshore oil and gas developers over private citizens interests (Cotton, 2016). Also included in this Act, is the provision which states that companies who install infrastructure in deep level land also have the right to leave it there (likely to pose potential future risk and harm to lives and the environment) (UK Infrastructure Act, 2015, Section 44).

This justifies the fears and uncertainty posed by research participants in the study with regards to how the regulations affects their lives, environment and their communities, given the present moratorium that is in place in England and how by definition it still does not stop all fracking processes in the UK but only high volume hydraulic fracturing activities as stated below by some participants:

"…And the definition and the moratorium of the content, the fluid and the pressure, basically, within the Infrastructure Act. And it's not it's obviously restricted the industry onshore in UK is clearly has the, the big amount of gas, they think it's down and still, I still don't believe would have been extractable, you know, if they need to fracture, it's as simple as that they need to do fracking to get the gas out of the ground. The other technique; the

proppant squeezing the stylization. They are still worked under the radar, they're still happening. Still companies trying to do it. There's one 20 miles down the road talking about drilling 60 wells. I say it's not restricting all onshore oil and gas I suppose, it's just extract them restricting the specific high volume hydraulic fracturing". (FRAC011)

"So the definition means that you, you would have to, you'd know that you were doing hydraulic fracturing, because you'd have to set out to do it. You can't, the way the infrastructure act is, rather, should I say the way that hydraulic fracturing is defined in the infrastructure act, you couldn't do it by accident, you'd have to deliberately set out to do it. Because the volumes that you use and the way that you would do it, you would know for well, that you're setting out to do that. So that's what I mean by hydraulic fracturing. The government effectively set a rule that said that operators can only get permission to do hydraulic fracturing, if they can demonstrate beyond all reasonable doubt that they will not cause seismic activity, they will not cause seismic events. Well, that that slight scientist, somebody will prove to me that the sun will rise in the east. It's just not feasible to do. You might as well just turn around and say, its banned, simple as that. But anyway, that's not science, that's politics ". (FRAC005)

At the initial stage when the Law was proposed in the speech delivered the Queen, it was stated that the decision on changing the trespass laws would be " ...dependent on the outcome of …consultation" (Cotton 2016, p. 195). Following the consultation, the former DECC received 40,647 public responses, with 99% opposing the change, where they also discounted the majority of the responses calling them organised responses, which they claimed did not answer the question but rather gave general components that opposed hydraulic fracturing. From the 4,065 validated comments 92% still opposed the change in the law (Cotton, 2016; DECC, 2014). This can further demonstrate that despite the demonstrated opposition from NGOs, local communities, the government still retained the controversial provisions and passed the Bill, which was described as lacking democratic legitimacy, generating noteworthy democratic deficits in planning policy and ignoring consultation responses Cotton (2017).

7.3 The factors that hindered unconventional oil and gas development in the United Kingdom

This section focuses on the factors that hindered UOG development in the UK and how these factors affected the decision on the exploitation of the onshore oil and gas industry. Such factors includes the level of stakeholder management that took place, and the issue with best practices from other experienced onshore oil gas industry from other countries.

7.3.1 The level of stakeholder engagement within the development of UOG in the UK

The discussion in this section focuses on the participation of stakeholders in the decision making process in the United Kingdom in relation to UOG development. A typical example here would be in Lancashire, one of the proposed fracking sites in Northern England and within the scope of this study. Leigh Day (2015) explained that the permitting process is quite complicated as it requires multiples steps, which includes:

- *Issuing of license by the Oil and gas Authority (OGA)*
- *Environmental impact assessment*
- *Landowner's lease/consent,*
- *Local planning authority permits,*
- *Health and Safety's well design assessment*
- *Risk assessment of design and protocols for induced seismicity*

The company then receives the environmental permit, from the Environment Agency (EA), for the exploratory activities after going through the permit process. Most of these proposals to frack at these sites remained controversial as the communities escalated their fears due to the risks to their health and the environment, which also included potential damage to water sources and quality in such countryside region, threat to their way of life, threat to tourism, increased traffic due to heavy vehicles plying these country roads and potential for induced tremor/earthquakes. Following these, the oil and gas developers need to seek approval from the local planning council; which is where the problem lies. The local councils consist of democratically elected local residents, who are charged with the sole responsibility to represent the local interests. Hence they could either approval or deny such permits depending if they are beneficial or would cause potential harm to their way of life and environment. In the case of such places as Lancashire, the County Council denied the permit requests, citing increased noise pollution and traffic as the main reason for denying the permits. This was further called local democracy (Bradshaw and Waite, 2017; BBC, 2016).

Harrabin (2015) explained that local planning procedures existed for the sole purpose to ensure a thorough and detailed consultation with communities before any fracking permits are granted or issued. This is to ensure that all the stakeholders participate and are fully engaged on the matters within the communities and their way of life. The local communities were concerned over the potential impacts of fracking; the reason was reflected in the denial of the permits to the oil and gas developers. While the UK government was in support of fracking, stating that it is for economic benefits, energy security and job creation (Bradshaw, 2017; Schaps, 2017). Following the denial of the permit by the County Council, in October 2016,

following a public inquiry, the then UK Secretary of State for Communities and Local Government Sajid Javid overturned the Lancashire County Council decision (Bradshaw and Waite, 2017; Halliday, 2017). Following this decision, the Lancashire County Council in response stated, "local democracy is dead" and that there is no social license to proceed with fracking in their community. Further insinuating that it is unacceptable for an industry that has been rejected at every level but seems to believe that they could inflict or impose itself on an unwilling county. Which makes it neither acceptable nor right and is definitely undemocratic (Bradshaw, 2017; PNRAG, 2016). This was also emphasised by research participants in this study

"Well, I was never consulted about whether fracking should be brought to my area at all. It was just, you know, got to hear what was planned. And we, at every level of local government here from Parish council up to County council, we rejected it. And as I said earlier, we were overruled by national government, despite the fact that they'd said that they were very keen on local democracy, clearly, clearly that wasn't provided consultation". (FRAC003)

"Well you have to understand that in North Yorkshire the economy relies on tourism and agriculture; both incompatible with fracking. So it threatens everything. The fracking industry would have been destructive in every way. Socially communities were divided by misinformation. The stress makes it so impossible to forget, the question of fracking is always hanging over everything. Environmentally it would have been ruinous". (FRAC019).

i. Public engagement on UOG development in the UK

A key aspect in this research study is the level and kind of public engagement platforms utilised by the UK government relating to decisions about hydraulic fracturing at the proposed local communities for UOG development. The DECC (now the department for Business Energy and Industrial Strategy; BEIS) conducted quarterly face to face, national in home surveys of adults 16years and above since 2012 with the aim to determine the income level/social status, gender representatives, and geography (UK BEIS, 2019b). Also, to collect information on the publics attitudes toward s radioactive waste, renewables, shale gas just to mention a few (UK BEIS, 2019b). For the purpose of this study, the BEIS September 2019 (wave32) used a random sample of 4201. But significantly, with each survey undertaken, there has been a rise in the opposition to fracking (44%) (BEIS, 2019b). Back in September 2014, only 27% were opposed to fracking, while 26% were in favour but in September 2019, the number of those opposed to fracking had increased to 44% and only 11% showing support

to fracking; while those that neither supported or opposed fracking remained constant (UKBEIS, 2019b). Based on Short and Szolucha (2017) analysis, members of the one of the proposed fracking sites communities suffered a range of social impacts due to lack of public engagement in the decision making process of UOG in their community. This included detrimental health effects even before the drilling activities started, anxiety; as many residents felt their voices were not heard on the issues affecting their communities and reported a lack of fairness in the decision making process (Szolucha, 2016).

Short and Szolucha (2017) study have shown that the proposal of shale gas operation and activities is enough to cause mental health impacts that include stress and anxiety. The lack of public engagement by the UK government in the decision making process has generated the perception that the local communities continues to mistrust the UOG industry as a result of lack of procedural justice and distributive justice (elements of environmental justice) (Shrader-Frechette, 2002). This was discussed earlier in Chapter 3.1.2 of this study on how lack of public engagement has resulted to environmental injustice and participative injustice, which undermines Shrader-Frachette's PPFPE (2002). This has further worsened over the years that led to the moratorium in England. Research participants within this study are of the opinion that they were not involved in the decision making process of UOG activities in their communities as described below

"I knew nothing whatever about fracking until in 2014, two young ladies knocked on my door. And, and a nice glossy leaflet looks with Cuadrilla. And said, they were from Cuadrilla, who were going to start drilling and fracking fibregrid metres from my house. And if I wanted to know more about it, there was a meeting at three o'clock that afternoon. Well, bearing in mind this was at 10 o'clock and, it was a weekday morning. Obviously, a lot of people were out at work or whatever, and certainly wouldn't be able to get through the block. The meeting at three o'clock was a bit of a faff to be honest with you; because none of us knew anything about fracking really". (FRAC002)

"I think I think I think there was actually very poor information. That means that when the Scottish Government or when the Energy minister or when any kind of public body tries to talk about it, they will be met with they will be met with opposition in the media, they will be met with opposition on social media, public meetings, if public meetings are or even organised, they will be they will be stacked with vested interests. So I think I think there's, it's wanting to talk about the platforms or the avenues for discussion and for information

exchange, but when that those platforms and those, there's opportunities for information exchange, also heavily manipulated and controlled by the oil and gas companies, as we know, they have been, I think, I think there's a huge there's a huge problem there". (FRAC010)

"Well in the beginning it was done by instructing local government that they had to be supportive. So it was hard to fit against development because all the conservative politicians were in support of it. All the supposedly neutral bodies like Public Health England were facilitating fracking. Then towards the end national government was making statements and putting out propaganda about how we needed fracking. But they never said anything about the risks, only made up benefits". (FRAC019)

From the discussion, it can be seen that victims of unequal opportunities for participation are most likely to be powerless, violent, marginalized and exploited. In order to ensure participative justice, one has to follow PPFPE on environmental related decision-making process in regards to giving fair and equal weight to all the stakeholders or expert during deliberations processes. The National Research council (NRC) report of 1996 articulated that there is a need for such a balance in order to offset all the private interests associated with environmental related matters (National Research Council, 1996). In order to achieve participative justice and promote public engagement in environmental decision-making process, "scientific proceduralism" is required. That is, a methodological, legal and procedural reforms that would encourage negotiation, debates about environmental policy controversies, stakeholder funding, and experts assessments. This would guarantee all the stakeholders equal decision-making voice with experts on issues relating to consents and compensation (Shrader-Frechette, 2002).

7.3.2 The issue with best practices from other fracking Countries

The United States (US) has significant shale reserves with potential for commercial development (Mohtar et al., 2019; Rabe, 2014; US EIA, 2011). In comparison to the United Kingdom, the US has much experience with unconventional oil and gas extraction: using experimented ways to stimulate oil and gas flow by artificial fracturing of the shale rock since 1940's (Rattle et al., 2020; Solarin et al., 2020; Lim and John, 2020; Cahoy et al., 2013). This has been discussed extensively in Chapter 1. The extraction of UOG involves a complex technical set of processes that are conducted at various stages that leads to potential risk to public health and the environment and disruption of the way of life the community members at all phases of UOG development (Johnson et al., 2020).

The UK is characterised by an asymmetrical devolution (England, Scotland, Northern Ireland and Wales), which means its different territories are accorded different powers. In each case, the land use planning also operates within its devolved power. The Scottish National Planning Framework (NPF) acts as an instrument that guides planning decisions in sectors such as economic development, regeneration, energy, environment, climate change, digital infrastructure and transport. The Scottish government has limited powers in its ability to borrow directly on capital markets to fund infrastructure projects. At such, the UK parliament at Westminster's retains the power on some key policy areas like taxation, energy and airports. Hence, energy policy and the control of the National Grid are not devolved matters, thereby resulting to power contention between the UK and the Scottish government because of the Scottish National Party (SNP) support for renewable energy and rejection for nuclear power. After the Scottish referendum in 2014, planning related activities like energy policy (including a ban for shale gas) was passed.

While in Northern Ireland (NI), the responsibility for the regional significant planning applications is held by the NI Executive. Back in 1960, planning powers were stripped from the local authorities and they were left with only consultative role. In 1992, the local plan preparation, development control and enforcement were given to the NI Department of the Environment. Although the process to reform the system has been slow, the devolution of the planning powers to NI local authorities appear to be challenging. Furthermore, it needs capacity building and a culture change. In 2015, a new strategic policy statement for NI was agreed upon, and it sets out the planning policy objectives for the securing of any land in NI under the new reformed two-tiered planning system which involves the strategic framework for local development plan preparation include shale gas (NI DOE, 2015).

In Wales, the Government of Wales Act 2006 increased powers of the Welsh Assembly in 2014 and advocated a reserved power for Wales that will offer more consistency and equity across the devolved nations in the UK. This will also support the devolution of certain borrowing powers; certain tax and lastly some planning powers to allow the Welsh Assembly manage certain natural resources in a more efficient way. Thereby recommending that all planning consents of both renewable and non-renewable below 350MW be devolved and that the UK government will have statutory responsibility of considering the Welsh planning policies when exercising its duty for bigger projects (Wales Office, 2015).

Lastly, England is the largest country in then UK compared to the other three constituents. The spatial planning system established by the previous Labour government in form of regional development agencies and regional spatial strategies was abolished by the new Conservative government (Rozee, 2014). Whereby newly instituted non-statutory local enterprise partnership brought both private and public stakeholders at a local scale in order to improve local economic growth (Pike et al, 2015). In 2015, tension arose from the promise of

the government to take localism agenda and decentralization further, that is, giving more power to local authorities and communities over local development. While on the other hand, the top-down pressures of the central government to local authorities to accept new developments at all costs and release planning permits for exploration of technologies like fracking and housing developments (HM Treasury, 2015). In retrospect, devolution in the UK occurs within the context of territorial politics where the power to allocate land use for the development of new technologies is critical. Thus effective policy planning practice rests not just on the deployment of technical skills but also on the knowledge on political economy of both local and regional growth and development.

In terms of a comprehensive regulatory framework, the United States does not regulate its industry at the national level or manage the impacts but just like the UK, it regulates its industry under various levels of legislations with policies that are developed for conventional oil and gas industry with some amendments (Esterhuyse et al., 2019; Mayer, 2019; Murtazashvili and Piano, 2019; Webster et al., 2019, Warner and Shapiro, 2013). Just like the United Kingdom, this would led to gaps in the United States regulatory framework for UOG industry posing risks to public health and the environment (Esterhuyse et al., 2019; Warner and Shapiro, 2013). In the US, some states banned hydraulic fracturing despite the permission granted by the practice of their state as a result of the US regulation that allows for the discretion of such individual states and communities to take such decisions on matters concerning their communities (Aczel et al., 2018; Gorski and Trenorden, 2018: Raber, 2014. The US usually conducts Health impact assessment and environmental impact assessment mostly at the proposed fracking sites (e.g at the Marcellus shale development in New York and Monterey shale development in California). The social impact assessment and the sustainability indicators were not conducted at these sites. Forsyth et al (2010) describes some comparison of UOG processes that is required to evaluate human and environmental health as seen below:

- Health impact assessment

Scope: This measures the plans, policies and projects at a variety of scales

Content: This focuses on both the wide range of issues related to human health and others the narrower range that are evidenced-based

Outcomes: Public awareness and engagement in decision making about health issues, communicating these and all mitigating measures to all the stakeholders.

- Environmental impact assessment

Scope: This measures the plans, policies, projects and programs while measuring the impacts of large projects that pose significant effects

Content: This focuses on both the wide range of issues related to human health, natural and built environment, environmental sustainability, social environment, economy and cumulative impacts

Outcomes: Public awareness of environmental impacts, changes or abandonment of projects, increase in perceived environmental quality and implementation of mitigation measures.

- Social impact analysis

Scope: This measures the plans, policies and projects that are conducted a at a different jurisdictions

Content: This focuses on community and institutional structure, population characteristics, community resources, political and social resources, individual and family change.

Outcomes: This results to extensive public engagement, provision of information to help marginalized groups during negotiation and changes or abandonment of projects.

- Sustainability indicators

Scope: This measures the impacts of integrated projects, plans, policies and programs that are conducted at various jurisdictional levels by either a non-profit organisation or a local government

Content: This focuses on the economic, environmental and social aspects

Outcomes: This provides information to help implement and take decisions to make changes to a policy or program and also increases awareness of environmental issues

Looking at the above assessments processes both the United Kingdom and the United States, there are deficit of some of these assessments when it comes to unconventional oil and gas development. Looking at the locations cited as examples in the US, the UK government and oil and gas companies have been speaking about emulating the best practices from the US to promote the onshore industry in the UK before the moratorium.

The US regulatory regime was discussed earlier in Chapter 2 and it has been significantly highlighted that the environmental impact assessment (EIA) process remains a very vital process in the evaluation of the safety of extraction and other developing technologies and further plays the role of determining the direction of the policy and regulation but if not applied fairly and justly, it can result to power imbalance even in very robust frameworks (Russo and Carpenter, 2019; Aczel and Makuch, 2018,; Warner and Shapiro, 2013). Furthermore, the variability in the various states regulations and authority/power given to states to be able to decide the scope of their own independent assessment procedures and also the level to which the public is engaged in the decision making process also poses a risk to

successful regulatory robustness that can lead to potential environmental, agricultural, water source and human health harm (EIA, 2018; Aczel and Makuch, 2018).

In California, approval of permits have been suspended pending reviews expected to be completed in 2020, although new permits began to be issued again just before the COVID-19 pandemic. Bacher (2020) and Beam (2020) informed that in November 2019, the California Governor Gavin Newsom halted approval of new fracking permits until, the projects can be reviewed by an independent body of scientists to ensure standards for the protection of environment, public health and safety were being met. Lawrence Laboratories conducted the review in Spring 2020, and 24 new permits were issued in April while 282 are still awaiting review presently. While also in the same year 2020, New York confirmed the ban on fracking through legislative action despite their many years of experience in this field. The New York Governor Andrew Cuomo made the 2015 ban permanent through the vehicle of the 2021 budget cycle (NY Office of the Governor, 2020) as seen below.

" The New York State legislature permanently banned fracking in its Fiscal Year 2021 Budget yesterday-one of seer budget items that prioritize the health and future of New York's people and environment. This measure comes five years after Governor Andrew Cuomo initially banned fracking in New York State, which while monumental, was accomplished through executive action, leaving it vulnerable to jettison by future governors. Codifying the ban makes it permanent, protecting generations to come". -Guerrero, 2020

It can be seen that the issue of environmental impact assessment with limited public engagement and limited scope is relevant in the UOG regulatory framework/regime in the UK as it also depicts that lack of robustness and effectives of the regulation, even in situations where such an assessment process in necessary and mandatory in order not to put the proposed local communities lives and environment at risk. Even the topography and geology of the US is very different from that of the United Kingdom and remember the proposed fracking sites in the UK are small closely lived communities with agricultural farmlands not situated for such UOG activities compared to the areas mentioned in the United States. This shows that sometimes, learning from best practices or lesson learnt from other countries might not be the best solution at all as nothing remains constant with regards to any technological development.

7.3.3 Synthesizing the discussion findings

This research adopts Cotton (2017) study on fair fracking using Shrader-Frachette's Principle of Prima Facie Political Equality (PPFPE) as a yardstick for addressing environmental justice

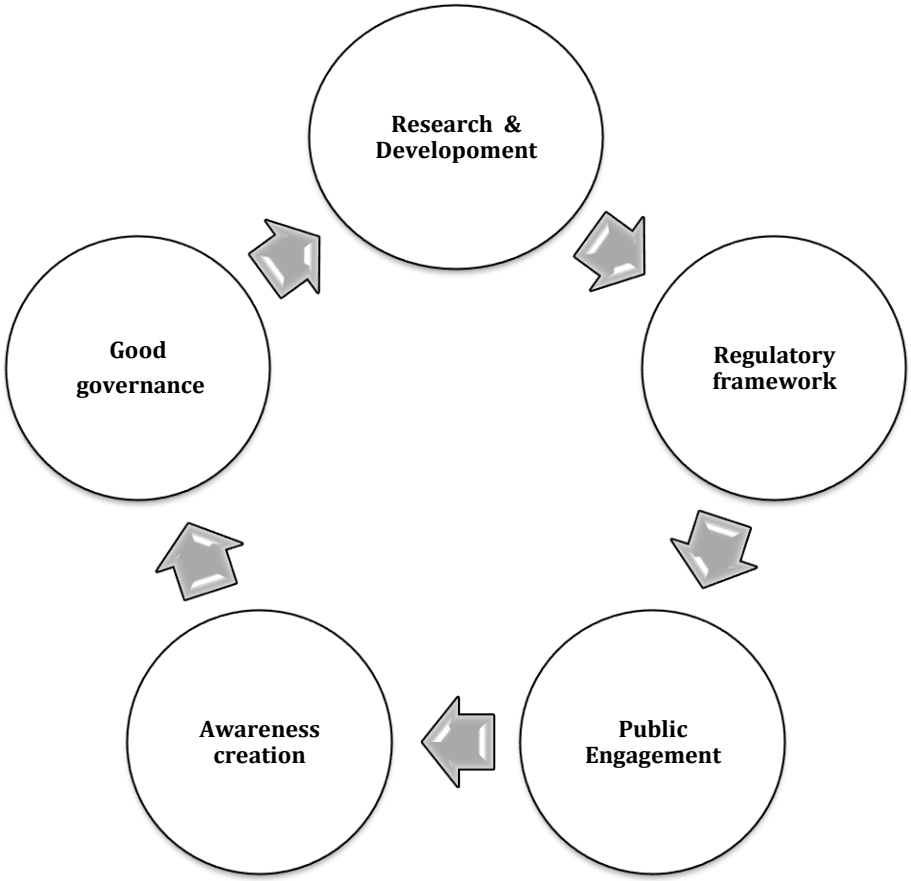
with concerns on how lack of public engagement has affected the decision on unconventional oil and gas development in The United Kingdom. This enabled the researcher to identify the critical success factors to be considered on the social, economic and environmental feasibility of extracting UOG in the UK. This research has adapted PPFPE having noted the prevailing discussions concerning fracking in the UK:

1. The motive for unconventional oil and gas development in the United Kingdom
2. The mechanisms that hindered unconventional oil and gas development in the United Kingdom
3. The reflection on the decision making process in the UK
4. The prospective transition towards renewable energy net zero carbon emission in the UK

It is clear that it is necessary to examine UOG development in The UK beyond the narrow definitions of energy security, economic boost and job creation but also to focus on positive and negative socio-economic, socio-cultural and environmental effects to the local communities and lastly to the involvement of all the stakeholders in the environmental decision making process. Sovacool (2013) explains that the concept of environmental justice and energy includes both academic analysis of environmental rights, grassroots political activism, racism, classism; the fair and equal distribution of risks and benefits and lastly the protection of sociocultural, place identities, political and community voice (Agyeman, 2005; Schlosberg, 2007). It can has been noted from the discussions with participants that except the mechanisms that are hindering UOG in the UK are addressed, the innovation and introduction of any technology would also continue to face setbacks and opposition no matter the industry.

Therefore, it is vital that the critical success factors constitute the building blocks of any new technology or project because it has the potential to facilitate the acceptance and implementation of such technology or project. Five critical success factors were identified in this research study: Review of the regulatory framework for UOG; research and development, public engagement; good governance and awareness creation. These critical success factors should all feed into one another to ensure socio-economic, political and environmental fairness in the decision making process in the UK if the moratorium is lifted in future.

Figure 27 Critical success factors for UOG development in the UK



Source: Author generated

7.4.1 Review regulatory framework for UOG development in the UK

There is a gap in the UK fracking policy as been discussed extensively earlier in this Chapter 7.2.2. From the literature review as well as in the collated interview data, there are some factors that impact decision-making process for UOG in the UK. These includes public engagement, access to information, transparency, inclusiveness in the policy decision-making process. The Principle of Prima Facie Political Equality (PPFPE) was used to evaluate the UK's fracking policy, regulations and planning developments. Shrader-Frechette (2002) explains that the government and industry have to fulfill both the participative and distributive elements of environmental justice in order to provide ethical legitimacy to the decision making process for an environmentally damaging industry like UOG. Such evaluation is necessary for such a contestable industry. It was gathered from the interviews that when the first tremor was experienced at Blackpool years ago, the UK halted all fracking activities until these UOG developers could show that they could undergo fracking activities without causing seismic (OGA, 2019). Following that event, once seismic risk protection reassurance was provided to the UK government, fracking operations began on the site. The

UK government without consideration of all other environmental impacts like, air pollution, water pollution, soil pollution, noise pollution, climate change etc, allowed the fracking exploratory activities to continue by defending the UK regulatory regime as been very stringent (Cotton, 2017). After the second tremor, a moratorium was put in place in the UK till date. The Conservative government preaches about empowering communities to make decisions that affect their communities on the surface, it has similarities with the Shrader-Frechette's PPFPE but in reality, the local planning procedures consist of a complex layer of contradictory injustices (Cotton, 2017). As the regulators in the national level have to take decision grant permissions before going to the local county authority. In which case, we have seen from what happened in Lancashire in the past where the former Secretary of State Sajid Javid overturned the fracking judicial ruling. A review to the present regulatory framework needs to be address if there is going to be any prospects for UOG development in the future; that is if the moratorium is lifted.

7.4.2 Research and Development

Most of the conversation about unconventional oil and gas has focused broadly on whether it would provide negative or positive impacts as opposed to how to manage certain stages of the development (Boomberg, 2015; Wagner, 2015). When it comes to UOG, the UK is still quite inexperienced when compared to countries like the Unites States (US) that have been performing this operation for years. As a result, the evolution of UOG appears to be in its early stages in the UK, thus, the onshore industry in the UK can learn from the US. In the UK, the science of hydraulic fracturing seemingly looks sounds; as the problem appears to the public understanding of the technology and acceptance of this renowned science (Stedman et al., 2016). One of the key roles of the UK Office of Unconventional Oil and Gas (OUGO) is to help people understand the facts about UOG and it's implications in the UK.

In this research study, it was observed that the knowledge and support for hydraulic are two different entities as noticed during the data collection phase of the study. The responses from the interviews conducted, academic papers, anti-fracking petitions and government reports revealed that most of the local communities who knew nothing about fracking before it came to their doorsteps have become very knowledgeable about the technology now. The fear of the risks and negative impacts of UOG made these local residents seek to acquire more knowledge and information in order to protect their way of life. It was observed that despite the information they had about UOG, there appears to be a gap showing scientifically proven evidenced based facts about the impacts of UOG to public health. Remember the fracking activities that took place in these local communities was only at the exploratory phase, which

is not enough to justify what would be the outcome if the fracking activities had gotten to the production phase. Recently in year 2021, the US with their years of experience with hydraulic fracturing method, have banned fracking in some of its states (e.g. in Denton city as previous discussed in Chapter 3) but permits are still been issued (especially in Texas). This makes one wonder if research is ongoing in the background about alternative new methods been developed for onshore oil and gas extraction.

If the UK government decides to move on with UOG development after lifting the moratorium, more research and development needs to be invested on and undertaken into alternative method of extracting onshore oil and gas in a safe manner that would not be detrimental to lives and the environment. The research participants in the study stressed the importance of gas in the energy transition mix. If the UK is to meet its Climate Change goals of net zero carbon emission by 2050, more investments needs to go into research and development and strategic plans like the net zero strategy if the UK is to become more energy independent, sufficient and sustainable.

7.4.3 Public engagement

Public engagement should form the basis for any policy decision-making process. In this context, the UK normally observes a period public consultation in the development of a new policy or legislation (Consultation Principles, 2012). Following that, the feedback received from the consultation process informs the decision or policy that would be arrived at. Garniati (2014) explains that in order to introduce an appropriate technology, sociocultural acceptability, technological and institutional feasibility, economical feasibility, and environmental acceptability must be taken into consideration. In the development of unconventional oil and gas in the UK, from the initial stage to the final stage of activities, public engagement must be part of the process. This would involve community participation at all stages not just at the developmental stage but also at the delivery stage and decommissioning stage. UOG development in the UK suffered setbacks, protests and oppositions due to lack of public engagement in the decision making process. Furthermore, the lack of opportunity for community consultation and public involvement in the developmental activities and decisions together with regulatory bodies not acknowledging the elected officials and not protecting the interest of the local communities resulted to conflict of interest (Cotton et al., 2014).

Recent events in the UOG industry reiterate the need for a shift towards greater inclusion and public engagement of the local population especially when introducing new policies and technologies. Cotton (2016) argues that when looking at decision-making process in local

communities, there appears to be a complex politics of localism. In order to understand this complexity, it is better to incorporate multi-stage dialogue with the various community groups in order to enhance procedural justice of public engagement in the decision making process. Thus providing a mechanism for understanding the specific priorities and values of these communities, which also helps to provide good governance if a policy or innovation is to be successful within such communities.

7.4.4 Good Governance

This section examines the decision making process applied to unconventional oil and gas development through the lens of a good governance framework to address why fracking faced so much opposition in the past and also to emphasise its importance as one the critical success factor if the moratorium were to be lifted in future. Lockwood et al (2010) explained that governance can be employed in different ways, from how local decision making and rule enforcing mechanisms, national frameworks of law and policy, to how industry manage their responsibilities. Unconventional oil and gas development in the UK has been a contested technology for quite some time until a moratorium was arrived at. Lockwood's (2010) principles of good governance provide a roadmap for a more inclusive and fair mechanism for engagement. This principle of good governance consists of seven indicators, which includes accountability, transparency, inclusiveness, fairness, legitimacy, connectivity and resilience (Lockwood, 2010).

Table 16 Lockwood's seven Principle of Good Governance and Indicators (Lockwood, 2010)

Principle	**Indicators that the principle is present**
Accountability	*Is there a clear responsibility for governance actions and decisions?*
Transparency	*Is the decision making process visible?*
Inclusiveness	*Is there meaningful opportunity for stakeholders to engage in governance processes and decision-making?*
Fairness	*Are all stakeholders' opinions of value equally and power fairly distributed?*
Legitimacy	*Does an actor or organisation have authority to govern?*
Connectivity	*Are there communication, connection and coordination among all governance actors?*
Resilience	*Do governance's actors have the ability to maintain relevance of the governance processes and actions under changing conditions?*

In order to address this, this study looked at the storyline surrounding UOG as discussed in the earlier Chapters 2 and 6 to evaluate and analyse governance in unconventional oil and gas development in the UK using Lockwood's (2010) seven principles of good governance indicators. It can be seen from literature that lack of good governance resulted to the rise in opposition for UOG development in the UK. Thus good governance is a critical success factor for UOG industry going forward.

Table 17 Lockwood's (2010) Principles of good governance and the observed research outcomes

Principles	**Observed research outcomes**
Accountability	*Lack of accountability by the oil and gas companies, regulators and the complex nature of the Trespass Act 2015*
Transparency	*UK government not sharing information about the potential risk, benefits and fracking activities*
Inclusiveness	*Lack of meaningful local community participation in the decision making process*
Fairness	*Community perception that decisions are top down approach*
Legitimacy	*National government ignored local council planning authority decisions and overturned judgment*
Connectivity	*Oil and gas companies did not integrate with the local communities in the decision making process*
Resilience	*Local community still suffering from Post Traumatic Stress Disorder (PTSD) and community is still divided and trying to heal*

Source: Author generated

7.4.5 Awareness creation

Public aware is dependent on how the stakeholders are managed. First will be to identify the relevant stakeholders that are to be engaged, which in turn will be beneficial to the overall success of UOG development. Stakeholders in this study includes the members of political

parties in Parliament, oil and gas companies, Non-governmental organisations, Regulators, civil servants, and Scientists. Each of these stakeholders will usually have a certain degree of knowledge and perception of the fracking discourse. Some research participants in this study had no knowledge of the fracking process but still had a perception about the method; just from what they heard and seen in the media or hear say. In the introduction of any new technology, awareness creation is important, so that when decisions are to be made concerning such technologies, individuals will speak from a place of an informed perspective. Findings in this study showed lack of information sharing, timely information, and how information concerning UOG risks and benefits were communicated to be one of the decision setbacks that resulted in the opposition for UOG development in the UK. Awareness campaigns should be promoted just like the politicians practice during election campaign season and should be emulated when introducing a controversial technology like fracking in future. It was noted that when organisations/companies carry along the local communities in the early stages of any development, it could save such organisations or government future problems as experienced in the UOG industry in the UK. This gives the local community a sense of belonging in such projects or developments.

7.5 Chapter Summary

This chapter discusses the themes that need to be reflected upon on UOG development discourse. This includes the policy narrative surrounding UOG, the level of stakeholder engagement and lastly the factors that hindered UOG development in the UK. It was also identified that the absence of an onshore regulatory framework did not help the support for fracking as deduced from the interviews conducted. The concept of a robust regulatory framework was emphasised upon, that would protect the rights of those residents living at the selected locations for UOG development. The chapter also identified the problems with best practices from other countries because the geological topography is arguably different, the regulations concerning the Environmental impact assessment will definitely be different because of this. Thus, learning from best practices from countries with more experience on fracking cannot be used as a reason for promoting fracking in the UK. Lastly, the chapter established the critical success factors for the implementation of new technologies like fracking. The next chapter is the last chapter of the study; it includes the summary, conclusions and the recommendations for practice.

CHAPTER EIGHT
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

This Chapter answers the research questions set out in 1.4 (i-iii). Furthermore, the chapter goes on to highlight the key contributions to knowledge and practice, and limitations of the research. The Chapter concludes with a set of recommendations as well as outlining future research areas.

8.2 Summary of research findings and addressing the research questions

This study aims to critically evaluate the planning procedures and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in England. In order to achieve this aim, the research questions were developed. The section below discusses the answers to the research questions.

8.2.1 Summary of the answer to sub-question one - The storyline for UOG development appear to have shifted from a local level to the national level. How did it influence the decision-making process surrounding UOG development in the UK?

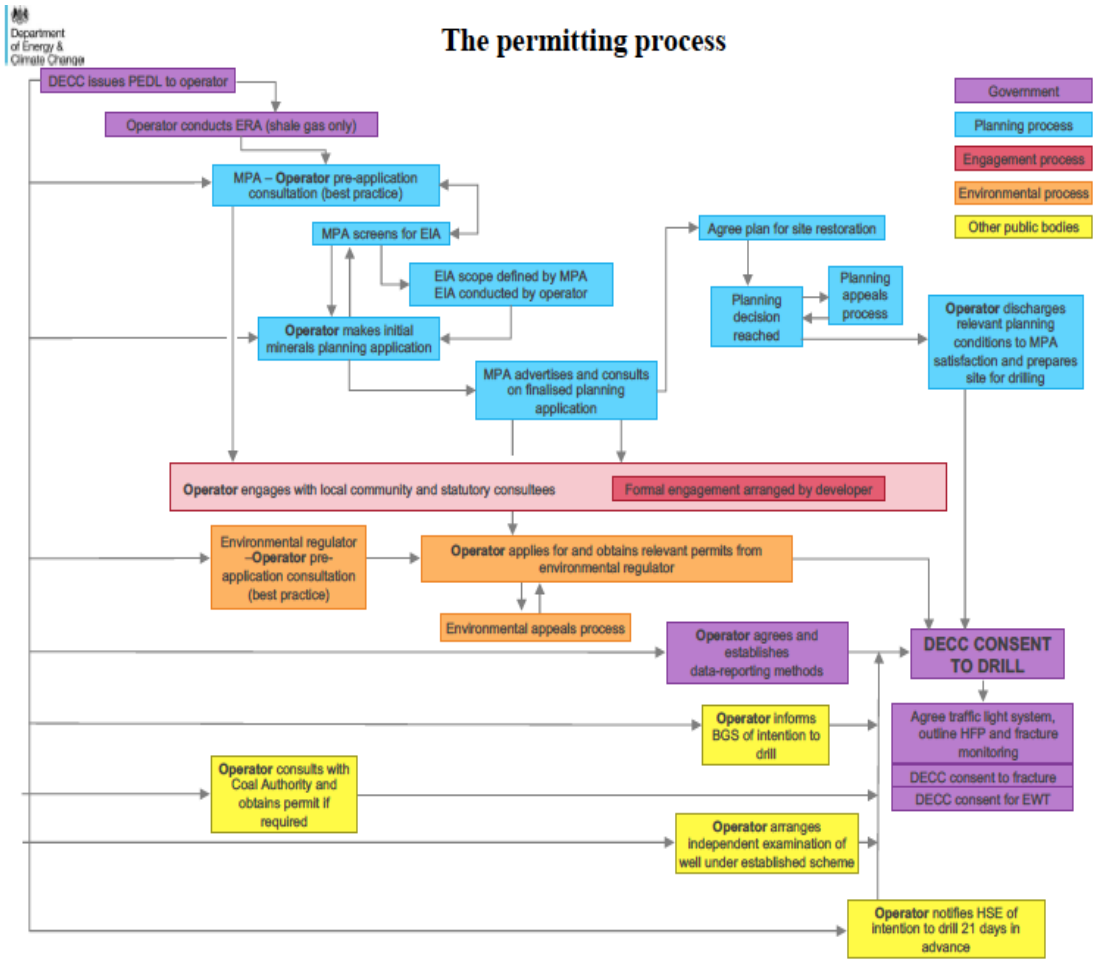
This study revealed that government interference at the national level has a significant impact on the fracking decision-making process in the UK. The former Conservative Party Prime Minister David Cameron and Nick Clegg from the Liberal Democrats on February 12th, 2015 received the Royal Assent for the Infrastructure Bill. The passing of this Bill was contentious and a key element of the Trespass law was changed. The main purpose highlighted in the Infrastructure Act was to encourage economic growth and construction by simplifying the planning process (Cotton, 2016). The new provision meant that companies intending to drill for geothermal sources or hydrocarbons development would no longer need to request for permission or gain consent from landowners if the drilling activities was at depths greater than 300m and that hydraulic fracturing is prohibited at depths less than 1000metres (UK Infrastructure Act, 2015; Cotton, 2016). This meant UOG developers could legally frack under the homes of the local residents without the owner's permission. Cotton (2016) further explained that this showed a difference to the previous Trespass law which needed consent from the homeowner, thus, been beneficial to the government and industry and less beneficial to the home owner. Another provision in the Act is that UOG developers do not have to remove the structures that have been constructed deep land level (UK Infrastructure Act, 2015)

The research findings revealed that based on the Infrastructure Act 2015, the local community and authority are powerless considering the provisions stated in the Act. This reveals how power has shifted from the local level to the national level because according the Infrastructure Act; the Secretary of state cannot issue fracking consent until all the conditions have been met. Such conditions include an Environmental Impact Assessment (EIA) carried out by the developers as instructed by the local planning authority, groundwater assurance checks, and public notification of the planning application. This further reveals that there is no clarification as to who grants consent and if the consent specifically designated for the use of fracking needs to be stipulated in the application. A further argument can be developed in the absence of scientific data that does not give a clear understanding of the consenting parties and what conditions are to be met for consent to be granted. This shows that the residents of the local communities need to be well informed about the process, benefits, risks, inclusiveness, fairness and transparency in the public engagement process.

8.2.2 Summary of the answer to sub-question two - The UK National Planning Policy Framework (NPPF) entails achieving a set of objectives to ensure sustainable development while taking into account the local circumstances. How did this affect support for UOG development and its implications for granting planning permits applications and decisions?

This study revealed gap in the implementation of the planning application permits and how this has affected the support for UOG development discussion. The National Planning Policy Framework sets out the UK government's planning policies for England and it's application. It further provides a framework within which locally prepared plans for housings and other developments such as UOG can be produced (UK Government, 2021). The planning law requires applications for planning permissions to be determined with the development plan, thus, NPPF must taken into account when preparing developmental plan as it is a material consideration in planning decision making process (Town and Planning Act 1990). However, the process for drilling permission is the same for offshore and onshore (Hawkins, 2015) but the UK government introduces a number of procedures to ensure and encourage safe and environmentally friendly development of UOG. These plans focuses mainly on the planning side and do not crucially deal with the health and environmental impacts as can be seen in the NNPF description above (UK BEIS, 2019). Figure 28 below describes the permitting process within the limits of NNPF.

Figure 28 Permitting process for unconventional oil and gas



Source: UK DECC, 2015

In Figure 28 above, it can be seen that there are no human, animal, social, community or human rights assessment indicated in the permitting process. Remember, the proposed UOG development sites are located in the North of England, these areas are mostly countryside residential areas, with most of the income generated coming agriculture and from the heritage sites used for tourism.

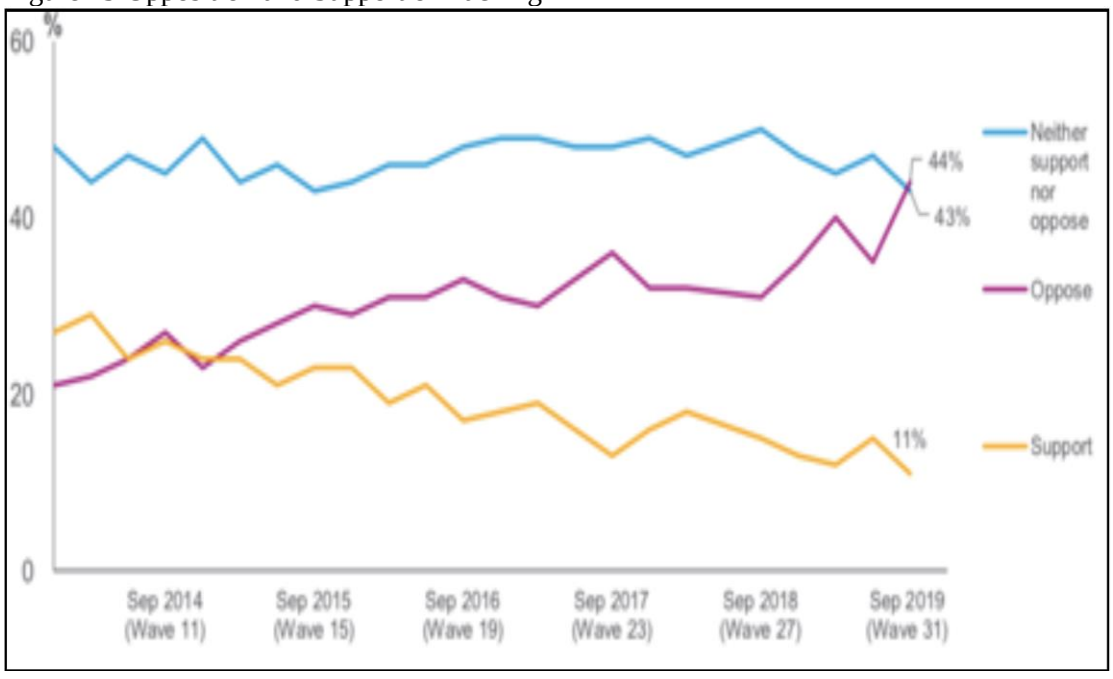
8.2.3 Summary of the answer to sub-question three - Does UOG development have a role to play towards the implementation of the UK's transition to Net Zero Strategy and its implications for meeting the climate change target of 2050?

This study revealed that with moratorium still in effect in UK, and the climate change conference (COP26) that took place in October/November 2021, with a lot of discussions, new

agreements and commitments drawn up to reflect the climate change emergency. There would be developing policies and new strategies to tackle the climate emergency

The UK is still on track to meeting its climate change target of net zero carbon emission by 2050 as of the writing of the thesis, but what is the future for UOG in regards to this targets. This study revealed in Chapter 6 and Chapter 7, from the data collection process through the semi-structured interview conducted that the risk of hydraulic fracturing to the environment was mentioned over and over again in regards to methane gas emissions and its management during fracking activities. Fears arising from methane leakages, which can cause air pollution, they may affect human, animal and the environment. This resulted to oppositions and low support for UOG development in these communities. The Figure 29 below shows the opposition and support for fracking as at 2019 using data reported in wave 32 of the quarterly BEIS Survey. This is yet to be updated as Covid 19 pandemic struck in early 2019 and a lot of restrictions were instituted that would have limited the execution of another Survey. The March 2020 survey was ended earlier than planned for this reason, the sample size was also quite smaller than those of previous years and arguably not comparable.

Figure 29 Opposition and Support of fracking



Source: UK BEIS, 2019

Fast forward to the end of 2019, with the moratorium in place in England, the UK government is still on its transition journey to newer forms of energy. The year 2020 the world was struck with a global pandemic COVID-19, which is ongoing as at the time of the

study. The UK Prime Minister Boris Johnson has announced a Net zero strategy; build back greener. This is after the Ten-point plan, is said to have raised over £5.8billion of foreign investment in green projects since it was launched. It has created 56,000 high quality jobs since 2020 (UK Government, 2021). It is assumed that the new Net zero strategy is expected to build on the progress of the Ten-point plan to get the UK to meeting its climate change target of 2050 as mentioned by the Prime Minister Boris Johnson.

The discourse on fracking brought about so much opposition and protests as a result of the environmental risks associated with the technology that halted its development in the UK. To answer the research question (iii), an evaluation of the critical success factor associated with any new technology needs to be extensively carried out with effective public engagement at its core, in order not to repeat the same mistake like in fracking. The future of UOG is uncertain as the UK government is making investment for a greener future.

8.3 Research contribution to knowledge and practice

The contribution to knowledge from this research study is provided from two perspectives namely: theoretical contribution to knowledge and contribution to practice

8.3.1. Theoretical contribution to knowledge

In the process of conducting this research, various theoretical frameworks from various literatures were reviewed. Shrader- Frechette's Principle of Prima Facie Political Equality (PPFPE) was considered as an appropriate theoretical lens to guide this study. Within this study, less attention has been paid to how the implementation of a new technology may violate environmental justice and PPFPE (Shrader-Frechette, 2002). This can be seen in the fracking debate that took place in the UK and why there is presently a moratorium to fracking in England. PPFPE consists of two components as discussed in Chapter 3; namely distributive justice and procedural justice. While distributive justice is very vital in the road to achieving environmental justice, as it involves and requires a fair and equal distribution of environmental and technological risks and impacts. Ethical theorist defined justice in terms of distribution of either non-material goods (equal opportunity) or material goods (wealth). Justice is providing a standard means by which a society is able to assess the distributive aspects of its basic structure (Rawls, 1971). While moral theorist assume that the main difference between capitalist justice and social justice is in their principle of distribution (Nell et al. 1992). This bags the question on the principles that are necessary to address issues with environmental justice. It would be assumed that with all things been equal irrespective of geological location,

status, educated or non-educated; with all of these entities there should be equal distribution of the risks and benefits of unconventional oil and gas development in the UK.

Distributive justice alone is not sufficient to promote environmental justice. A rural community like Lancashire where UOG development was to take place resulted in resistance and protests from the local community. The local residents were concerned and agitated that they were not engaged in the decision making stage and process and no one had the right to deny the citizens right to evaluate and reject fracking activities in their communities which puts their every day life, livelihood and environment at disproportionate risk. Correcting democratic process and structures is a cumbersome task that is usually not completely successful, as it requires constant attention, reviews and updating (Walzer, 2017). Emphasizing further that the fact that a group of individuals are richer and has more power, does not automatically give them the access to dominate the other group of individuals. One way to break such dominance is to use the principle of participative justice to evaluate processes, procedures, social structures that result to flawed distribution. In trying to understand participative justice as part of PPFPE as a yardstick to illustrate why effective public engagement is necessary in policy decision-making process, one is trying to remove any unjust constraints that some group of individuals may have over the other. Thus, the research outcome has added further theoretical depth to the literature on the Principle of Prima Facie Political Equality on unconventional oil and gas development in the United Kingdom as it provided an understanding that when discussing PPFPE, in order to achieve the two element of both distributive justice and participative justice in environmental issues, a system that involves, methodological, legal and procedural frameworks that encourages public engagement, negotiation, public debate, dialogue, stakeholder funding for independent expert assessment should be developed and implemented.

The increasing global environmental challenges and climate change concerns cannot be disregarded and tackled in isolation from each other, as it involves complex interactions between such processes (Reed et al., 2018). Thus such complicated and controversial discussions like UOG require engagement with a conflicting group of stakeholders (Reed, 2008). A more participatory approach in tackling environmental concerns will reduce protects, conflict, promote inclusiveness, build trust, and facilitate learning among the public, all stakeholders, and help in implementing decision making in the long run (Derak et al., 2018; De Vente et al; 2016; Reed, 2008; Beierle, 2002). When public engagement fails, it results to what has been observed in the UOG industry in the UK, which resulted to conflict and lack of trust amongst the stakeholders. Redpath et al (2013) argues that lack of public engagement is when conservationists assert their interest to the detriment of others, which leads to many

conservation conflicts. This has led to the debate criticizing the energy policy decision-making process in the UK. Despite many different literatures citing the need for public engagement in various industries in decision making process, there appears to be a gap in knowledge on a theory that attempts to generalize and explain the reason why public engagement sometimes work and sometimes fails to achieve the desired goal (Kochskamper et al., 2016; Kok et al., 2009). Just as in the case of UOG industry in the UK, where despite the consultation process that took place, the local community's still feels their consent was not given or taken into consideration before permits were issued to the UOG developers.

The recent trend towards increased involvement of the public in the affairs and policy decision-making process has frequently been referred to as public participation (Rower and Frewer, 2005). In the UK, this trend has been quite apparent in both local and national government domains such as in energy policy making, land planning, transport planning, environment, healthcare etc (Bickerstaff and Walker, 2001; Martin and Boaz, 2000; Owens et al., 2020). There has also been an increased drive for public participation processes/techniques/instruments/mechanisms at various levels of involvement. To this end, the different processes or mechanism for promoting public participation results to uncertainty as to what level should public participation be engaged. One major outcome of this study is a modified theory, which suggests that public engagement can be enabled at various levels to suit any particular situation. Rower and Frewer (2005) explain that in the public participation domain, most of the key concepts are usually not well defined even after several decades. Even the concept of public participation is not well communicated, such that some researchers might disagree with the scope of activities explicitly or implicitly included within the concept by others. For example, public engagement or public involvement may be used in the place of public participation in some literatures. Public participation is a practice of involving the public in the decision making process of policy forming activities of government/organisations/institutions etc (Rowe and Frewer 2005). Such a definition is arguably too broad leaving room for different interpretation as the public may be involved at various levels or in different ways (Wiedemann and Femers, 1993; Neilken and Pollack 1979; Arnstein, 1969). This could either be the public been involved or by the recipient of information from regulators, or governing bodies, while in other instances, the public might be involved in providing input such as consultation process. While in other instances, the public might participate by been representatives in the decision making process itself such as been a member of an advisory committee.

Rower and Frewer (2000) further emphasised that irrespective of the instances for participation, there exist a flow of information between the public and other parties involved

(stakeholders), thus, concepts such as public communication, public consultation and public participation can be used to differentiate the participation initiative. These three concepts in combination can be referred to as public engagement, while the mechanism/initiative intended to enable one of the three form of engagement can be labeled appropriately (that is, communication, consultation, and participation mechanisms). Rowe and Frewer (2005) further described the three types of public engagement;

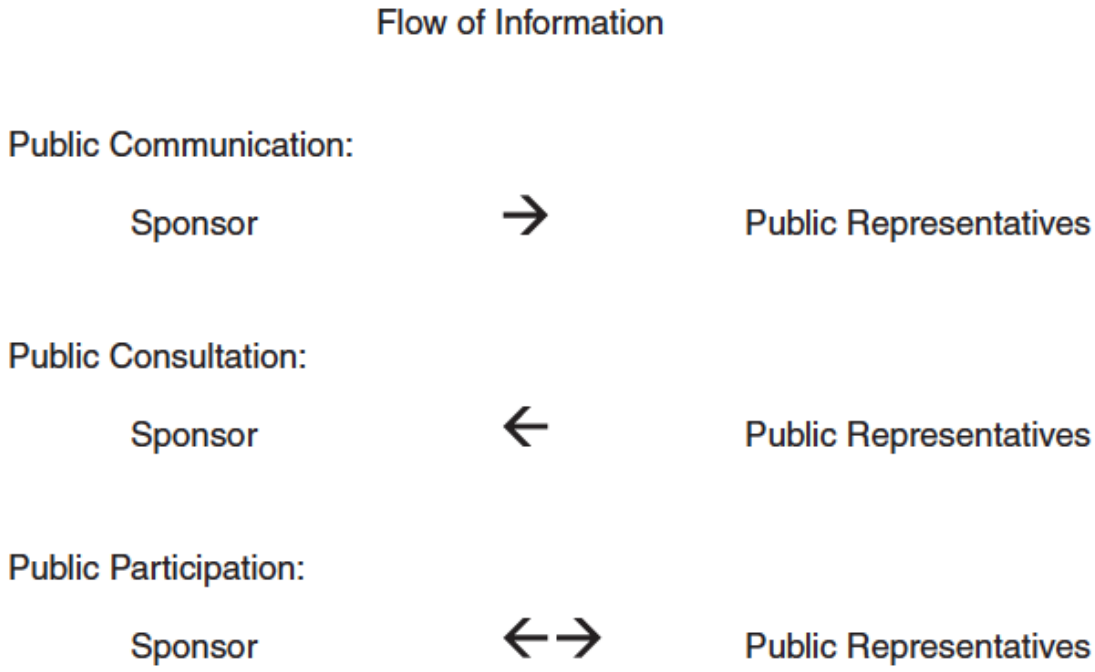
In *public communication*, information is transferred from the parties initiating the engagement activities (such as UK government, OGA, EA, BEIS, PHE, UOGO, unconventional oil and gas developers etc) to the public (local communities). The information flow here is one way; there is no involvement of the public in terms of feedback or contribution.

In *public consultation*, there is a transfer of information from the public to the parties that initiated the engagement activities. Such an engagement is to elicit the current opinion of the public on the desired subject area.

In *public participation,* there is an exchange of information between the parties that initiated the engagement activities and the public. This could be in form of dialogue, negotiation that may require representatives from both sides. This is to facilitate a change and transformation in opinions of the members of both sides of the discussion (e.g. government regulatory bodies, UOG developers versus the public).

Rowe and Frewer (2005) information flow model Figure 30 below illustrates the three types of public engagement and how information is transferred and the type of engagement activities.

Figure 30 Three types of public engagement

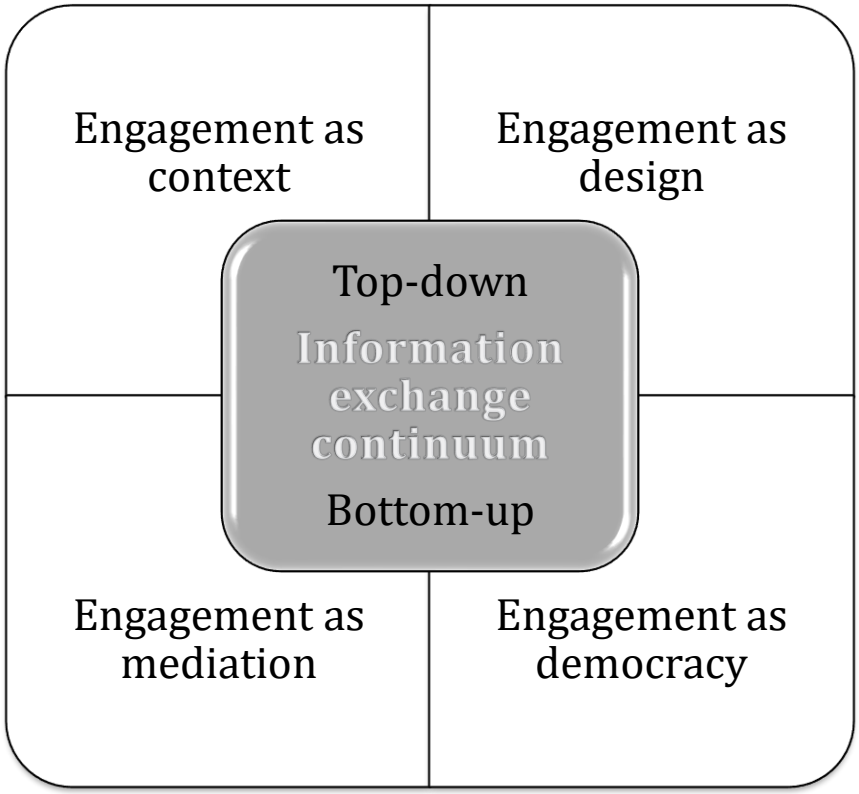


Source: Rowe and Frewer, 2005.

Accordingly, Rowe and Frewer fail to explain the different type of context in which engagement can take place. Webler (1999) argues that matching the appropriate type of public engagement to an appropriate context will not guarantee that the engagement process or exercise will be successful as there are other variables and factors of engagement that plays greater role in helping to understand public engagement in decision making process. In order to address this, Reed et al (2018) explains that engagement can be applied to match the context, design, mediation and democracy constructs, which can lead to a desired outcome across a wide range of sociocultural, economic, and environmental discussions.

Reed et al (2018) theory explains that engagement constructs such as context, design, mediation, and democracy can be used to understand how public engagement process can be utilised to suit a particular type of agenda/topic/situation to get a desired outcome. To this end, all types of engagement should be made available in order to understand in theory what kind of engagement is fit for a desired purpose as seen in Figure 31 below.

Figure 31 Public engagement constructs integrated with type of information transfer/communication.



Source: Adapted from Reed et al (2018)

Prior to this study, few research study has been done on the impact of public engagement in the decision making process of UOG development in the UK. Hence, the result of this study, has added more theoretical depth to unconventional oil and gas management literature and industry. The researcher modifies Reed et al (2018) theory to critically evaluate the institutional framework and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in UK. The intention is to understand the reason how the lack of public engagement led to low public support for UOG development in the UK. This resulted to constant hurdles for the UOG developers during planning applications and protests, as a result of lack of scientific evidence that hydraulic fracturing could be carried out in a safe and effective manner without causing seismic activities like tremors/earthquakes which resulted to the moratorium that is presently in place in England. This further reiterates the need for effective public and stakeholder management and how participation theory helps to fill in the gap in literature in relation to UOG.

Engagement as context- Quite a number of literature have emphasised on the role that local context plays in determining the outcome of an engagement process (Ingram, 2013; Blicharska et al, 2011). Delli Capri (2004) explains that such studies have been focused on sociocultural, socioeconomic and institutional contexts. Larson and Larch (2008) argues that the bottom-up process of communication, information exchange together with significant power inequality are more likely to suppress the interests of weaker actors than the more formalized top-down process where the power dynamics are appear to more controlled, especially when such process is devised by organisations or actors that are already in positions of authority. Such instances would impact the decision that is made and the acceptance of such decisions as those who feel disadvantaged by the process might look to seeking legal actions (De Vente et al, 2016). Fox (2015) explains that engagement should not be about technicality of the process itself but rather a growing awareness of the relationship between political society, civil society, and the roles of the cultural norms, global factors and the ongoing political agenda on civic engagement. There are very few engagement projects/ developments that focus on the material well being of the public. One example of such project is the Cornwall Geothermal project (United Downs Deep Geothermal Power Project *UNDDGP*) in England. The public and the private sector, which includes the European Regional Development Fund, Cornwall Council and Thrive Renewables plc. funded the project. The company running this project (GEL Geothermal Engineering Ltd) has ensured that the project is as engaging and transparent as possible by creating drop in sessions and private group visits and talks with the local residents at the various stages of the project. From the beginning of the project, the local community of Cornwall was included in the decision making process in which they feel a sense of inclusiveness at every stage. The company also supports the Cornwall and Isles of Scilly Careers Hub and the STEM initiatives, just to mention a few (GEL, 2021). Other companies and industries can learn from such engagement process.

Engagement as design- Newig et al (2016) suggests that on of the key roles of the construct of design in determining the outcome of an engagement process is that public engagement provides a detailed information inputs that can underpin more robust decisions. A well-designed engagement process should in theory be seeking to value all the various perspectives in a decision making process (De Vente et al., 2016). An engagement design that involves large number of stakeholders in complex decision making process like UOG development can increase the understanding of the process or system, as will lead to consensus over the conceptual points butt it further makes it harder for the decision makers to choose between the available options (Gray et al., 2012; Buscher and De Beer, 2011).

Engagement as Mediation- For many years now, top-down approach in decision-making process has been the norm. In recent times, such an approach has received criticism from various sources. Recently, more stakeholders are looking towards the bottom-up approach as a distinct form of dialogue process between stakeholders in decision-making process (Kennedy, 1997). Armitage et al (2015) explains that in environmental governance studies, cooperative approaches like coproduction of knowledge have long lasting effects in stakeholder relationships, social learning and implementation of environmental legislation. Unconventional oil and gas development in the UK was bound to create conflict as the UK lacks experience using a controversial technology like hydraulic fracturing. Such conflicts arise during the decision-making processes like in stakeholder participation exercises and planning approval processes in the local communities intended for the fracking operations. A conflict resolution that follows an informal route such as mediation rather that the formal route of arbitration is advisable (Fuller, 1971). This is because mediation is a more nonhierarchical process in resolving conflicts (Menkel-Meadow, 1993), without the presence of a judge to give a ruling on the matter but rather allowing the stakeholders to dialogue amongst themselves in order to resolve the conflict (Vella at al., 2015). Which is a more stakeholder–directed decision-making process for conflict resolution than having the solution imposed by the stakeholders by an external body like a judge. This is with the sole aim of a win-win situation. One major shortcoming of assessing the outcome of a mediation process in environmental related discussions like UOG development is that there is no set or standardized universal criteria for assessing the success of the mediation process (Bercovitch, 2007).

Engagement as Democracy- The historical path of a country towards democracy will reflect on what kind of engagement discussion that would be possible (Gaventa and Barret, 2012), and the various available routes for deliberative democracy (Cornwall, 2008). This results to a variation in the perception of the type and level of engagement, as a successful engagement process will depend on the trajectory historical and cultural values of such a country. To this end, countries with newer democracy in developing economies like in Africa tend to experience lack of public engagement in decision making process as such populations are considered by the decision makers as subordinates rather than citizens with equal rights in the decision-making process (Derak et al., 2018). In contrast to this, first world countries who have a longer history of democracy appear to remain stuck in fake democracy (Leighninger, 2014). Conrad et al (2011) include that such a democracy does not allow public citizens to be heard for the purpose of frustrating the public citizens, public officials (at times), which makes its citizens less likely to be receptive towards engaging with public institutions. Public engagement would likely not take place due to such democratic institutions.

The summary above explaining the different engagement constructs (context, design, mediation and democracy) does not answer why the different forms of engagement leads to different outcomes for the stakeholders just as in the development of UOG in the UK. Public consultation took place in both the England and in Scotland, but the resulting outcome for Scotland was a ban, whereas in England, a moratorium was put in place. A modification to Reed et al (2018) would help bridge this gap of why different types of engagement may lead to different outcomes. The engagement constructs discussed above can be synthesized into four factors that can enable public engagement in decision-making process more likely to provide and result to the desired outcome. These four factors are intertwined directly or indirectly with the four engagement constructs previously reviewed depending on the context. These factors are context, design, power and scalar fit.

Context- These are contextual and design factors that could either be used directly or indirectly as it shows how public engagement is affected by the socioeconomic, institutional and cultural factors. The existence of an engagement culture is likely to affect the process. Also, previous successful or non-successful engagement processes. Time is a critical success factor for the understanding of the context to which the engagement is to be applied or implemented in order for an effective design of the process in which the engagement is to be applied. The Scottish government before placing a ban on UOG, undertook a robust, multiple public consultation process for a lengthy period in order to give the public and other stakeholders enough time to respond. This was not the case with England. A consultation took place and fracking exploration activities started as the UOG developers were granted approvals despite the protests and obstacles from the local communities citing the environmental, health and sociocultural impacts of fracking in their communities. The moratorium in England was later put in place following the seismic activity (tremors) experienced at the fracking sites.

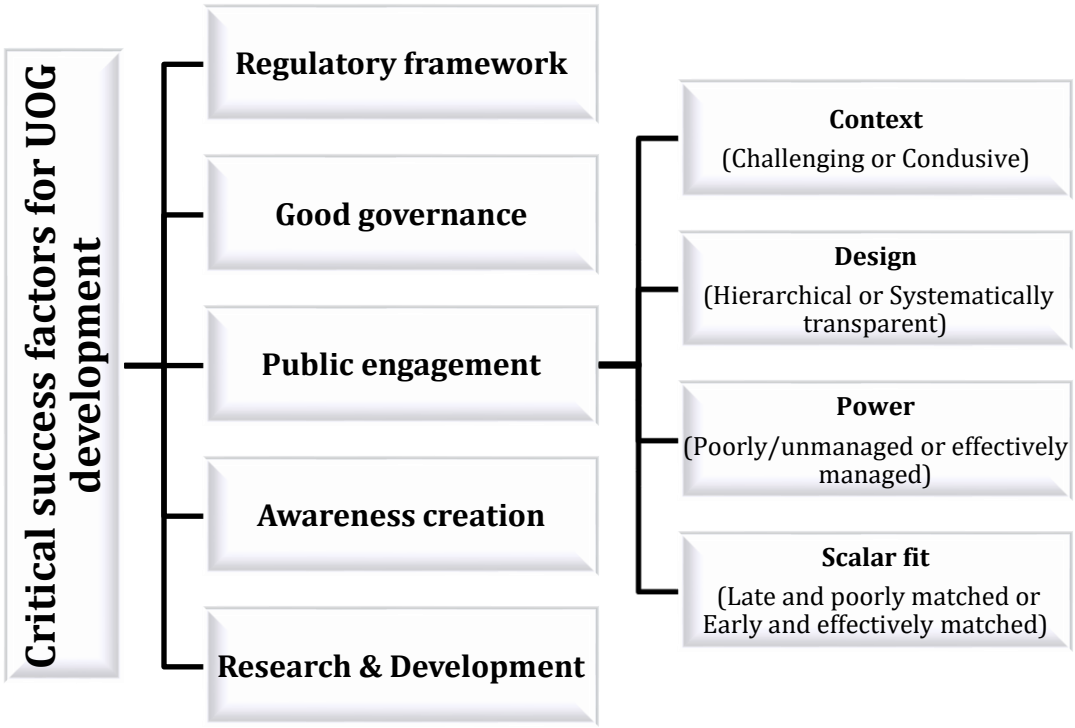
Design- The design of the engagement process is likely to increase the success of the desired outcome of the process, which cuts across political, economical, and sociocultural, and environment contexts. A public engagement process that provides room for transparency has more potential to influence the desired outcome (Reed et al., 2018). This creates room for transparency and opportunities to engage by all the stakeholders. Engagement helps to facilitate room for learning, knowledge and information exchange as this can provide the desired outcomes through the development of shared goals and collaborative and coproduced results. A critical success factor here is dialogue.

Power- The management of power dynamics is a critical success factor for any engagement process. A poorly managed power design that is hierarchical in nature is more likely to be unsuccessful. In most cases, an independent professional mediation is more likely to manage an engagement process that requires mediation in instances where conflict resolution is required. Reed et al (2018) explained that power is a descriptive factor that's solely runs through literature on mediation and horizontal justice, and deliberative democracy. Thus, effective management of power, authority, fair and equal opportunities to engage are critical success factors in order for every stakeholder contribution and participation to be acknowledged.

Scalar fit- Engagement outcomes are mostly time dependent. Thus, the selection of one option over another may change over short timescales. Newig et al (2016) highlights that time scale is an important factor that can help explain why engagement processes succeeds or fails. To this end, public engagement should be designed and conducted at a spatial scale that is relevant to the discussion and within the jurisdiction of the institutions that are equipped for it. Therefore, there should be a correlation when designing an engagement process, so that the process matches a spatial scale that is relevant to the scale of the discussion in order to receive the desired outcome. In this study, the UK government, oil and gas regulatory bodies (BEIS, OGA, EA, PHE, HSE), office of unconventional oil and gas (OUOG) who possess decision making power shall be more involved in national decisions while the local councils, local residents in the county will be empowered to engage in issues at scales that are more relevant to their lives and environment (e.g. planning decisions, SLO etc).

Figure 32 below is a theoretical framework that shows the modification of Reed et al (2018) theory. This shows the interrelationship between public engagement as key success factor on the discussion of the low support of fracking in the UK and how engagement constructs/factors can be effectively designed and applied to produce the desired outcome.

Figure 32 Modification of Reed et al (2018) theory



The modification of Reed et al (2018) theory and understanding the critical success factors that are necessary to facilitate an effective public engagement process helps one to understand that a theoretical informed approach to public engagement has the potential to improve a decision making process if UOG development in the UK is ever going to be implemented (that is if the moratorium does not lead to an eventual ban).

8.3.2 Contribution to practice

This study has been able to identify and create awareness on the impact of public engagement in the policy decision-making process of unconventional oil and gas development in the United Kingdom. According to the findings in this study it was revealed that in the decision making process involved in issuing of UOG planning approvals and permits there is a gap in practice as to what is the best medium or procedure to engaging or seeking the consent of the local community residents in the decision making process concerning such a technology like hydraulic fracturing. The office of unconventional oil and gas does not have the capacity and funding to conduct meetings with these local communities and operators for knowledge

sharing after assessments have been carried out by the regulatory bodies like Environment Agency (EA), Oil and Gas Authority (OGA) and Public Health England (PHE). The EA together with some of the UOG developers did hold some meetings in these local communities, but this study revealed through the data collected from the interviews conducted, that adequate and timely information was not shared, neither was there room for deliberation between the local residents and the UOG operators. Thereby resulting in appeals against planning approvals that were granted to these companies for fracking related activities.

In practice, the type of engagement in such projects cannot necessarily determine what the outcome of the engagement. Would it have resulted to no moratorium at all despite the tremors that was experienced at Blackpool or the protests and conflict of interest and tremors as we have observed so far which led to the moratorium. Reed et al (2018) explains that all types of engagement should be made available for use, but a theoretical understanding of its application and what works based on their selection and application in order to experience the desired outcome. In order to understand why public engagement is likely to work or otherwise and not only in unconventional oil and gas industry, but also its application in other industries. The application of the modified Reed et al (2018) theory Figure 32, the following would be recommended for practice:

1. There should be detailed and comprehensive understanding of the local context to which the public engagement method is to be utilised and it should be fit for purpose. The unconventional, oil and gas operators in the UK shall meet with the local residents and other stakeholders, stating the purpose of their activities with detailed and robust scientifically proven documented backing as evidence of their intended activities/operation which will cause no damage to lives, properties and the environment. This sort of engagement would promote inclusiveness, transparency and accountability with the local community.
2. Mediation and dialogue is another possible outcome if the engagement or discussion fails. All the stakeholders and affected parties should be invited for dialogue as soon as possible without time wasting as this promote knowledge and information sharing to discuss the desired outcome.
3. Industry body shall ensure an all inclusive stakeholder communication, contribution, participation which is fair and equal to provide opportunities for equality in the decision making process, and this shall be applicable at all stages and levels of UOG development in the UK.
4. Policy decision makers shall ensure the frequency of engagement matches the desired goals or outcomes as ideals, values and notions that are deeply rooted would take a longer period/time to convince as with the case of UOG development in the UK. The

UK has a history of coal mining in the past and how it affected the local communities. This has left a bad perception and impression on how implementing new technologies like hydraulic fracturing can affect the local communities.

5. The level of representation of the stakeholder interest and the level of decision-making power should be matched with the severity of the issue such as hydraulic fracturing. If and whenever the moratorium is lifted in England, the office of unconventional oil and gas needs to be adequately equipped with the required resources, capacity, funding and capability to run on its own just as the offshore oil and gas office in the UK. This is as a result of using hydraulic fracturing as a method for extracting oil and gas onshore within local communities as oppose to it been used for years in the UK offshore oil and gas industry. The road to net zero is just beginning in the UK, and this study has revealed that the UK government is not completely ready to stop the extraction of fossil fuel just now, as it needs its some resources for generating renewable energy. Therefore, adequate level of representation of all the stakeholders at every stage in the development of UOG in the UK is necessary in practice and not just in theory.

8.4 Limitation of the study

The researcher strived to maintain an objective standpoint but it is vital to mention that there are issues related to subjectivity and perceptivity within the research process. The data obtained was from the input from respondents across the various groups of stakeholders targeted for this research study. A common problem in social science research is when participants do not provide objective views, for different reasons (Creswell et al., 2018). Thus, the data gathered from the participants will slightly limit some of the results in the study. As some participants were not willing to supply information that contradicts their organisations official statement or standpoint on the subject area. In order to mitigate the issue above, an unstructured exploratory initial pilot study was carried out with a set of industry practitioners that helped to shape the interview design to include non-sensitive data.

Despite having such a mitigating plan in place while designing the interview questions, the research met with some roadblocks during the interview process as some oil and gas regulators (stakeholders) refused to grant interviews as they cited not having enough resources and capacity to give interviews. The researcher gathered that the office for unconventional oil and gas (OUOG) is a portfolio in the Department of Business, Energy and Industrial Strategy (BEIS) office. The researcher considered drafting a Freedom of Information Request to these regulators but the bureaucracy of the long waiting time to receive response would have been

time consuming considering the time constraint for this research project. Collecting and reviewing the regulators reports was initiated to help mitigate this problem.

Another group of stakeholder were some onshore oil and gas companies (stakeholders) who refused to grant interviews, as they were not presently operational due to the moratorium and anything said might contradict the discussions they are having with the UK government behind the scenes. To mitigate this, the researcher had to view and review these company's reports and public statements with regards to the subject area.

The data collection phase had to be structured to suit the period when the MP's were in session in order to suit their availability to accept and grant the interview session. Despite this, some MP's continue to postpone and reschedule the interview date. The researcher had to increase the targeted number of MP's to be interviewed, and extend the response time as they are the key stakeholders and their opinions, experience and views on the subject area is vital for the research. Spacing out the timeline also helped the researcher to reflect on the previous interviews conducted and update/ follow up on themes from the previous interviews.

While conducting the interview of the group with the local community participants where UOG exploration took place (Lancashire), at first some respondents were still affected by the subject and are still healing. Some respondents declined speaking to the researcher, as the topic of hydraulic fracturing is quite a controversial and sensitive subject and they thought the researcher was from the UOG operators. The introductory letter, together with phone calls and emails helped to mitigate this problem. Following that, the design of the semi-structured interview questionnaire allowed the participants to express their lived experiences and their views on the subject.
Finally, this research study was conducted following Robert Gordon University's research ethics guidelines as all participants' information and data was handled confidentially which helped to mitigate any unethical process.

8.5 Recommendations for practice

Recommendation 1. The planning process for hydraulic fracturing needs to be revisited in order to strengthen the environmental impact assessment criteria before any planning permits are granted. Assessments such as environmental impact assessment, social impacts and health impacts should be more stringent. Thus, it is to include multiple stages of inputs from all the stakeholders involved. This would provide the opportunity for feedbacks and a deliberation

process that will encourage and promote public participation and engagement. Town and Country Planning Regulations on Impact Assessment (2017) should be reviewed and amendments considered for a clearer understanding of the three assessments mentioned above. It is the responsibilities of all the actors from the local authority up to the national level to provide the guidelines that should be properly detailed and easily interpreted.

Recommendation 2. UOG operators and companies in the UK shall provide financial assurance in form of community payback packages as an act of corporate social responsibility. Such schemes should hold some legal weight so that when these companies default they would be liable to penalties. This should be to foster transparency, accountability and promote corporate social responsibility amongst these stakeholders.

Recommendation 3. The UK shall review and update all regulations and policies including framework for procedural and environmental justice in relation to UOG development using hydraulic fracturing post Brexit. This should be a detailed, fair and transparent process to ensure environmental justice for the local community as suggested in the Principle of Prima Facie Political Equality PPFPE (Shrader-Frachette, 2002).

Recommendation 4. As the UK post Brexit, is trying to promote and transition away from fossil fuel to other renewable forms of energy, the Department of Business, Energy and Industrial Strategy (BEIS) shall evaluate and review the oil and gas regulatory frameworks such as anticipatory regulation (Armstrong et al., 2019). In the BEIS report 2019 presented in Parliament such a step has been taken as the first step towards this goal (BEIS, 2019). Other steps such as encouraging and investing in renewables should follow simultaneously despite oil and gas still important to in the transition to net zero for now.

Recommendation 5. It should become mandatory that companies and operators in the UK who are interested in investing in UOG shall acquire a SLO before even been granted permits to drill for shale gas. This will ensure that the legitimacy of their operations is trustworthy. This should be at the local councils level so that there is a clear definition of the purpose of the SLO and the oil and gas operators must meet every requirement stated.

Recommendation 6. A new office shall be created in order to enhance the integration and governance relationship at both the local and the national level of government. With the office created functioning as a non-political office with the sole function of enhancing the local community capacity and resources while been headed by a professional expert rather than an elected political party official, which will promote integration and trust between the

government and the local community. The UK government can also achieve this by redefining the office and role of the Secretary of State for Housing, communities and Local Government.

Recommendation 7. In order to settle and mediate disputes, a UK based civil society body shall be inaugurated for national and local governance mechanisms in order to protect community and human rights. Such a body can follow the model of Permanent Peoples Tribunal which will provide fairness, transparency in the decision making process when mediating in order to balance conflict of interest of energy extraction and preservation of natural resources (Aczel et al., 2018).

Recommendation 8. The UK government shall improve information sharing and knowledge gathering on hydraulic fracturing and other oil and gas developing technologies through citizen based science to expand data and information collection while also engaging a wider spectrum of stakeholders (Kinchy, 2017). Departments such as BEIS shall require a comprehensive analysis of soil quality, surface and ground water quality, geological survey, seismicity history, air quality, community health profile etc. Seismic cameras and monitors shall be mounted and satellite based technology like Forward-looking Infrared (FLIR) to help monitor and detect methane emissions. While Public Health England shall be responsible for conducting the local community public health profiles and submitting to BEIS for dissemination to the public while establishing the metrics for public access and understanding of the information drafted in the reports. The British Geological Survey (BGS) would also be responsible for conducting baseline geological survey and submit their findings to BEIS for dissemination to the public.

Recommendation 9. The UK shall explicitly acknowledge that effective public engagement and good governance framework is necessary when introducing regulations for any new technology such as hydraulic fracturing for UOG development that has potential health, community and environmental impacts. Thereby also acknowledging that the foundation for any environmental and energy decision-making process is acceptance, consent based on the fundamental principle of fairness and justice.

Recommendation 10. The UK government shall acknowledge the responsibility to ensure that local participations is essential in policy decision making process when faced with such an unforeseen and controversial technology like hydraulic fracturing within vulnerable populations. Therefore there is the need for inclusiveness of those rural communities that feels marginalized where these fracking operations/activities will take place. The planning process shall also include feedback mechanisms that will ensure equal access to information,

incorporate the needs and priorities of all the stakeholders connoting fairness in adequate representation of all the groups in the decision making process.

Recommendation 11. The oil and gas companies and operators shall be obligated through legal contracts to be responsible for the decommissioning (dismantling, maintenance, cleanup, monitoring, risk management etc) of the wells, sites beyond their end of production dates. All constructed infrastructures both above and below the ground shall be remove by the industry. The Infrastructure Act 2015 shall be amended legally through legislature to include this clause. Post well and site production environmental and health risks shall continue to be monitored by independent post-production assessment experts in consultation with BEIS, Environment Agency and Public Health England.

Recommendation 12. The UK government, its regulatory bodies, operators shall inspect and consult with energy experts on how to repurpose the wells after they have reached the end of their productive life cycle for renewable energy purposes. The UK government shall look into investing more into renewable energy sources by also utilising the UOG development sites where hydraulic fracturing have been put on hold due to the moratorium as we move towards been more energy secured and meeting climate change targets of net zero by 2050.

8.6 Recommendations for future research

The aim of this research study was to critically evaluate the planning procedures and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in England. This research study modified Reed et al (2018) public engagement/participatory Theory on how the different types public engagement can work in terms of context, design, mediation and democracy. It further integrates how this can be utilised in any industry, organisation and local context decision-making process/ approach (top down/ bottom up/ at the line where information continuum exists).

Firstly, research need to be carried out on understanding the need for making policies and taking decisions that are tailored to sustainable technologies that do not craft negative socio-economic and environmental detriment to lives, properties and the environment. This study suggests further study into the critical evaluation of the impact of decision-making, communication, information sharing in sustainable oil and gas technologies. Furthermore, future study can assess the influence of public engagement as a critical success factor for the implementation of new technologies in the UK oil and gas industry

as this study as established that a relationship exists between public engagement and policy decision making process.

Secondly, considering the aim of this study in Section 1.2 of this study, the research study utilised Cottons (2017) study on PPFPE as a yardstick for understanding distributive and procedural justice elements of environmental justice in relation to environmental discussions like the use of hydraulic fracturing for UOG development in the UK. Furthermore, PPFPE within the research context that draws from UOG literature reviewed and the synthesis and analysis of data collected from the exploratory study, pilot study and eventual fieldwork has helped to shape this study to understand the need for a review of the oil and gas regulatory policies in the UK. Furthermore, such research should include the issues associated with planning policy decisions and its implication to new energy systems. There also appear to be little research on how regulatory policies can be altered to suit the emerging discussion on the role of fossil fuel in the transition to renewable energy in the road to net zero carbon emission targets in the UK.

Thirdly, this research aimed to critically evaluate the planning procedures and policy implications for the social, economic and environmental feasibility of extracting unconventional oil and gas in England. A comparative research studies in other industries in the UK could complement and benefit from the modified Reed et al (2018) theory. Thereby a conclusion can be arrived at that will help in strengthening the modified Reed et al (2018) theory in both practice and in the body knowledge.

Finally, emerging debates in the domain of energy transition such as the cost implication of producing green hydrogen, how feasible is the production of clean hydrogen by 2030, net zero targets versus the increasing energy prices, oil production increases versus climate change declaration. These emerging debates are suggested for further studies especially as it relates to energy policy in the UK.

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APPENDICES

Appendix A: Letter of Introduction from the Researcher

Month/Day, 2021

Dear Sir/Ma

REQUEST FOR INTERVIEW

My name is Benita Ize-Iyamu, a doctorate student at Aberdeen Business School, Robert Gordon University. My research topic is:

'Investigating the social, economic and environmental feasibility of extracting onshore oil and gas in the United Kingdom'.

Essentially, the study aims to evaluate the institutional framework and policy implications for unconventional oil and gas development in the UK.
I would love to discuss with you to obtain your opinion about the impacts of fracking in the UK.
The interview should take about 45 minutes.
Please note that any information obtained would be treated in line with UK Data Protection Act (1998). Only the research team would have access to the data to analyse for **only** this study. The data would be stored securely and destroyed within three months. No identifying information would be used within the study to keep your anonymity.
I am looking forward to speaking with you, as your opinion on the subject matter is essential for the study.
Please email me to arrange a suitable time for a discussion, which can occur via Zoom due to the pandemic, and if you require any further clarification.
I am looking forward to hearing from you soon.

Yours sincerely

B. O. Ize-Iyamu

Benita Ize-Iyamu
b.o.ize-iyamu@rgu.ac.uk

Appendix B: Consent Form

CONSENT TO PARTICIPATE IN INTERVIEW

Investigating the social, economical, and environmental feasibility of extracting onshore oil and gas in the United Kingdom.

You have been asked to participate in a research study conducted by Benita .O. Ize-Iyamu from Aberdeen Business School at The Robert Gordon University. This study aims to critically evaluate the institutional framework and policy agendas for the social, economic and environmental feasibility of extracting unconventional oil and gas in the United Kingdom.
You were selected as a possible participant in this study because you are familiar or unfamiliar with onshore oil and gas development in the United Kingdom using hydraulic fracturing (fracking) method, which is vital for the proper understanding of this study. You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

- This interview is voluntary. You have the right not to answer any question, and to stop the interview at any time or for any reason.
- You will not be compensated for this interview.
- Unless you give us permission to use your name, title, and / or quote you in any publications that may result from this research, the information you provide us will be treated confidentially.

- This interview would not be recorded without your permission, as it would be used for reference while proceeding with this study. If you do grant permission for this conversation to be recorded, you have the right to revoke recording permission and/or end the interview at any time.
- The data gathered would be securely stored with only authorised access to the research team using the approved RGU policy.
- The data would not be used for any other purpose except as stated above, using RGU approved policy.

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

(*Please check all that apply*)

☐ I give permission for this interview to be recorded.

❖ I give permission for the following information to be included in publications resulting from this study:

☐ my name ☐ my title ☐ direct quotes from this interview

Name of Participant:

Signature of Participant _____ Date _____

B. O. Ize-Iyamu *2021*

Signature of Investigator _____ Date _____

Please contact Benita O Ize-Iyamu, b.o.ize-iyamu@rgu.ac.uk with any questions or concerns.

Appendix C: Interview Questionnaire

Research Topic: Investigating The Social, Economic And Environmental Feasibility Of Extracting Onshore Oil And Gas In The United Kingdom

Group 1: MPs, Oil & Gas companies, Regulatory bodies, Scientists

1. Are you familiar the method of hydraulic fracturing 'fracking'?
2. What is your perspective of fracking as a method proposed for unconventional oil and gas (UOG) development in the UK?
3. What form of public engagement platforms or methods did the UK government utilise in informing the public about the risks and benefit of UOG in the UK, and how effective did you think these methods were?
4. What are the economical, social and environmental implications of UOG?
5. Why are the local communities and other stakeholders still concerned about the social, health and environmental implications of fracking despite the proposed potential benefits you have just mentioned?
6. If the narrative surrounding UOG were to change, what would be the onshore policy implications post Brexit?
7. Following Brexit, what are the factors that would be considered for planning/reshaping UK's Energy policies and the present National Planning Policy Framework (NPPF)?
8. Did the central government concede to the local communities on the decision to place a moratorium on fracking for election purposes?
9. Did the UK government have enough geological and seismic monitoring data relating to UOG exploration at the proposed fracking sites (e.g at Preston New Road) before taking the decision to issue permits to the developers before the moratorium?
10. The United Kingdom's regulation for unconventional oil and gas is situated within the existing framework for conventional oil and gas developments. Is the UK government going to review, update or develop new regulation in order to meet its climate change agenda of 2050?
11. Is UOG extraction compatible with the UK government's zero carbon emission targets?

Group 2: Members of the public, NGOs

1. Are you familiar the method of hydraulic fracturing 'fracking'?
2. How and where did you hear about fracking?
3. Do you have easy access to information about fracking?
4. What is your perspective of fracking as a method proposed for unconventional oil and gas (UOG) development in the UK?
5. Do you have any economical or social or environmental concerns with regards to fracking?
6. Are there any other factors you would like to include?
7. Have you been informed about the risks and benefits of UOG development in the UK?
8. The UK government suggests that UOG development would affirm the country's energy security and provide job opportunities, community payback schemes, what do you think about this?
9. Are you familiar with the UK's climate change agenda, and the implications of UOG, what do you think about it?
10. If the narrative surrounding UOG development were to change in the future, what form of engagement would you prefer and at what level?

Appendix D: Research Student's Self Declaration (RDDECL) Form

RESEARCH STUDENT'S SELF DECLARATION *(RDDECL)* FORM

Name: **IZE-IYAMU BENITA OYEMWEN**

Degree for which thesis is submitted: **PHD MANAGEMENT**

Thesis title: **"Investigating the social, economic, and environmental feasibility of extracting onshore oil and gas in the United Kingdom"**

1 Material submitted for award

(a) I declare I am the sole author of this thesis.

(b) I declare all verbatim extracts contained in the thesis have been identified as such and sources of information specifically acknowledged.

(c) I certify that, where necessary, I have obtained permission from the owners of third party copyrighted material to include this material in my thesis and make it available on web pages.

(d) I confirm I have undertaken an electronic plagiarism check of my thesis submission using Turnitin PDS within the Graduate School Moodle page and a report is attached.

(e) *either* * I declare that no material contained in the thesis has been used in any other submission for an academic award.

or * I declare that the following material contained in the thesis formed part of a submission for the award of ..... *(state the award and awarding body and list the material below):*

(f) I agree that an electronic copy of the thesis be held in the Robert Gordon University OpenAIR @ RGU Repository with full public access with the following status:

either *Release the entire thesis immediately for access worldwide

or *Restrict access to the thesis after the date of deposit of the thesis.

If restricting access, please indicate below the reason for this (delete as appropriate):

- The release of the material would prejudice substantially the commercial interests of any person.
- The material includes information that was obtained under a promise of confidentiality.
- Other. *Please specify the reason for exemption in accordance with the Freedom of Information (Scotland) Act:*

Please state the length of time the embargo is required for the thesis and provide justification for this request. Please note that, if no further application for extension to embargo has been received by the time the approved embargo ends, the thesis will be distributed

I retain the ownership rights to the copyright of my work. I retain the right to use all or part of this thesis in future works (such as books and articles).

I hereby grant to the Robert Gordon University the non-exclusive right to archive and make accessible my thesis, in whole or in part in all forms of media. I agree that, for purposes of preservation, file format migration may be carried out, should this be necessary.

2 Concurrent registration for two or more academic awards

either *I declare that while registered as a research student for the Robert Gordon University's research degree, I have not been a registered research student or enrolled student for another award of the University or other academic or professional institution.

or *I declare that while registered for the Robert Gordon University's research degree, I was, with the University's specific permission, a *registered research student/*enrolled student for the following award:

PhD Management

**Delete as appropriate*

Signature of Research Student B.O. Ize-Iyamu ..... Date Jan 07, 2022

**Signature of Principal Supervisor ..... Date
***Signature only required if student is seeking a thesis embargo.*

This section of the form is for internal use only, for completion by the Convener of the Research Degrees Committee

Date considered by the Graduate School:	
Approved	
Rejected	
Reason for decision	
Signed	
Date	