Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Social and Educational Sciences
Department of Geography

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"Sometimes we don't have equipment and have to do the practical aspect in theory, which is very bad"

A case study of the petroleum geoscience and production program at Makerere University in Uganda.

Master's thesis in Geography with Teacher Education
Supervisor: Haakon Lein
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Abstract

Uganda found commercial oil in the Albertine region in 2006. The production of oil can have social and economic consequences for Uganda as a whole, but also for its citizens, in terms of employment creation and improved living standards. However, developing Uganda's oil and gas resources presents challenges given a global trend away from fossil fuels towards renewable energy sources. To ensure that Ugandan citizens get employed in the relatively new and growing oil and gas sector, the Government of Uganda (GoU) imposed local content policies which regulate recruitment and training in the sector.

This case-study investigates how the petroleum geoscience and production (PG&P) program at Makerere University in Uganda is designed to ensure that their graduates get employed in the domestic oil and gas sector after graduation, and how the domestic local content policies is securing employment of Ugandan labor. The data collection was based on interviews with students, graduates, and lecturers at the PG&P program, in addition to a group discussion with students. Furthermore, a review of relevant policy documents and literature was conducted to discuss and ascertain claims made by the participants. In addition, the study presents participants' views on; the mobility and ability of the programs graduates to get employed in other sectors; possible impact of the oil and gas sector on development in Uganda; how the energy transition might impact the oil and gas sector in Uganda.

Results show that the PG&P program receives limited funding from the GoU and suffers from limited support and cooperation with the oil and gas sector. This has implications for the students training and purchase of new and relevant equipment to improve the quality of education. The mineral sector and water sector were mostly highlighted as other possible employers for the PG&P graduates. Although both students and graduates were optimistic about how the oil and gas sector could impact the development of Uganda based on their motivation to enroll in the PG&P program, were there also skepticism because of corruption and the limited absorption of graduates in the oil and gas sector. All participants thought that the energy transition will happen in Uganda at some point, but that the lack of investments and technology in Uganda slows down the process. Even though Uganda found oil in 2006, the first drilling for commercial oil started in 2023. This means that the oil and gas industry in Uganda is young and still developing.

Sammendrag

Uganda fant kommersielle mengder olje i Albertine-regionen i 2006. Produksjonen av olje kan ha helhetlige sosiale og økonomiske konsekvenser for Uganda, men også Ugandas innbyggere, i form av skapelsen av arbeidsplasser og forbedret levestandard. Utvikling av Ugandas olje- og gassressurser byr på utfordringer på grunn av en global trend bort fra fossilt brensel mot fornybare energikilder. For å sikre at ugandiske borgere blir ansatt i den relativt nye og voksende olje- og gassindustrien, innførte regjeringen i Uganda (GoU) reguleringslovverk (local content) som regulerer rekruttering og opplæring i sektoren.

Denne case-studien undersøker hvordan petroleumsgeovitenskap og produksjon (PG&P) programmet ved Makerere Universitet i Uganda er utformet for å sikre at kandidatene deres blir ansatt i den innenlandske olje- og gassektoren etter endt utdanning, og hvordan reguleringslovverket bidrar til å sikre sysselsetting av ugandisk arbeidskraft. Datainnsamlingen var basert på intervjuer med studenter, ferdigutdannede og forelesere ved PG&P-programmet, i tillegg til en gruppediskusjon med studenter. Videre ble relevante politiske dokumenter og litteratur undersøkt for å diskutere og fastslå påstander fra deltagerne. I tillegg presenterer studien deltakernes syn på; mobiliteten og evnen til ferdigutdannede fra programmet til å bli ansatt i andre sektorer; mulig innvirkning av olje- og gassektoren på utviklingen i Uganda; hvordan energiomstillingen kan påvirke olje- og gassektoren i Uganda.

Resultatene viser at PG&P-programmet mottar begrenset finansiering fra GoU og lider av begrenset støtte og samarbeid med olje- og gassektoren. Dette har implikasjoner for elevenes opplæring og kjøp av nytt og relevant utstyr for å forbedre kvaliteten på utdanningen. Mineralsektoren og vannsektoren ble fremhevet som andre mulige arbeidsgivere for PG&P-kandidatene. Selv om både studenter og nyutdannede var optimistiske rundt hvordan olje- og gassektoren kunne påvirke utviklingen av Uganda basert på deres motivasjon til å starte på PG&P-programmet, var det også skepsis på grunn av korrupsjon og den begrensede absorpsjonen av nyutdannede i olje- og gassektoren. Alle deltakerne trodde at energiomstillingen vil skje i Uganda på et tidspunkt, men at mangelen på investeringer og teknologi i Uganda bremser prosessen. Selv om Uganda fant olje i 2006, startet den første boringen etter kommersiell olje i 2023. Det betyr at olje- og gassindustrien i Uganda er ung og fortsatt i utvikling.

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Abbreviations

AAPG – American Association of Petroleum Geologist

AfDB – African Development Bank

CNOOC – China National Offshore Oil Corporation

DGPS – Department of Geology and Petroleum Studies

PAU – Petroleum Authority of Uganda

PG&P – Petroleum Geoscience and Production

LCA – Legal and Corporate Affairs

MPGS – Makerere University Petroleum and Geology Society

SPE – Society of Petroleum Engineers

UNOC – Uganda National Oil Company

1. Introduction

Uganda discovered commercial oil in the Albertine region in 2006 (Polus & Tycholiz, 2017). The Albertine region is in the north-western part of Uganda, on the border to the Democratic Republic of Congo and along Lake Albert. The first drilling for commercial oil started in January 2023 and is looked upon as a milestone towards first oil output in 2025 (Biryabarema, 2023). The potential income from the oil and gas industry can help Uganda, which is one of the poorest countries in the world, to escape extreme poverty and become less dependent on donor aid (Ogwang et al., 2018).

Oil and gas production can lead to social, economic, and environmental consequences for Uganda, and there are two theories that try to explain two different outcomes: the resource blessing and the resource curse. The resource blessing pictures a scenario where extractive industries and the production of oil cause less poverty through creation the of employment, income, infrastructure development, and economic growth for the country (Byakagaba et al., 2019). On the other hand, we have the resource curse, which refers to countries with resource wealth who tend to struggle to use their wealth to boost their economies and people in these countries continue to have low income and low quality of life (Badeeb et al., 2017).

The Industrial Base Line Survey from 2013 expected that the oil and gas industry in the Albertine region could generate around 13 000 direct jobs in the construction phase and 3 000 jobs in the operation phase (SBC, 2013). About 15 percent of these jobs are intended for engineers and managers, which is 450 jobs under the operation phase, and are the most relevant jobs for PG&P graduates.

To ensure that the discovery and production of oil also can be beneficial for Ugandan citizens, has the GoU imposed local content regulations that regulate the domestic oil and gas sector. Local content policies can be implemented as a government strategy to address issues like unemployment, poor local technology, and weak industries, but also to motivate citizens to take part in the industry and benefit from the resource wealth in the country (Byaruhanga & Langer, 2020). In this case, does the local content impose companies in the domestic oil and gas industry to hire domestic labor.

Uganda's local content policy in the oil and gas sector has been praised and described as a robust framework, and the Director of Economics and National Content Monitoring at the Petroleum Authority of Uganda (PAU), Ms. Peninag Ageebwa, says that 92% of the employed people in

Uganda's oil and gas sector is Ugandan citizens (PAU, 2023). The PAU doesn't share more detailed information on domestic employment in the oil and gas sector, which makes it impossible to investigate if the percentage is correct and what types of jobs that are included and are employed by Ugandans. On the other hand, there is a study that shows that most graduates in petroleum engineering in Uganda are either unemployed, engaged in low-paying part-time jobs, or gone back to school to study other courses and that oil and gas companies would rather employ experienced professionals rather than fresh graduates (Kaguhangire-Barifaijo, 2022).

To find out why the graduates from PG&P don't seem to get jobs in the oil and gas sector after graduation, it is relevant to look at the quality and structure of the education. Lau (2017) identified both core competences and areas of education for the next generation of petroleum engineers, and Meehan (Meehan, 2021) argues what types of knowledge and skills that will be important for the future petroleum engineers. Kaguhangire-Barifaijo (2022) argue that the instructors at Makerere University are well-qualified and that the syllabus is comprehensive enough, but it seems like the curriculum is too focused on theoretical learning rather than practical skills and hands-on experience. All of these will be valuable to compare with the structure and content of the PG&P program at Makerere University to investigate if the program is capable and designed to educate graduates with the required skills to get employed in the future oil and gas sector.

Even as we see Uganda's potential for economic growth, increased welfare, and creation of employment opportunities for Ugandan citizens through the oil and gas sector, we also see a global trend towards an energy transition. The energy transition refers to a shift from a dominant source of energy over to another source of energy (Carley & Konisky, 2020), which in this case is from fossil fuel-based energy to renewable energy. Further, is the energy transition seen as one of the pathways that can contribute to accomplishing the future climate goals set in the Paris Agreement, where the main goal is to hold the global average temperature under 2°C above pre-industrial levels (UN, 2015). Because the energy transition is a global trend that happens all over the world, it might also have an impact on Uganda's oil and gas sector and future employment opportunities for PG&P graduates.

1.1 Research Theme, Main Objectives, and Research Questions

This study's research theme is the educational quality of the PG&P program. The main objectives of this study are to investigate if the graduates in PG&P from Makerere University are able to find employment in the oil and gas sector in Uganda and what views students, graduates, and lecturers at the PG&P program have on employment in the domestic oil- and gas sector. Additionally, it will consist of their views on their mobility and ability to get jobs in other sectors and their views on how the energy transition may influence the creation of employment opportunities.

The research questions to be addressed are:

1. How are the petroleum geoscience and production program and domestic local content regulations designed to ensure that graduates get employed in the domestic oil and gas industry?
2. How do the students, graduates, and lecturers view the possibility for graduates to get jobs in other sectors than the oil and gas sector?
3. What are the students, graduates, and lecturers views on the possible impact of the oil and gas sector on the development of Uganda?
4. What are the students, graduates, and lecturers views on the possible impact of the energy transition on the oil and gas sector in Uganda?

1.2 The Structure of the Thesis

The thesis is divided into seven chapters. Chapter 1 is the introduction chapter, where the topic of the thesis has been introduced, as well as the research questions.

Chapter 2 introduces the background and literature review of this study, where the development of the oil sector in Uganda and a presentation of the bachelor's and master's programs at the PG&P program will be accounted for. Further will literature on PG&P education, employment in the energy sector and the energy transition be presented.

In Chapter 3, will the general perspectives be introduced. This includes legal framework like local content regulations and the Uganda Vision 2040, the resource blessing and resource curse, and stranded assets.

Chapter 4 will present the study's research design. This includes the research method, methods for data collection, research ethics, discussion around the quality of the study, and different difficulties connected to the chosen methodology.

Chapter 5 will present the results from the interviews and group discussion. They will be presented based on themes. In addition, it also provides with findings from other sources.

Chapter 6 is the discussion chapter, where the results will be discussed up against the theoretical framework and aim to discuss the different research questions. The chapter is further divided in four, where each discussion is directed to each of the four research questions.

Lastly, in chapter 7, the conclusion will be presented and aim to answer the research questions. In addition, the last section of this chapter will be about recommended future research.

2 Background and Literature Review

This chapter will present the background and is divided into six sections. The first section focuses on the historical development of oil activities in Uganda, from the first discovery until the present time. The second section will present both the bachelor's and master's programs in PG&P at Makerere University in more detail. Third, will the literature revolving around education in petroleum geoscience and petroleum engineering be reviewed. A review of employment trends in the energy sector is presented in section four, and a presentation of the energy transition will be the content of the fifth section. The sixth and last section will be a summary of the other five sections.

2.1 Oil in Uganda

Natural oil seeps were already discovered in the Albertine Graben region in the 1920s (Vokes, 2012). The discovery was made by Uganda's Geological Survey, but they could not confirm any large oil deposits after their discovery of natural oil seeps (Polus & Tycholiz, 2017). This was during the period when Uganda was a colony of the British Empire, and Uganda later got its independence in 1962 (Miller et al., 2009).

The GoU started doing surveys in the Albertine region again in the 1980s, and the new Museveni government wanted to attract foreign investments to the country (Vokes, 2012). Later in the late 1990s and early 2000s, wildcat companies like Tullow Oil and Energy Africa were the most active companies (Polus & Tycholiz, 2017). Wildcat companies are relatively small companies that are willing to take on such high-risk explorations where the major companies were not willing to do it. Heritage and Tullow Oil were two of these wildcat companies that got a license for exploration in the Albertine region (Vokes, 2012).

In 2006 they found oil in commercial quantities, and between 2008 and 2014, there were twenty-one recorded discoveries in the Albertine region (Polus & Tycholiz, 2017). Later, with the new discoveries of oil in the area, the leading exploration operations shifted from being dominated by the smaller wildcat companies to only three companies: Tullow Oil, China National Offshore Oil Corporation (CNOOC), and TotalEnergies. These companies got production licenses, where CNOOC got it in 2013, while Tullow Oil and TotalEnergies got it in 2016 (Polus & Tycholiz, 2017). Further on, all these three foreign companies got until the end of 2017 to make the final

investment decision (FID). The FID is when the companies signify their commitment to invest and participate in the project.

Although the due date to sign the FID was by the year 2017, this didn't happen before 2022. 2nd of February 2022, the FID got signed for Uganda's oil and gas project where the three oil companies TotalEnergies, CNOOC, the Uganda National Oil Company (UNOC), in addition to the Tanzania Petroleum Development Corporation signed a commitment to the project (PAU, 2022). The specific projects are the Kingfisher and the Tilenga, located the Albertine area.

Figure 1: Location of oil projects in Uganda

Source: (TotalEnergies, n.d.-a)

Currently, are TotalEnergies the largest shareholder of the three oil companies that share the upstream development in Uganda (TotalEnergies, n.d.-b). as seen in Figure 1, TotalEnergies is the operator of the Tilenga project, and CNOOC the operator for the Kingfisher project. In addition to these two foreign oil companies, UNOC is the last shareholder in the upstream development of Uganda's oil project. UNOC was established in 2013 and is owned by the GoU, and their function is to handle commercial interests in the oil and gas sector on behalf of the GoU (UNOC, n.d.-b).

Drilling for commercial oil started in the first production well in January 2023 and is looked at as a milestone towards the target of first oil output in 2025 (Biryabarema, 2023). Currently, Uganda has 6,5 billion barrels in its oil reserves, and 1,4 billion of them are estimated to be economically recoverable (International Trade Administration, 2022). Most of the oil is located towards the western border with the DRC, which is in the Albertine region.

The oil-production network can be divided into different phases, where the first phase is the upstream phase which revolves around exploration, drilling, and extraction (Bridge & Billon,

2017). Secondly comes the midstream phase. This phase is the storage and transportation to the third phase, the downstream phase, which is about refining, distribution, and consumption of oil products. Above this paragraph, I have talked about the exploration, drilling, and extraction of oil in Uganda, which is a part of the upstream phase. But Uganda also takes part in the two other phases of oil production. In the midstream phase, they are going to construct a pipeline for transporting crude oil from Hoima in the Albertine region and to Tanga in Tanzania, where they get connected to the international oil markets (PAU, n.d.). They also plan to develop an oil refinery, through The Uganda Refinery Project, which refines crude oil (UNOC, n.d.-a).

There have been raised concerns regarding the militarization of the oil regions in Uganda, where the presidential control and authority makes it hard to get access to the local communities, also for the civil society (Van Alstine et al., 2014). Taodzera (2020) says that the current regime in Uganda have absolute control over the domestic oil sector through the threat of military forces and public institutions. Van Alstine and others (2014) argues that the increased state control and limited response from the civil society causes a shortage of participation, information and monitoring at sub-national level in Uganda.

2.2 Bachelor's and Master's Program in PG&P at Makerere University

Both the bachelor's and master's program in PG&P is at the College of Natural Sciences at Makerere University in Kampala and are under the Department of Geology and Petroleum Studies (DGPS). The bachelor program was first introduced in February 2009 and was established to help to bridge the knowledge gap in the oil and gas sector in Uganda (Nabatte, 2019).

The main aim for establishing this program was to train petroleum geoscientists that could contribute to the exploration and development of petroleum resources effectively. The bachelor program in PG&P is taught over four years, and the main objective is described as: "…to develop capacity in Petroleum Geoscience and Production through training and research that are much needed in the region, in order to sustain exploration and production" (Department of Geology and Petroleum Studies, n.d.-a).

According to Dr. John Tiberindwa, the former Head of the DGPS at the time the program was established, was the equipment not good enough to facilitate courses, but he was optimistic about

the contribution the program could have to the oil and gas sector in the country (Department of Geology and Petroleum Studies, n.d.-c). Further on, he explains that the intake of students has increased since the establishment of the PG&P bachelor program and that they did not expect to enroll more than 40 students each year because of their limited facilities and because the sector is so new in the country. The number of students that enrolled was 45 in the first year after establishment and increased to 80 students in the academic year of 2010/2011 (Department of Geology and Petroleum Studies, n.d.-c).

In 2012, the master's program in PG&P was established. It was intended to help the country to build the capacity of higher learning at the institutions to further fill the capacity gap of human resources in the sector (Wacha, 2012). The master program is further justified because of the oil and gas discovery in the country and their neighboring countries, and they are therefore in urgent need to trainskilled local human resources (Department of Geology and Petroleum Studies, 2012). The establishment of the master's program is specially timed to start when the first lot of students from the bachelor program are about to graduate (Wacha, 2012). The master program runs over two years, and the general objective is described as: "to train Petroleum Geoscientists who can contribute effectively to programs of exploration and development of petroleum resources" (Department of Geology and Petroleum Studies, n.d.-b).

Potential professional employment after graduation is in the governmental bodies like PAU, in petroleum development companies like TotalEnergies or CNOOC, or oil and gas service companies like Schlumberger (Department of Geology and Petroleum Studies, n.d.-b). These possible career opportunities are relevant for both the bachelor's and master's programs in PG&P at Makerere University.

2.3 Education in Petroleum Geoscience and Production

Development of competence in petroleum engineers is a lifelong process in the oil and gas industry which becomes more and more complex. Lau (2017) explains that required competence in the industry has additional dimensions that is not found in the curriculum of traditional undergraduate studies in petroleum engineering and geosciences. The core competencies for the next generation of petroleum engineers are identified as interdisciplinary, intercultural, leadership and health, safety, and environment, and basics of petroleum engineering and geoscience (Lau, 2017).

Learning of these competences happens either on the university or in the workplace, where learning of basics and some leadership competence happen at the university and the three others mostly happens on the workplace.

For the next generation of petroleum engineers, the following areas is identified as the core areas of education: connection with the industry, mentoring, leadership and technology (Lau, 2017). Connection with the industry can be company and field visits or summer internships, which allows the students to interact with industry professionals, learn professionalism and accepted workplace behavior, and exposure to the industry might help the students to figure out which companies they can work for after graduation. Regarding mentoring, argues Lau (2017) that educators should behave more like mentors to the students and share their professional experience in terms of both failure and success, which can be a powerful tool for education. To achieve this, universities can employ professors with industry experience or invite industry leaders or professionals to coach students in a period of one or two semesters (Lau, 2017).

Education in leadership revolves around engineering ethics that reflects the societies core values, and that the next generation of petroleum engineers have the duty to extract energy from natural resources in a way that also protect the health, safety and environment of the public (Lau, 2017). Technology in education advice educators to use new technology in teaching and that a successful strategi includes hands-on teaching with simulators, group discussion, collaborative learning with feedback, and mixed learning methods that let the students learn at their own pace.

New approaches to instruction in geoscience have in the last few decades developed based on discipline-based education research. These new teaching strategies is about active learning and mixed learning methods between traditional classroom teaching, lab, and field instruction (Mosher & Keane, 2021). These strategies are regarded as important to foster deep conceptual understanding of important skills and competencies in the discipline. Field instruction, or experiential learning where you learn by doing, is regarded as an effective way for the students to gain skills, knowledge and experience outside the traditional classroom (Mosher & Keane, 2021). Different ways of experiential learning are for example field trips or internships, and studies abroad.

Mathieson and others (2019) argues that it is the end of petroleum engineering as we know it and that the emerging advanced technologies in the oil and gas sector will enable one petroleum engineer to do the work of many and it will be likely that the future of petroleum engineering jobs

will be radically different and smaller in numbers than today. Meehan (2021) agrees that petroleum engineers job will change but looks at the development as a new beginning. He reasons this statement in that knowledge in big data, AI, sustainability and reducing emissions is some of the emerging essential areas of competences for the future petroleum engineer.

Kasozi (2016) argues that African governments low priority of universities has resulted in reduced production of domestic and local skilled human resources, and consequently an over employment of foreign labor. Alani (2021) reveals that for the last two decades public universities in Uganda have only gotten 0,35% of the GDP in annual funding on average, and that it is unlikely that the labor force will attain the required high-level skills because of the low level of funding.

2.4 Employment in the Energy Sector

Employment in the energy sector reached 58 million on a global scale in 2017, and approximately half of these jobs were in fossil fuel industries (Czako, 2020). Employment in the fossil fuel sector is divided between the different industries; coal mining, manufacturing, and refining of petroleum products, and oil and gas extraction. The fossil fuel industry supports about 30 million of these jobs globally, but on both medium and long term is it expected that employment in the fossil fuel industry will decrease compared to renewable energy industries in the energy sector. Based on the development of employment in the fossil fuel industries in the EU-28, we can see that the coal mining industry is where employment are decreasing the most and that employment has decreased to a lesser extent in extraction of oil and gas (Czako, 2020).

A study argues that renewable energy and energy efficient industries generate almost three times as many jobs as the fossil fuel industries (Garrett-Peltier, 2017). Garrett-Peltier (2017) shows that for each 1 million dollar spent in fossil fuel industries, will generate 2,65 full time jobs on average, where 0,94 of those are jobs that are directly into the industry and 1,71 is indirect jobs created in the supply chain. Renewable and energy efficient industries generate 7,49 full time jobs on average, where 4,50 is jobs directly to the industry and 2,99 is indirect to the supply chain of the industry.

Even though renewable and energy efficient industries generate more jobs than oil and gas industries, it does not necessarily mean that these new jobs emerge in the regions where the oil and gas jobs phased out (Atteridge & Strambo, 2020). If these impacts of energy transition are not taken

to consideration, it can cause loss and suffering to the communities that rely on carbon-intensive activities such as fossil fuel extraction.

2.5 Energy Transition

The energy transition refers to the shift from one or a set of dominant energy resources and to another (Carley & Konisky, 2020). It is seen as one of the pathways towards the future climate goals according to the Paris Agreement. The Paris Agreement is an international treaty on climate change which is legally binding and Uganda was one of the parties that signed this treaty in 2015 (UN, 2015). The main goal of this treaty is to hold the global average temperature below 2°C above pre-industrial levels and to further pursue to limit the average temperature to 1,5°C above pre-industrial levels (UN, 2015). Data from United States Environmental Protection Agency show that 65% of greenhouse gases emitted by human activities is carbon dioxide from industrial processes (EPA, 2023). In 2021 it was also recorded a record high fossil fuel related emission (UN, 2022).

Transition from fossil fuel-based energy to lower-carbon sources of energy will produce winners and losers, following pre-existing paths of winners and losers (Carley & Konisky, 2020). The winners will benefit from the cleaner sources of energy, reduced emissions, and the opportunities regarding employment and innovation that accompany this transition, and the loser will lack access to these opportunities and bear the burdens. To avoid this and manage the transition in a fair way, there has been a call for just transition. Just transition means to manage the transition in a fair and inclusive way for everyone, where it is created decent opportunities for work and leaving no one behind (ILO, n.d.).

Atteridge and Strambo (2020) explain that the concept of a just transition recognizes that the global effort to decarbonize will have a bigger impact on some countries or regions where they lack necessary capacity to transition fast without causing disturbance. They further recommend that international financial assistance could be mobilized to assist or lower the responsibility for historical emissions of greenhouse gases to assist those countries and regions who lack capacity. Because the technical advancement and level of economic development of a country has a big role in the energy transition should energy transition be understood as a process which cannot happen at a global level but differ depending on which country or region it concerns, where the transition evolves with social and economic advancements (Nalule, 2019).

Regarding energy transition in Africa, the President of the African Development Bank (AfDB) Akinwumi Adesina explains that African countries need space to industrialize and facilitate access to electricity for the population of Africa and in the short term need to use a range of energy sources like wind, solar, geothermal, and gas (Ighobor, 2022). He further says that the AfDB does everything to get to renewable energy sources but that renewables like wind, solar, and hydro is variable and not reliable in Africa, and a shift from coal and fuelwood to gas will reduce emissions from African countries significantly.

In Uganda, the Director of Legal and Corporate Affairs (LCA) at the PAU, Ali Ssekatawa, says that the global shift towards renewable energy won't harm Uganda's oil and gas industry (Ssekatawa, 2020). Ssekatawa reasons this statement on that the current global energy mix is dominated by crude oil and will continue to do so for the next six decades at least. Further on, he says that Uganda will produce oil for the next fifty years at minimum, even as they join the rest of the world in the transition to renewable energy sources (Ssekatawa, 2020).

2.6 Summary of the Background and Literature Review

The sections in this chapter are identified as relevant because of their importance for the present situation regarding employment in the oil and gas sector in Uganda. The first section gives an explanation to how the oil and gas sector in Uganda has developed to its current state and gives a context to the study. Further, is both the bachelor's and master's programs in PG&P presented to give an understanding of how and why they were established. The sections about education in PG&P, employment in the energy sector and the energy transition provides a review of the literature of each section, which will be discussed and compared with the results in chapter 6.

3 General Perspectives

This chapter is divided into four sections. In the first section will the legal framework be presented, where Uganda Vision 2040 and local content regulations will be the presented. Further will the resource curse and the resource blessing be the topic in the second section. Stranded assets will be the content in the third section, where this phenomenon will be explained. At last, there will be a fourth section that summarizes the first three sections.

3.1 Legal Framework

In 2008 the National Oil and Gas Policy for Uganda was launched, where the intention was to guide development of the emerging oil and gas sector in Uganda after the commercial oil and gas discovery in 2006 (GoU, 2008). Objective number 8 of this policy is: "To support the development and maintenance of national skills and expertise" (GoU, 2008, p. 22). In 2013 came the Petroleum (Exploration, Development, and Production) Act that gives a framework for regulation of the upstream activities of the oil and gas industry in Uganda(GoU, 2013). The PAU was established in section 9 of this act, and the UNOC was established in section 42.

Uganda Vision 2040 (the Vision) was launched in 2013 to address the socio-economic development of the country (GoU, n.d.). In the Ugandan regulations and acts, they use the term national content rather than local content, but in this study will the term local content be used. Local content regulations regarding upstream activity and operations were issued through the Petroleum (Exploration, Development and Production) (National Content) Regulations, 2016 (Upstream Regulations). Regulations on local content in the midstream and downstream activities are regulated through The Petroleum (Refining, Conversion, Transmission and Midstream Storage) (National Content) Regulations, 2016 (Midstream Regulations). Local content regulations related to the mining and mineral industry is regulated through the Mining and Mineral Act (Mineral Act) from 2022.

3.1.1 Local Content Policies

The most frequent reasons for governments to implement local content policies is a desire to increase domestic value through substituting domestically produced goods and labor for imported goods and labor (Tordo et al., 2013). Tordo and others (2013) explain that domestically produced goods and labor are connected through the creation of employment, which an increase of domestic production gives. Local content policies can also be implemented in oil-producing countries to motivate its citizens to take part in the industry and benefit from the country's resource wealth (Byaruhanga & Langer, 2020). This can be a part of a government's strategy to address issues as unemployment, poor local technology, and weak local industries.

Byaruhanga and Langer (2020) refer to studies from other countries that has varied outcomes on how effective local content policies has been on ensuring benefits from a country's resource wealth. Some of the positive outcomes is increased employment among the national citizens and that local companies are being involved in the industry. The negative impacts can be conflict that escalated from the lack of including citizens in the industry and setback of local development (Byaruhanga & Langer, 2020). The local content regulations in the oil and gas, and mining activities in Uganda, will be explained in more detail later.

3.1.2 Uganda Vision 2040

The statement of the Vision is: "A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years" (GoU, n.d., p. 4). It also includes development paths and strategies to operationalize the Vision statement. The Vision wishes to exploit strategic opportunities by strengthening relevant fundamentals to maximize the economic returns (GoU, n.d.). The oil and gas sector are one of the identified opportunities, and two of the identified fundamentals is infrastructure and human resources. This means that they want to strengthen the infrastructure and human resources in the oil and gas sector to maximize the economic return, which further on will help the country to fulfill their Vision statement. The discovery of commercial oil and gas has the opportunity to trigger economic growth, create employment, generate revenue that gives the possibility to invest in development in other strategic sectors, and foster technology transfer (GoU, n.d.). Regarding development of the human resources related to the oil and gas, the Vision says that the: "…Government will transform the human resource and build a critical mass

of scientists, engineers and technicians in the oil and gas sector, and ensure that they are equipped through application of the latest science and technology" (GoU, n.d., p. 50).

The Vision identified challenges to the development of Uganda, some of these are inadequate human resources and limited government investment in strategic and emerging industries (GoU, n.d.). The Vision regards unemployment as an issue in Uganda, where the country has a big challenge regarding the labor force which is largely unemployed because of inappropriate skills and that the capacity of the economy has a slow absorption. This results in a large number of youths that is unemployed and becomes a social and economic threat (GoU, n.d.).

Uganda is ranked at 121 place out of 142 countries based on overall competitiveness by World Economic Forum in 2012 (GoU, n.d.). The competitiveness is based on a countries ability to produce goods and services to the global market and to be favorably traded, and the Vision wants to improve factors like infrastructure, higher education and training and labor market development to attract foreign direct investments and develop a strong private sector.

3.1.3 Upstream Local Content Regulations in Uganda

The Upstream Regulations applies to local content in petroleum activities where all of the licensees, and any other who is involved in oil and gas activity in Uganda, must implement and incorporate these local contents in their oil and gas activities (GoU, 2016a). Some of the purposes of this regulation is to promote training and employment of Ugandans, and technology and knowledge transfer. Local content is defined in section 4 of the Upstream Regulations as:

> "the level of use of Ugandan local expertise, goods and services, Ugandan companies, Ugandan citizens, registered entities, businesses and financing in petroleum activities; and the substantial combined value added or created in the Ugandan economy through the utilization of Ugandan human and material resources for the provision of goods and services to the petroleum industry in Uganda" (GoU, 2016a, p. 721).

According to section 7 of the Upstream Regulation, shall the licensees submit a local content program stating the employment and training of Ugandans, transfer of knowledge, skills and technology to Ugandan citizens and companies, and support to local education institutions among other things (GoU, 2016a). This program shall be submitted to the PAU within twelve months after

granting the license. The licensees shall also ensure that recruitment and training plan follow targets specified in section 17 of the Upstream Regulations: (1) from the start of the petroleum activities shall the management staff be at least 30% Ugandan citizens and that it increases to 70% within five years, (2) at least 40% of the technical staff at the start of the petroleum activities shall be Ugandan and that it increases to 90% within ten years, (3) at least 95% of all other staff should be Ugandan citizens from the start of the petroleum activities (GoU, 2016a).

If the lack of required qualifications lead to Ugandans not being employed, the licensee should supply training locally or elsewhere approved by the PAU within a specified period set by the PAU (GoU, 2016a). Further on, in section 18 of the Upstream Regulation, it imposes the licensee to provide with internships for Ugandan citizens in petroleum activities, provide knowledge and technology to existing institutions in Uganda, mentorships, scholarships, knowledge and technology transfer by sending resource persons to training institutions. Upon request by the PAU should they provide industrial training for students and support institutions of education, and the training should be undertaken in Uganda if it is possible (GoU, 2016a).

3.1.4 Midstream Local Content Regulations in Uganda

The Midstream Regulations applies local content regulations in midstream and downstream operations in Uganda, and has the purpose to promote training and employment of Ugandans, and knowledge and technology transfer (GoU, 2016b). Regulations concerning employment, recruitment and training is found in section 17 and 18. It says that the licensee shall prioritize Ugandan citizens for employment in midstream operations and that the licensee shall submit a detailed plan for recruitment and training to the PAU within twelve months after granting the license (GoU, 2016b). This plan shall provide details about training of Ugandans in all phases of the midstream operations.

Regarding recruitment into the midstream activities, should the licensee have a recruitment plan that targets: (1) at least 20% of the management staff to be Ugandans at the start of the operations and that it shall increase to minimum of 60% within five years, and 80% in ten years, (2) at least 30% of the technical staff should be Ugandans at the start of the operation and increase to 60% within five years, and 80% within ten years, (3) 95% of all other staff should be Ugandans.

It is listed different means to provide training and knowledge transfer in section 19 of the Midstream Regulations. This includes internships, mentorships, and scholarships for Ugandan citizens in the midstream operations, and that they provide resource persons to training institutions (GoU, 2016b). Upon request by the PAU should the licensee also provide support to institutions of education and provide industrial training for students.

3.1.5 Local Content in the Mining and Minerals Act in Uganda

One of the purposes of the Mineral Act is to promote local content in the mineral subsector in Uganda (GoU, 2022). Under section 195 and 196 of the Mineral Act, is it specified that a mineral right holder and licensee should make a commitment to maximize knowledge transfer to Ugandan citizens, submit a detailed program for recruitment, training and promotion of Ugandans, and prioritize employment of Ugandan citizens. If the mineral right holder or licensee fail to find qualified Ugandan citizens to employ, should the right holder or licensee employ citizens of an East African Community Member State (GoU, 2022). It is also the mineral rights holder or licensees' burden to provide proof of their failure to find qualified Ugandan citizens.

3.1.6 Issues Connected to the Local Content Policies

Byaruhanga & Langer (2020) found in their studies that some parts of the existing local content policies in Uganda was vague and led to different interpretations of what a Ugandan company and Ugandan goods and services means. This have enabled foreign companies to out-compete Ugandan companies in supplying the oil and gas sector with goods and services. Another consequence of this has been that it has undermined the transfer of technology and capacity development for indigenous Ugandan companies (Byaruhanga & Langer, 2020). Some of the obstacles to development that Ugandan oil and gas suppliers encounter is the demanding quality standards in the industry and shortage of workforce skills (Sen, 2020). Sen (2020) recommends that it is established an Industry Enhancement Centre which is jointly planned by the international oil companies and the GoU to give business and technical training to the Ugandan supplier firms.

Another recommendation is to create a dedicated institution that monitor and oversee local content aspects of the oil and gas sector, where it also have the power to punish those who violate the local content requirements (Gwayaka, 2014). Although it is a monitoring process established already,

where it is a requirement that licensees submits quarterly and annual reports to the PAU that explains their performance in detail, these are not available for the public (Sen, 2020). Sen (2020) highlights that if these reports were made available to the public, it could provide information about the licensees planned and achieved procurements of locally produced goods and services to aspiring suppliers and enhance transparency in the industry.

In Fox (2021) study, most of the participants were dismissive towards the impacts of the local content regulations in Uganda, and that the operators (oil companies) were willing to find loopholes in the regulations. It appears that the government struggle to establish an effective framework for implementation of local content and monitoring in the sector (Fox, 2021).

3.2 Resource Curse or Resource Blessing

The recent oil and gas exploration in Uganda can lead to social, economic, and environmental consequences. Regarding these consequences, there are two theories that tries to explain the possible outcome: “resource blessing” and “resource curse”. The resource blessing scenario is when extractive industries, like the oil and gas industry, leads to less poverty through creation of employment, income, infrastructure development, and economic growth (Byakagaba et al., 2019).

On the other hand, we have the resource curse. This phenomenon refers to countries that are rich on natural resources, such as oil and gas, tend to have worse development outcomes and lower economic growth than countries that have fewer natural resources (Badeeb et al., 2017). These countries appear to be unable to use their resource wealth to boost their economies, and the citizens in these countries continue to have low income and low quality of life even though the country is rich on natural resources. Issues like corruption and instability is also issues that is connected to the resource curse, and these issues tends to be associated with oil when it is a lack of transparency, rule of law and oversight of actors in the public and private sector (Ogwang et al., 2018).

The establishment of the Vision envisages Uganda to become a middle-income country. Ogwang and others (2018) consider that it may be possible to achieve the goals set in the Vision if the revenues from oil production is used in the right way and invested in the appropriate infrastructure and social development. Further on, they highlight that the country stands over some critical policy choices, that both the local communities in the Albertine region and Uganda in general are

dependent on, to achieve its welfare potential from the oil discovery and production. Uganda as a country lack the required funds to invest in the oil and gas projects in the country, so they are also dependent on companies that are willing to invest and help them to fund the needed facilities and infrastructure (Ogwang et al., 2018).

A study that has been done in the Albertine region, revealed people's expectations from the discovery of oil and future oil production. Many of the participants thought that the discovery and production of oil could contribute with improved roads, increased employment opportunities, higher incomes and better access to public services (Ogwang et al., 2018). The ones that were skeptical about the outcomes of the discovery thought so because they meant that the local workforce does not have necessary qualifications to benefit fully from the opportunities that is created. One of the informants in Ogwang with colleagues (2018) study, said there had been many people moving to the region hoping for an employment opportunity in the oil and gas industry after the discovery, but that their hopes were not realized.

Another study argues for that the discovery of oil and gas in the Albertine region can present opportunities for local economic development, if they account for the identified risks (Mawejje, 2019). One of the identified risks is related to people's perceptions and expectations regarding their involvement in key decisions and access to information. This could help to get acceptance and legitimacy of the interventions that is intended to do in those areas, and limited access to information can lead to ungrounded rumors and uncertainty which can result in conflict (Mawejje, 2019).

A study that investigated the oil and gas exploration in Uganda and its socio-economic and environmental implications based on the perspective of the locals in two villages in the Albertine region, showed that increased wage rate and employment opportunities was the least mentioned socio-economic impacts (Byakagaba et al., 2019). This suggests that not many people have experienced improvement in wages and increased employment opportunities. Byakagaba and others (2019) says this study provides insight on the local people's perception which could help to develop policies that will ensure that the oil and gas industry improves the local livelihoods. Further, they also highlight the importance of implementation of a local content policies and to build capacity of local people so they could participate in the oil and gas exploration effectively.

3.3 Stranded Assets

The decarbonization of global economic activity has led to a growing likelihood that it will be a decline of fossil fuel use in the future and that it will rather be a rise in use of renewable energy sources. One of the consequences of this development can be that oil and gas resources become stranded assets. Caldecott (2017) cites to this definition of stranded assets in the context of upstream energy production: "those investments which have already been made but which, at some time prior to the end of their economic life (as assumed at the investment decision point), are no longer able to earn an economic return" (Caldecott, 2017, p. 2). If the global demand of carbon-intensive energy fall and the market price of fossil fuels decline, this may affect entire nations. In this scenario where the oil and gas resources become commercially unviable to extract it can create a risk of stranded nations when a considerable share of the wealth of a nation may lose its value (Manley et al., 2017). Climate change impacts and societal responses to these impacts can also result in stranding of human capital (Caldecott et al., 2016). If entire industries close and the workforce has a lack of mobility to get new jobs in other industries or regions, could such knowledge and labor stranding affect entire regions and communities, especially those communities that are specialized in a specific industry.

3.4 Summary of General Perspectives

This chapter has provided with information about how the GoU wish to take advantage of the domestic oil and gas sector through the Vision and how they want to regulate it through local content policies. Local content regulations in the mineral sector are included because the findings from the interviews revealed that graduates from the PG&P program also get employed in the mineral sector. In addition, have this chapter looked into the resource curse and blessing, and stranded assets, which gives different scenarios on how resource wealth can impact both employment and countries in general.

4 Methods

In this chapter will I describe and discuss the research design used in this study, and it is divided into nine sections. The sections will describe the research method, the data collection, ethical aspects that were considered, the quality of the study, and how I as a researcher influenced the research and different implications regarding research in another culture and country. Chosen methodology and obstacles I came across will also be discussed, in addition to a summary of the chapter.

4.1 Research Method

A qualitative research method has been used in this study. Qualitative research can be used as an approach to explore and understand the meanings individuals or groups have towards a social or human problem (Creswell, 2014). In human geography, qualitative research can help to gain information about identified trends through personal explanations, and provide insight and understanding of lived experience of different conditions (Hay & Cope, 2021). Because the research questions are based on the participants views on different topics and issues, it is relevant to use a qualitative research method to gain their personal understanding and experiences to give me insight to answer the research questions.

There are different qualitative methods to collect data, I have used interviews, group discussion, email interviews and document analyses. The document analyses were done mostly before the interviews and group discussion. This helped me to gain as much knowledge as possible on the relevant topics before I formulated the interview guides. I made four different interview guides that corresponded with the intended interviewees, which can be found in the appendix. Because of the complexity of the topics in question in this study, new information was gained through the interviews, which made it necessary to conduct document analyses also after the interviews to gain knowledge on the new topics that was discovered during the interviews.

4.2 Interviews

Table 1 presents a summary of the eleven interviews that was conducted. The names of the interviewees are anonymized. Eight of the interviews were conducted face-to-face, two over the phone and one over email. All the interviews were performed while I was in Uganda.

Table 1: Interviews conducted.

Name	**Position**	**Date of interview**	**Type of interview**
Daniel	Lecturer	19.01.2023	Face-to-face
Joe	Student	24.01.2023	Face-to-face
Josephine	Student	24.01.2023	Face-to-face
Robert	Graduate	25.01.2023	Over the phone
Thomas	Student	25.01.2023	Face-to-face
Franck	Student	26.01.2023	Over the phone
Linda	Lecturer	26.01.2023	Face-to-face
Oscar	Student	26.01.2023	Face-to-face
Lily	Student	27.01.2023	Face-to-face
Juliet	Student	27.01.2023	Face-to-face
David	Graduate	29.01.2023	Over email

4.2.1 Semi-Structured Interviews

Some of the strengths of interviews is that you get access to information, peoples opinion and experiences that may vary from individual to individual (Dunn, 2021). It is different forms of interviewing, where one of these are semi-structured interviews. It is usual to use an interview guide in semi-structured interviews, where the interview is ordered but flexible regarding questioning (Dunn, 2021). This means that the researcher has an order of the questions and topics but is not restricted to follow it. The questions in the interview guides were ordered by topics that I thought were relevant and that arranged for a flow in the interview. Initially in each of the interview guides, I started with questions that Dunn (2021) defines as descriptive. The further questions ask more about the participants experiences and opinions regarding the issues, and fits

with Dunn's (2021) definition of opinion questions. I used follow-up questions on the topics I wanted the participant to explain more in detail. If topics came up that I didn't prepare for, but found valuable and relevant for the study, I followed up on those as well.

I interviewed students, graduates, and lecturers in the program of PG&P at the DGPS at Makerere University in Kampala. Consequently, I made one interview guide for each group. The idea was to get different perspectives on the employment situation of PG&P graduates and how the energy transition could impact the creation of employment in Uganda. I imagined that the students could give me their expectations regarding their future and that the graduates would give me information about their experiences after graduation. Regarding the lecturers, I thought that they could give me their views on employment situation among their graduates and how they cooperated with both the oil and gas industry and government to design the program.

All the eleven interviews were conducted in Uganda and lasted approximately 30 to 45 minutes. I got in contact with a gatekeeper through my supervisors. A gatekeeper is an individual that have the power to either grant or withhold access to people within an organization (Valentine, 2005). After getting in contact with this gatekeeper, I sent the project description and the three different interview guides to the gatekeeper and then I got access to some of the students and lecturers at the PG&P program, and contact information to graduates. After interviewing the students, I got in contact with through the gatekeeper, I used snowballing to get in touch with several students. Valentine define snowballing as: "using one contact to help you recruit another contact…" (Valentine, 2005, p. 117). So, I asked the students I was interviewing if they knew anyone that could be interested in taking part in an interview and if I could have their contact information to send a request.

Initially, I wanted to get in contact with students from different stages of both the bachelor's and master's program in PG&P. Because it was exams during the two weeks of my stay there, it was hard to get access to the students. I didn't get the information about the exam period until I arrived at the university, which resulted in that I just got in contact with students from one of the years at the bachelor program. I also wanted to get in touch with graduates from both the bachelor and master program, but the DGPS didn't have sufficient contact information among the bachelor graduates. Therefore, I got just get the contact information of graduates from the master's program.

It was hard to get in contact with the master's graduates. Some of the reason might be that the contact information that I got was wrong, and that they have changed their email addresses after graduating. Also, the gatekeeper explained that most of the graduates did not live in Kampala, and most lightly didn't have the time or ability to take part in an interview. The initial contact with the two graduates was made through email but they could not meet up with me in person. Therefore, was one conducted over email and the other one over the phone. Because of bad connection was it some trouble during the interview over the phone, where the call suddenly dropped out or lagged. Consequently, it was important to repeat the questions and ask if I understood the answer correct. This was also the case during the interview with the bachelor student that was conducted over the phone.

A tape recorder was used during the face-to-face interviews, in addition to taking brief notes. Tape recording, or audio recording, allows the researcher to maintain the nature of the conversation with the participant (Dunn, 2021). This gave me the opportunity to focus on the content and flow of the interview without having to take long notes. The transcribing process was done manually. After transcribing the interviews, was all the transcriptions analyzed and coded based on themes. Some of the themes were pre-determined based on the literature review and interview guide I made before the interviews. Because new topics came up during the interviews, I had to make some additional themes for those in the analysis. Within each theme was the answers from the different participants matched with each other based on the specific topic. This analyze of the transcriptions gave me a good overview of the views from the participants on the different issues and is also the basis of the result chapter in this study.

4.2.2 Email Interviews

Like showed in Table 1, one of the interviews were conducted over email. One of the advantages of email interviews is that the interviewee have more time to give an detailed answer to the question and that the respond is carefully thought through (Dunn, 2021). I also thought that I could use email interviews to get a hold of even more graduates. The initial email that I sent to all the graduates I got from the gatekeeper, suggested that the interview could be conducted over email as well. But like previous mentioned, most of them did not reply.

The email interview was done because the graduate was not able to meet up in person and didn't have time to do the interview over the phone. I sent the questions and the project description to the graduate, like those in the appendix, and got a well described answer. After I got his reply, I wanted to follow up on some of the questions, but he did not reply to this email. Based on the lack of respond after the first email, it would have been more favorable to conduct the interview over the phone or in person.

4.2.3 Group Discussion

In addition to the interviews, I also conducted a group discussion among some of the students at the PG&P program. Initially, I wanted to have a mix of students from different stages from both the bachelor's and master's program, but because of the exam period that the students had, it was difficult to arrange this. Therefore, it was only students from one year that attended the group discussion.

The goal of the group discussion was to get insight on the student's views on the energy transition and how oil could influence Uganda in more general terms, which I did not go so much into detail on during the interviews. To get a good flow in the discussion, the questions prepared in the interview guide were based on the topics I wanted to discuss, and I tried to make them as open as possible. The interview guide for the group discussion is in the appendix.

The group discussion aligns best with the literature revolving focus groups. A focus group is a method that involves six to ten people that is discussing a topic or issue chosen by the researcher (Cameron, 2021). Because it is involving multiple participants it provides an opportunity to explore different points of views and discuss them with each other. The researcher plays an important part in this method, where the researcher promote group interaction around the issues that is discussed and sometimes encourage disagreement among the participants (Cameron, 2021). Seventeen students took part in the group discussion, which is almost double the size of what's recommended in the literature. The reason why so many participated is related to the exam period the students had. Because it was hard to come in direct contact with the students, the gatekeeper got me in contact with one of the students that further shared the information about the group discussion on their class chat on WhatsApp. Since the students had their exam period, I expected few of them to participate, so the size of the group that arrived surprised me.

I experienced that one of the advantages of the size of the group was that there was an increased chance of different points of view, but the size also limited the time each participant had to contribute. Based on this, it was important to structure the discussion, so everybody had the chance to talk and speak their mind about the topics. To increase the outcome and give everybody the chance to participate, I could have split the group into two and conducted two group discussions. But because of their exam period, the students did not have time to wait while I carried out the first discussion.

The group discussion was also recoded with a tape recorder. Due to the size of the group, it was important that the participants spoke one at the time, so it was possible to distinct between the different participants.

4.3 Literature Review

A literature review is to locate and summarize other studies that is related to the topic of your study (Creswell, 2014). Some of the advantages that come from a literature review is that you increase your knowledge on the subject by reading related studies, and you can get new ideas and inspiration to your study from reading others (Flowerdew, 2005). Like mentioned earlier in this chapter, was most of the literature review done before the interviews took place. This was to gain knowledge about the topics and issues so that I could design the interview guides. The knowledge I was pursuing was related to education in PG&P, the oil and gas industry in Uganda, and employment situation in Uganda, as well as the energy transition.

To conduct a literature review, Creswell (2014) recommends to capture, evaluate and summarize the literature. Initially I was given some studies from my supervisors that I could use to gain knowledge about the subjects. After that I was on the search myself to find related articles and studies. I tried to evaluate the different studies and categorize the opposed and similar studies, so that I could get an overview and understanding of the research that had been done. When I thought I had appropriate number of studies that was related to my study, I started to summarize it. The results of the summary of the literature review can be found in the three first chapters of the study; introduction, background and literature review, and general perspectives.

In addition to reviewing similar and past research of the related topics in this study, it was important to find information about the background, historical development aspects and legal framework in

Uganda. This knowledge and information were found in some articles and studies, but also in governmental and university websites, websites of active oil companies in the country and newsletters. Some of the websites that was important to capture the legal and historical framework were sometimes unreliable, where the websites sometimes were hard to get access to.

Because of the complexity of this study and new views and information that was gained through the interviews, it was important to do literature review after I came back from Uganda. The oil and gas industry in Uganda is still young and are developing continuously, so it has been important to pay attention to updates in relevant newsletter that follow the development closely and can give important and relevant information for this study. Due to the ongoing development in the country, there have been several changes to the study during the writing process. In addition, has it been important to perform a good literature review to find data on how the domestic local content regulations and the PG&P program tries to ensure employment, which is the content of the first research question.

4.4 Research Ethics

Before I started with the data collection, I applied to the Norwegian Centre for Research Data (NSD), now called Norwegian Agency for Shared Services in Education and Research (Sikt), to get permission to conduct my research. The application was approved, and I further followed the ethical guidelines provided by the NSD.

4.4.1 Anonymity and Confidentiality

In the process of a qualitative study, it often involves asking personal questions and therefore concern knowledge that is not publicly obtainable (Catungal & Dowling, 2021). The private details should therefore not be released without the consent of the participant. Because I did not find it important to disclose their real names, I made pseudonym names for all the participants, like seen in Table 1. The only personal information that I found valuable was their gender, and that they were either a student, graduate, or lecturer at the PG&P program at Makerere University. They were informed about this at the start of each interview.

All the material from the interviews and group discussion is saved on a personal NTNU server, which only I have access to. To withhold the anonymity of the participants, I have not written down their names, telephone numbers or personal information. If they changed their minds regarding participation in this study, I gave them my email address so they could contact me if they wanted to withdraw their answers.

4.4.2 Informed Consent

Before every interview, I read the informed consent to the participant and presented their rights connected to the project and explained how they could contact me if they changed their mind. At the end, I asked them if they consent to participate in this study. How this process was conducted aligns with what Catungal and Dowling (2021) explain to be important under informed consent. Regarding the interviews that was conducted over the phone or email, I them this information over email.

4.5 Credibility, Dependability, and Transferability

To ensure the quality of a study, it is common to look at the study's credibility, dependability, and transferability in qualitative research. Thomas and Magilvy (2011) defines credibility as: "…the element that allows others to recognize the experiences contained within the study through the interpretation of participants' experiences" (Thomas & Magilvy, 2011, p. 152). This means that the result of the study is accurate and captures what's happening. To achieve credibility is peer debriefing one of the recommended strategies. Peer debriefing is when a peer reviews the transcripts and final themes and findings of a study (Janesick, 2007). This has been done in this study by sending in drafts of the transcriptions and findings to my supervisors, where they have helped me to assess the results of the study.

Dependability is defined as the decision trail of a researcher in a study, and if it's possible for others to follow this trail (Thomas & Magilvy, 2011). Thomas and Magilvy (2011) explains that this is achieved through describing the study's purpose, discussion around the participants and findings in the study, description of the data collection and transcription. To provide dependability in this

study, I have explained every decision I made throughout the study and used my supervisors to examine the content.

Transferability is if the results or methods of the study is transferable to other contexts (Thomas & Magilvy, 2011). To achieve this, it is important that the study has a solid description of the studied population and descriptions of geographical boundaries. Concerning the research method in this study, I think it is capable and appropriate to be used in a similar study in another country, because it provides with personal experiences from the participants. When it comes to the transferability of the results, it is possible that students, graduates, and lecturers in PG&P from other higher education institutions in Uganda has the same experiences as the findings in this study has shown, but it is impossible to guarantee. That is mainly because I haven't found any other studies that have investigated related topics at other universities or higher education institutions in Uganda.

4.6 Critical Reflexivity and Power Relations

"Critical reflexivity begins with the recognition that the practice of research, as well as researchers and our participants, do not operate in a vacuum, but in fields of power and ongoing histories of social differentiation" (Catungal & Dowling, 2021, p. 25). This means that I had to pay attention to the power relations between me and the participants in the interviews and group discussion, and how I as a researcher influenced the outcome of the data collection.

Regarding power relations, academics often assume that the interviewer is in a dominant position during interviews, but when interviewing elites it may often be opposite (Valentine, 2005). Valentine (2005) also highlights a heightened sensitivity to the power relations between researchers and interviewees in less developed countries. During the interviews and group discussion with the students, I felt that they regarded me to be in the dominant position. Therefore, I tried to make them feel comfortable and safe in the situation, so that they felt safe to share their accurate views on the topics.

As to the interviews with the lecturers, I felt that they were in the dominant position based on the differences in the knowledge on the topics between me and them. The literature review I did before the interview was necessary to maintain a good flow in the conversation and to come up with follow-up questions. If I didn't have the knowledge that I did on the topics before interviewing the

lecturers, I think that it might have influenced the outcome of the interview and that the lecturers wouldn't have taken me seriously.

4.7 Interviewing in a Different Culture and with a Different Language

This study was conducted in Uganda with only Ugandan participants. Differences in how it is expected to dress, local codes of behavior and misunderstandings are common when interviewing in a different cultural context then what you are used to (Valentine, 2005). To get some information on how I should behave or how I could get informants to my study, I got some tips from my supervisors. Other than that, I used the gatekeeper to get information about what's expected of me during my stay. To avoid misunderstandings based on the language, I was aware to ask the interviewee to repeat the answer again or to use other words to describe what they meant if I did not understand.

Cross-cultural research is complex and if you are in the field for a short period, the urgency you feel regarding the project might not be shared with the potential participants and people that help you in the field (Gergan & Smith, 2021). The duration of my stay in Uganda was only two weeks, which is relative short. And like previous explained, there was exams for the students while I was there. This made it hard to get access to them, and I felt the urgency to get in contact with them was not shared with my gatekeeper. On the other hand, I respected that they were occupied with their studies. Luckily, I got in contact with them at last, like explained before.

4.8 Discussion of Difficulties in the Chosen Methodology

The first obstacle was access to participants. Like previous mentioned, the students had their exam period while I was there, so they didn't have much time to spare, and the gatekeeper didn't want to bother them to much while they were reading. To prevent this, I should have investigated the possibility to access the students before I arrived at the university. There were also problems connected to the access to graduates, where some of the reason for this was that most of the email's I sent to the master graduates, were left unanswered and that the DGPS didn't have sufficient contact information of the graduates from the bachelor's program.

The second obstacle is that all the students that was interviewed was from the same year at the bachelor's program. If the participants would have been from separate years, and from both the bachelor's and master's program in PG&P, it might have resulted in a bigger pool of experiences. For example, didn't any of the participants go for internships because of the covid restrictions in the country, which means I didn't get their view on how they experienced it and where they went. In addition, this resulted that I didn't get any explained experiences from current students in the master's program in PG&P.

4.9 Summary of Methods

In this chapter have the study's research design been presented, where the choices that I made before, during and after the fieldwork has been discussed. The data collection was based on results from interviews and group discussion, in addition to literature review. Ethical aspects like anonymity and informed consent have been discussed and explained how it was achieved in this study. How the quality of the study can be examined have been looked at considering credibility, dependability, and transferability. My influence on the study have been reflected upon through critical reflexivity and power relations, also different complications connected to doing research in another culture and country have been accounted for. Section eight highlighted the most noticeable difficulties connected to the chosen methodology, as well as other problems have been explained throughout the chapter.

5 Results

This chapter will present the results from the interviews and group discussion and is divided into nine sections. The content of each section is based on the results from the interviews and group discussion, where responses from the participants on the same theme is gathered in each section. Additionally does this chapter provide with findings from other sources as well.

5.1 Design and Structure of the Program

The bachelor's program was started in 2009 while the master's program in PG&P commenced in 2012. Both are hosted by the DGPS at Makerere University. In the tables below, is the semesters and courses in both bachelor's and master's in PG&P at Makerere University described, where: L = Lecture; P = Practical; CH = Contact hours. Further are the elective courses colored in red and courses that are in the inter-semester break in green.

Table 2: First year in BSc. PG&P. Source: Department of Geology and Petroleum Studies, n.d.-a

BSc. First year			
Course name	**L**	**P**	**CH**
Semester 1			
External Earth Processes	15	30	30
Internal Earth Processes	30	0	30
Mineralogy	15	30	30
Calculus	45	0	45
Probability and Statistics	45	0	45
Basic Inorganic Chemistry	30	30	45
Basic Physical Chemistry	30	30	45
Properties of Matter	30	0	30
Semester 2			
Paleontology	15	30	30
Petrology	30	30	45
Geology of Uganda	30	0	30
Introduction to Computer Science	15	30	30
Linear Algebra	45	0	45
Basic Organic Chemistry	30	30	45
Electricity and Magnetism	45	0	45
Heat and Thermodynamics	30	30	45

Table 3: Second year in BSc. PG&P. Source: Department of Geology and Petroleum Studies, n.d.-a

BSc. Second year			
Course name	**L**	**P**	**CH**
Semester 3			
Structural Geology and Geotectonics	30	30	45
Introduction to Petroleum Geology	45	0	45
Petroleum Geophysics	30	0	30
Computing and Geostatistics	30	30	45
Introduction to Petroleum Engineering	15	30	30
Rock Mechanics and Fluid Physics	45	0	45
Fluid Mechanics	45	0	45
Mineral Optics	15	30	30
Material Science	15	30	30
Semester 4			
Sedimentary Petrology	15	30	30
Stratigraphy	15	30	30
Geochemistry	30	0	30
GIS	15	30	30
Electromagnetic and Radiometric Methods	45	0	45
Mathematical Analysis	45	0	45
Field Geology and Surveying	30	30	45
Remote Sensing	15	30	30
Environmental Geology	30	0	30
Field Attachment	0	150	75

Table 4: Third year in BSc. PG&P. Source: Department of Geology and Petroleum Studies, n.d.-a

BSc. Third year			
Course name	**L**	**P**	**CH**
Semester 5			
Analytical Separation Techniques	30	30	45
Sedimentology	30	0	30
Palynology	30	30	45
Seismic Data Interpretation	30	0	30
Signal Processing	15	30	30
Geophysical Data Acquisition, Processing and Interpretation	45	0	45
Well Logging	30	30	45
Electrical and Paleomagnetic Methods	30	0	30
Scientific Project Proposal and Report Writing	30	0	30
Semester 6			
Regional Geology of East Africa	30	0	30
Petroleum Geochemistry	30	30	45
Seminar Presentation	30	0	30
Computer Modelling and Design	45	30	60
Analysis of Sedimentary Basins	30	30	45
Sociology and Ethics in Petroleum	30	0	30
Oil and Gas Policy and Environmental Law	45	0	45
Differential Equations	30	0	30
Thematic Map Interpretation	15	30	30
Project	-	-	-

Table 5: Fourth year in BSc. PG&P. Source: Department of Geology and Petroleum Studies, n.d.-a

BSc. Fourth year			
Course name	**L**	**P**	**CH**
Semester 7			
Petroleum Economics	60	0	60
Petroleum Reservoir Management	30	30	45
Drilling Engineering	45	0	45
HSE Aspects of Petroleum Development	45	0	45
Reservoir Geophysics and Geology	45	0	30
Reservoir Engineering	30	30	45
Electronics and Instrumentation	15	30	30
Drilling Fluids	30	0	30
Semester 8			
Petroleum Production Methods	45	0	45
Management of Petroleum Operations	45	0	45
Enhanced Oil Recovery Processes	45	0	45
Regulation in the Oil and Gas Industry	30	0	30
Safety and Reliability Analysis	45	0	45
Project	0	150	75
Gas Marketing and Gas Utilization	30	0	30
Petroleum Refining and Transportation	30	0	30

Table 6: First year in MSc. PG&P. Source: Departement of Geology and Petroleum Studies, 2012

MSc. First year			
Course name	**L**	**P**	**CH**
Semester 1			
Petroleum Geology	45	0	45
Petroleum Geophysics	30	30	45
Principles and Practices of Petroleum Geochemistry	15	30	30
Sequence Stratigraphy	30	30	45
HSE Aspects of Petroleum Exploration and Production	30	0	30
Depositional Systems	30	30	45
Petrophysics and Formation Evaluation	30	30	45
Field Course	0	120	30
Semester 2			
Applied Biostratigraphy and Chronostratigraphy	30	30	45
Basin Analysis	15	30	30
Petroleum Structural Geology	30	30	45
Production and Reservoir Monitoring	30	30	45
Research Methods	15	30	30
Seismic Reservoir Characterization	30	30	45
Geological Development of the East African Rift System	45	0	45

Box 1: Second year in MSc. PG&P

The third semester will be spent gathering data in the field with the research method approved in the proposal (Department of Geology and Petroleum Studies, 2012). After that will it be conducted laboratory work where they prepare samples and analyze.

Data interpretation and presentation of their findings in seminars and workshops will be the content of the first part of the fourth semester, before they use the last part of the semester to write the dissertation until submission (Department of Geology and Petroleum Studies, 2012).

Linda explained how the program was designed. It was designed through consultation from Tullow Oil and that the Ministry of Energy guided them regarding the content of the program. She further explained that the Ministry of Energy was guiding them because they were involved in the industry before them, so they knew what to include to produce graduates that would fit and manage the industry after graduation.

The different oil companies and government institutions like CNOOC, TotalEnergies and the Ministry of Energy are involved when they are reviewing the program every third year, where they send their representatives to join in on the review (Linda, Lecturer). The reviewing process is carried out to update the content of the program to fit the needs of the oil and gas sector. The current courses in the bachelor's program in PG&P can be found in Table 2, 3, 4 and 5 and in Table 6 and Box 1 concerning the master's program. Regarding the cooperation with the oil industry, Daniel the lecturer explained that they get people from the industry occasionally hold lectures for both the bachelor's and master's program, but that is usually when the students invite them through student associations.

Regarding the field trips, is there no cooperation with the industry, but they might accidentally meet them when they are out in the field and then they might engage with them, but it is not on purpose (Daniel, lecturer).

Students at the bachelor's program go for internships for ten weeks after the fourth semester, while students at the master's program don't have internships at all during their education (Daniel, lecturer). Daniel explains that some bachelor students find internships through their own connections and others are connected with various organizations through the DGPS. Organizations which the DGPS has a cooperation with include among others; PAU, UNOC, The Directorate of Petroleum, Directorate of Water Development, TotalEnergies, CNOOC and Schlumberger. Despite the existing agreements, most of these companies have not been taking bachelor students for internship in the recent years, because there was no petroleum activity in the country. After the signing of the FID, Daniel expects that these companies can take bachelor students for internships and there are also new service companies that they expect to establish cooperation with.

The international companies also have limited numbers that they take for internships, maybe two or three each year. Further on, Daniel says that not all students get placement and that those students are catered for within the DGPS with internships based on learning how to use the various software

that the DGPS has available. The coronavirus resulted in that the students that was interviewed did not get to go on internships with companies because of the restrictions in conjunction with the virus.

Both lecturers informed that oil companies grant scholarships to students at the PG&P, both at the bachelor's and master's program. Although, none of the students or graduates in this study were on scholarships granted by an oil company.

5.2 Student Associations and Societies

Regarding what a student in PG&P could get out of being a member of a student association or society, Josephine answered that most of the societies and associations aim to bridge the gap that exist between students and professionals. American Association of Petroleum Geologists (AAPG), Society of Petroleum Engineers (SPE) and Makerere University Petroleum and Geology Society (MPGS) is some of the different societies and associations that she mentions (more information about student associations and societies in Box 2). Further on, Josephine gave examples of how the different associations and societies may be benefiting for the students. The AAPG, which is an international association, gives the students the opportunity to apply for research grants. SPE on the other hand provides the students with a platform for mentorship from professionals in the industry from across the world. The two societies and associations mentioned above also hold internal events where they foster interaction between professionals and students. MPGS organize events where students can exhibit projects to showcase their knowledge they acquired from different courses from the program. They also invite the oil companies in the country to these exhibitions. Josephine further highlights that these types of arrangements are a massive networking opportunity for students and that they get opportunities to acquire internships and graduate trainee programs from the different oil companies or information on how to get them.

Box 2: Relevant student associations and societies.

The AAPG is a nonprofit corporation was founded in 1917 and since its establishment it has been a pillar of the scientific community worldwide (AAPG, n.d.). 8000 of their members is students and 39% of their members live outside of the United States. The AAPG provides resources and programs that students can benefit from both at graduate and undergraduate level. Further on can these programs help students to have contact with the professional geoscience community, and in that way gain access to learning and leadership opportunities (AAPG, 2015).

The SPE started as a committee within the American Institute if Mining Engineers, but it is now an independent and nonprofit global society with members in 138 countries (SPE, n.d.-a). SPE also established a section in Uganda in December 2011. They state their mission to help to provide opportunities for professionals to enhance their competence and knowledge that is related to their profession and that they want to collect, exchange and disseminate technical knowledge about oil and gas resources in exploration, development and production for the public benefit (SPE, n.d.-c).

Further on, in their membership brochure, they highlight their programs for young professionals and student membership. Their program for young professionals gives them the opportunity to get career advice from experienced professionals through an eMentoring program, meet specialists from different disciplines to gain insight to possible career paths and identifying their knowledge gaps through free tools they have for their members (SPE, n.d.-b). Regarding their programs for student members, they offer resources and opportunities that expands their knowledge and skills, gets practical career advice from professionals through the eMentoring program and they also grant scholarships for students pursuing oil and gas related degrees at both graduate and undergraduate level.

5.3 Quality of the Program and Possible Improvements

All the students indicated that they felt the education at the program was relevant for employment in the oil and gas sector in the future, but they also felt that there were too much theoretical compared to practical learning. Six out of seven students also indicated that they felt the program was really challenging and that you really had to work hard to get through the program.

When it comes to the student's perspectives on what that could help to make the program become better and increase the chances for a job after graduation, they were mostly mentioning the lack of field trips, especially field trips to the oil and gas regions in Uganda. They also commented on the lack of equipment and relevant instruments. The student, Franck, commented that he wanted more career guidance through the education, and he also thought that visiting the areas where the production is taking place can help the students learning ability and motivation. One other student further commented on this topic: "Most of the things you just imagining, like I have never been at a drilling site or rig" (Lily, student)

The graduates also share this view with the students, where they criticize the lack of practical aspects in the program and one of them explained: "It is not enough field work in the programs, and the access to the oil wells is hard. Limited access to the oil wells, so the field work is limited" (Robert, graduate).

One example from the students on how the program could become better was that they wanted a more direct relationship between the DGPS and the oil companies in the country, so it would be easier to get internships and to visit the drilling sites. The students also highlight the diversity of the bachelor program as one of the important aspects, and what's most important depends on what you want to venture in after graduation. The graduates shared this view with the students and explained that the program was relevant for employment in the future especially with their experiences from geology and geological field mapping.

Regarding the balance between practical and theoretical learning, Linda the lecturer explained that they have a challenge to fund the field work to get enough practical and hands-on learning. The lack of funding of the program results that they must reduce the length of the field trips and they can't afford the relevant instruments and equipment for practical learning. The other lecturer, Daniel, shares this view, where he further explains: "Sometimes we don't have equipment and have to do the practical aspect in theory, which is very bad" (Daniel, lecturer).

5.4 Employment in the Oil and Gas Sector after Graduation

Out of the seven bachelor students, five of them knew someone close to them that had got a job in the oil and gas sector after graduation from the bachelor program. One of the students explained that he has friends that got jobs at the foreign oil and gas companies, and said:

> "A few have gotten a job in the big companies Total, CNOC, but even when they get the jobs it takes like one year where they go to training, at least 6 months. The company takes you for training, like I told you here we don't have the hands on, when you get a job, it is hard for you, so they give you the instruments. My friends go to France with Total, and those with CNOOC had to undergo some training" (Thomas, student).

Regarding how many the students thought got a job in the oil and gas sector after graduation, the numbers are low but differ between the students. The numbers differ from around 10% to 50%. On the question if it is a risk to enroll to the PG&P program, regarding the relative low number of graduates that they thought got a job in the oil and gas sector after graduation, Thomas the student said that it's not a risk, but you must be dynamic. He further explained that the program is so broad and that you may also get a job in other sectors like mineral or water sector. One other perspective on the same subject from another student, Oscar, was that the oil and gas industry in the country is so young, so the industry can't absorb everybody at the same time. Further, was the importance of networking and how important it is to know people to get a job highlighted by Josephine. She further mentioned that she takes part in societies and student organizations to get a bigger network and career growth. This perspective is also shared with the graduates, which explains that some people are favored for jobs because they know people in the authority.

Robert said that he does not think anyone from his class got a relevant job after graduation, but David knew people that got relevant jobs, for example in PAU, CNOOC and UNOC. Neither of the graduates got a job in the oil and gas sector after graduation. Robert got a job based on his previous bachelor, and David is still unemployed. Both applied for different kind of jobs in the oil and gas sector, but they did not apply for jobs outside the sector.

The lecturers had different perceptions on how many that get jobs after graduation. Linda thought it was around 40%, and Daniel though it was between 3 to 5%.

Both lecturers thought that the foreign companies didn't want to hire domestic labor because of the lack of skilled labor in Uganda, and that the foreign oil companies therefore wanted to hire foreign skilled labor. Daniel thought that it might be true that the domestic labor lacks the required skills but that the reason for that is the lack of funding in the PG&P program. He further explained that the problem of funding and lack of equipment causes that the students don't get enough time to grasp every practical aspect in the field. If the funding was there, he thinks that they would be able to buy the necessary equipment and help the students to be skilled enough and ready for jobs in the field. Daniel also explained that they don't get any funding from the government.

5.5 Employment in other Sectors after Graduation

On the question regarding how many they knew that got a job in another sector than the oil and gas after graduation, all the students knew someone, and highlights especially the mineral and water sector. They explain that those sectors that absorb students from the bachelor program is sectors that relate to the same knowledge that they have learned through the PG&P program. Even though they know someone that got a job in other sectors, they also knew of graduates that still don't have a job after graduation. The graduates share this perspective with the students, but also highlights geothermal exploration as a possible sector.

Regarding the lecturers, Linda said that not more than 50% in total get a job after graduation and explained that the reason is that the job market in Uganda is not big, so it is not possible for everyone to get jobs. She also informs that the DGPS don't keep updated records of the employment situation among their graduates. Linda further explained that the program must be diverse and broad because it is a university policy, where the policy is meant to ensure that students are able to get jobs in other sectors as well. Daniel agrees with this statement and said that most of their students get employed outside the oil and gas sector, so it is important that the program is so diverse and covers so many topics. Linda also said that some graduates go to teach PG&P at other universities.

5.6 Motivation to Enroll and Career Expectations.

Six out of the seven students said that their motivation to enroll was that they wanted to take part in the development of Uganda through the oil and gas sector. Four of the students mentioned that they were motivated to enroll because it is a chance for them to increase their standards of living for themselves and their families. Both graduates were also motivated to enroll because of their wish to take part in the development of the oil and gas sector in Uganda. Robert said that the government encouraged people with an interest and qualifications to apply for this program. A presentation of the enrollment numbers for both the bachelor and master program in PG&P is found below in Figure 2.

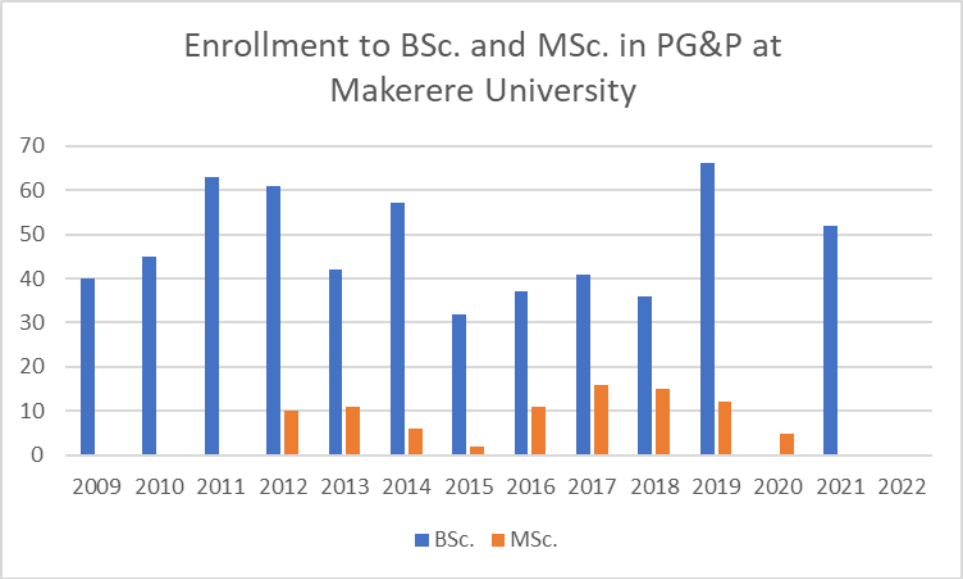

Figure 2: Enrollment to BSc. and MSc. Source: Data provided by the Department of Geology and Petroleum Studies.

Regarding the student's career expectations after graduation, all of them were expecting a job in the oil and gas sector. Five out of seven students said it was not important what type of job it is, but they just wanted some industry and hands-on experience. This was further explained by one of the students:

> "Right now, with the kind of industry we have in the country, being a young one, you can't go out now and say that you specifically want this, if you can land on anything that is petroleum, you start there and gain experience over time then maybe land on that specific one over time" (Oscar, student).

5.7 Impacts of the Energy Transition

Regarding the student's perspective on how the green shift, sustainable development, and energy transition can influence employment in the oil and gas sector in the future, they mostly agree that it will not influence the employment in the near future. Their answers differ from 25 to 50 years before employment is influenced by these factors in the country. Joe thought so because of the energy gap between Uganda and the western countries, and that the western countries should do it first before it can happen here. Josephine explained that the country is looking for just transition and that Uganda should be catching-up with the western countries through industrialization.

The graduates shared the students view and explains that it a shift can't happen fast, it takes time. Linda the lecturer explained that the graduates will have jobs in the short run and highlight that there is a technological and investment problem for Uganda regarding the shift. Since Uganda is just starting to produce oil and gas, the graduates will have jobs. Regarding how long it might take for the employment to be influenced by this, the lecturers answered around 10-25 years. One of the lecturers also explained why it is important for Uganda to produce oil: "We need to produce, to get the money, to fund the green shift. If we are to transit, we need the money first, to renewables, to agricultural. You cannot just say stop, you can't" (Linda, lecturer). Currently, topics like the energy transition in not in the curriculum in the program, but the lecturers teach about these topics in sections in some of the courses. Linda thinks that the energy transition will happen in Uganda and that the DGPS and the students must prepare for this. She also thinks that it will get a place in the curriculum the next time the program is reviewed. Daniel said that he just designed a new standard for PG&P programs where he tried to capture some elements from the green shift and energy transition. This is now up for approval and will later be communicated to other universities that offers PG&P programs, if it gets approved.

5.8 How Oil can Impact Uganda

Some of the students during the group discussion said they were skeptical if oil could be a positive influence on Uganda, and they based this on the corruption in the country. One of the students, which grew up in the district where oil was discovered in Uganda, said: "Few may benefit because of corruption, ideally many are supposed to benefit. In the district where I'm from, people are already benefiting, getting jobs, guys working on site construction" (Thomas, student).

In the discussion group, the students were split on the question on how oil could influence Uganda in the long run, but they highlighted some of the positive changes that already happened with development of infrastructure in the areas where oil was discovered, along the pipeline and that the locals got an opportunity for jobs in constructing.

5.9 Summary of Results

This chapter have presented the finding from the interviews and group discussion and have been structured in sections based on themes. In addition, have findings like descriptions of the courses, semesters and enrollment numbers at both the bachelor and master in PG&P, and information about AAPG and SPE.

6 Discussion

This chapter will be divided into four sections where each section will contain discussion around one of the four research questions. The first section will start with discussing how both the bachelor's and master's program in PG&P and domestic local content regulations is designed to ensure graduates a job in the oil and gas industry after graduation. Secondly, the discussion will revolve around the students, graduates, and lecturer's views on their mobility and ability to get jobs in other sectors than the oil and gas sector. Next section will discuss their views on possible impacts the oil and gas sector can have on the development of Uganda. The last part of the discussion will revolve around their views on how the energy transition may influence future employment in the oil and gas industry in Uganda.

The findings from the interviews and group discussion will be discussed in light of the background and literature review, and general perspectives in all of the sections. Lastly in this chapter, there will be a section which summarize the discussion.

6.1 Ensuring Domestic Employment in the Oil and Gas Sector

The Vision states that unemployment is an issue in Uganda and some of the reason of this is that the labor force is relatively young and poorly educated and skilled. The Vision wants to handle this through skilling and educating of the youth to further attract foreign direct investments (GoU, n.d.). Commercial oil and gas are one of the strategic opportunities that is identified in the Vision and to operationalize the potential in the oil and gas industry, the GoU want to strengthen it through development of infrastructure and human resources to create employment and trigger economic growth. Related to the creation of employment, the Industrial Base Line Survey expected creation of both direct and indirect jobs from the oil and gas industry at Lake Albert (SBC, 2013). For both students and graduates in bachelor and master in PG&P, jobs as engineers in the oil and gas industry is most relevant for them. Based on the interviews with the students, all of them is expecting a job in the oil and gas industry in the future after they graduate. Five out of seven of them said that it is not important what type of job it is in the industry, but that they just wanted some industry and hands-on experience. This might indicate that they will also be open for employment in other jobs that is related to their education in the oil and gas sector in Uganda.

Regarding the development of the human resources in the oil and gas industry, the Vision states that the: "… Government will transform the human resource and build a critical mass of scientists, engineers and technicians in the oil and gas sector, and ensure that they are equipped through application of the latest science and technology" (GoU, n.d., p. 50). This indicates that the GoU wants to invest in education and skilling of engineers and ensure that they are equipped with the latest science and technology, which should include both the bachelor and master program in PG&P at Makerere University. Both the students and the lecturer's comment on the lack of equipment and necessary instrument that would help to improve the practical learning aspects of the education, where Daniel said: "Sometimes we don't have equipment and then we have to do the practical aspect in theory, which is very bad". Lack of funding has other consequences for the education. Funding of field trips is lacking and results in shorter duration which they can afford to take the students for field trips. This indicates that the goal of building a critical mass of engineers lacks the required investments from the GoU stated in the Vision.

The lack of funding was clearly expressed by the participants in this study, where this also relates to the inability to have practical training for the students which in turn is bound to the quality of the graduates. According to Alani (2021), is higher education in Uganda generally under-funded, where just 0,35% of the GDP has been spent on annual funding on average the two last decades. Kasozi (2016) argues that this is a trend among African governments, where universities is of low priority and has resulted in a reduced domestic production of skilled human resources.

Lau (2017) identified both core areas of competences and education for the next generation of petroleum engineers and geoscientists, and also found that some of the required competences that the industry requires is not found in the curriculum of traditional undergraduate studies for petroleum engineers and geoscience. All the students that took part in the interviews experienced that the education at the program was relevant for future employment, but they also felt like there is an imbalance between theoretical and practical learning. This imbalance has been noticed in another study, where the overly focus on theoretical learning rather than practical skills may be a possible answer to the unemployment because the lack of required current and future needed practical skills (Kaguhangire-Barifaijo, 2022). A possible answer to why there is limited practical learning in the education may be the shortage of funding of the program, as discussed in the previous paragraph. The program's inability to fund relevant instruments and technology results in

graduates who do not have the required practical skills, which further puts them a disadvantaged position when applying for jobs.

The identified core areas of education for the next generation of petroleum engineers and geoscientists, is interesting to see in light of the results from the interviews and how the informant's views on their education align with the identified core areas of education. Three of these core areas are connection with the industry, mentoring and technology.

Regarding connection with the industry as an area of education, this can be company and field visits or summer internships. There is no cooperation with the industry regarding field trips at the PG&P program, but they might engage with them if they meet them by coincidence (Daniel, lecturer). Most of the students have never visited a drilling site. As articulated in other studies (Taodzera, 2020; Van Alstine et al., 2014) does the graduates explains that access to the oil wells is strict. Mosher and Keane (2021) specify how field trips and internships can be an effective way for the students to gain skills, knowledge and experience outside the classroom.

The DGPS has cooperation with different companies, but Daniel the lecturer informed that they have not taken any students for internships the recent years because there has been no petroleum activity in the country. In addition, has the international companies limited capacity to take students for internships. The restrictions of the coronavirus also made it impossible for the students to attend internships. A better cooperation between the DGPS and the oil companies is also one of the suggestions from the students on how the education could have been better, and that it could help to make the process of getting an internship less stressful.

Lau (2017) explains different learning outcomes that the students get from the connection with the industry. Concerning that the program has limited cooperation with the industry regarding field trips and company visits, and different implications connected to internships, it might be difficult for the students at the program to acquire these learning outcomes.

Student organizations, associations and societies was named as an aspect that helps to bridge the gap between students and professionals. Professionals occasionally give lectures at the PG&P program, but this is when invited by the students through student organizations. Josephine was an active member of the MPGS and had knowledge about how other associations and societies could be of service to the students. Two of these are the AAPG and the SPE. In Box 2, you can see the

different opportunities and services they deliver to their members. Given Lau's (2017) description the possible learning outcomes students can get from connection to the industry, these types of organizations can be a replacement when the DGPS and the PG&P program lacks the possibility or ability to offer this to its students.

Local content regulations for both the Upstream and Midstream Regulations states that the licensees have responsibility to provide training, internships, mentorships, scholarships, and knowledge and technology transfer to existing institutions in Uganda (GoU, 2016a; GoU, 2016b). The licensee should also offer support to education institutions if it is requested by the PAU. Based on these local content regulations and the responsibilities that is required that the licensees follow, a cooperation and connection between the DGPS and the industry should occur. There have been recent complications regarding some of these responsibilities like the restrictions following the corona virus and the late signing of the FID, but one could argue that transfer of knowledge and technology as well as support to education could still have been covered.

One of the graduates knew other graduates that had been hired by the foreign oil companies like CNOOC and TotalEnergies, and that they were sent to industrial training abroad after graduation by their employer. In addition, does the lecturers inform that some students get scholarships from the oil companies in the country, but none of the students or graduates in this study were on scholarships from them. This indicates that the licensees provide with industrial training and scholarships like they are required to do, but industrial training is only to those they hire.

Although the PAU has responsibility of the monitoring process where they follow-up on the licensees local content responsibilities, suggest Gwayaka (2014) to establish a dedicated institution to monitor and oversee the local content aspects of the industry, with the power to punish them who violate it. Because of the missing implementation of the responsibilities from the industries to support Ugandan education institutions, it could be appropriate to establish an independent institution to oversee local content aspects in the oil and gas sector in Uganda. On the other hand, did Fox (2021) argue that oil companies were willing to find loopholes to avoid following the regulations. Based on their willingness to avoid the regulations, can it seem that the current regulations aren't strict enough and that the PAU are either unable or unwilling to punish those who violate it.

Daniel the lecturer was expecting that the DGPS are going to establish cooperations with new service companies in the oil and gas industry and was optimistic that the oil companies take students for internships after the signing of the FID and start of the petroleum activities. The intake of students has also been over what the former head of the DGPS expected in the first years of running the program (Department of Geology and Petroleum Studies, n.d.-c). The enrollment numbers presented in figure 2 shows that the enrollment for the bachelor program circulate around 40, where some years it is a little bit under and some years over. Although the stated enrollment number from the former head of the DGPS doesn't match with the numbers found in this study, we can imply that there is no limit for how many they enroll each year. Based on that the international companies have limited numbers of internships, it could be a solution to set a limit on how many students they enroll to ensure that all the students get internships during their education. This may help to achieve the possible learning outcomes for the students from connection with the industry.

Although the industry was represented with a company in designing the program of PG&P at Makerere University and that different oil and gas companies in the country send representatives when reviewing the program every third year, there seems to be a lack of connection between the industry and the education at the DGPS. This is mostly based on the lack of implementation of responsibilities from the licensees. Investments and funding from the GoU are also inadequate and missing, which is odd based on the statements in the Vision. As mentioned before, have Alani (2021) documented the lack of governmental funding of higher education in Uganda, which have been low for the last two decades. The lack of cooperation and connection with the industry combined with the lack of investments and funding from the GoU results in the absence of new technology, field trips and company visits, relevant equipment and instruments, and internships for the bachelor students and the DGPS. If these factors were invested in and followed through with, it could have contributed to help the students reach the required competence and skills needed to fit the requirements in the industry. This aligns with the statement from one of the lecturers as well, who believes Ugandan labor might be too poorly skilled to match the requirements in the industry because of the lack of investments and funding (Daniel, lecturer).

This study does not provide information about the lecturers professional background, and if they have any. Therefore, it is hard to make assumptions on the lecturer's ability to act like mentors for the students. Like mentioned before, there should be involvement from the industry and the

licensees to provide mentorship for the students. Based on the comment from one of the students that call for more career guidance (Franck, student), there seems to be a demand for more mentoring at the program. This could be provided through one of the student organizations like explained before and in Box 2. However, it takes personal initiative to obtain mentoring through a student organization, so it is not given that every student has time or access to information about student organizations. To make sure that mentoring is available to every student, so everyone could achieve and obtain the possible learning outcomes from mentorship, mentoring should be offered through the program and on the DGPS's initiative with help from the licensees in the oil and gas industry.

Technology as a core area of education advice to use different methods of learning and use new technology in teaching (Lau, 2017). As mentioned before, the DGPS and program suffer from poor funding of new and relevant instruments and equipment. This might make it hard for the lecturers to perform the education in an appropriate way to make the students obtain the learning outcome from the use of technology.

Learning strategies that foster deep conceptional understanding of important skills and competences is explained by Mosher and Keane (2021) and focuses on active, experiential and mixed methods of learning. Lau (2017) identified core competences for the next generation of petroleum engineers and explain that these are learned both at the university and at the workplace. One of the similarities between how Mosher and Keane explain their learning strategies and Lau's explanation of the identified core competences, is that they highlight practical learning. In Table 2, 3, 4, and 5, you can see the different courses in the bachelor program in PG&P. Out of the 70 different courses does 37 not include practical aspects. In addition, explains one of the lecturers that they don't have relevant equipment, so they sometimes must do the practical aspects in theory as well (Daniel, lecturer). This aligns with the view of the students, where they feel an imbalance between theoretical and practical learning.

The structure and courses in the PG&P master program, is found in Table 6 and Box 1. Compared with the bachelor program, has the master program just 3 out of 15 courses the first year that don't have any practical aspects, but they as well suffer from the lack of equipment for the education. In addition to this, they don't have the opportunity for internship during their education, where the field course is hosted and taught by the lecturers at the program. Yet again can we see that the lack

of funding and relevant equipment have consequences for the PG&P program, which further may impact the quality of the graduates.

Both the Upstream and the Midstream regulations require the licensees to have a recruitment plan that targets recruitment of Ugandan citizens, where the percentage of recruitment of Ugandan citizens should increase based on how many years it is since the petroleum activity started (GoU, 2016a; GoU, 2016b). This indicates that there will be an increase of employment opportunities in Uganda's oil and gas sector in the future, but it might take some years because of the recent start of the oil and gas activity in Uganda. On the other hand, we have seen that the labor force in Uganda might lack required skills to get employed in the industry. If the licensees are going to be able to achieve the required goal of recruitment of Ugandan citizens, investments and funding to the education institutions should improve from the GoU and the industry to ensure that the future petroleum engineers and geoscientists holds the required skills after graduation.

6.2 Mobility and Ability

Even though the goal of both the bachelor and master program is aiming to contribute and build capacity to exploration and production in the oil and gas sector in Uganda, like seen in chapter 2.2, both lecturers says that many of the graduates gets employed in other sectors than in the oil and gas. The water sector and mineral sector was the most mentioned sectors in the interviews, in addition to the oil and gas. Both lecturers highlighted the importance of the diversity of the program, and even says it is a university policy, to ensure that the students can get jobs.

The student, Oscar, explained that the oil and gas industry in Uganda is still young, which makes it hard for the industry to absorb every graduate. Linda the lecturer further explained that the job market in Uganda is not so big. On this topic, the students explain that sectors that relate to the same knowledge they learned from this program also absorb some of the graduates. We have also seen that enrollment to the bachelor program has been over what's expected from the previous Head of the DGPS (Department of Geology and Petroleum Studies, n.d.-c). The combination of high enrollment numbers with a young oil and gas industry which can't absorb every student and a late signing of the FID, might make it important that the students have opportunities to find employment in other sectors as well. In addition argues Mathieson and others (2019) that emerging

technologies will enable one engineer to do the work of many, which can limit the creation of employment opportunities in numbers.

Based on the finding that graduates from PG&P also get jobs in the mineral sector, it is relevant to investigate how the local content in the mineral sector facilitates for employment of Ugandan citizens.

Local content in the mineral sector in Uganda is regulated and described in the Mineral Act, where it is stated that a mineral licensee should prioritize employment of Ugandan citizens (GoU, 2022). In comparison to both the Upstream and Midstream Regulations of the oil and gas sector in Uganda, the Mineral Act does not specify the percentage of the recruitment that should be prioritized to Ugandan citizens. Even though this study doesn't include numbers on how many Ugandan citizens that work in the mineral sector in Uganda, one might think that a specified percentage of recruitment of Ugandans will increase and contribute to creation of employment. And based on the finding that PG&P students also get employed in the mineral sector, this might contribute to increase employment opportunities for those as well.

As explained in chapter 2.2, the main possible employers of petroleum geoscientists described by the DGPS does not include the employment in the mineral sector, but they are a major contributor to employment based on results from the interviews. That raises the question if the graduates in petroleum geoscientist is regarded as qualified for employment into the mineral sector. There is no definition of what a qualified citizen is in the Mineral Act, but based on the finding that both students and lecturers highlight the mineral sector as a possible employer of graduates, they might be considered as qualified.

Based on that the Vision states that unemployment is an issue in Uganda and that Kaguhangire-Barifaijo (2022) study show that graduates from petroleum studies struggle with unemployment, their other possible employment opportunities could be more highlighted, like their opportunity in the mineral sector. This can be done through the DGPS where it can be highlighted as a possible career path and that the DGPS can look after cooperation with mining and mineral companies as well, which also would help to ensure internships and connection with the industry for all the students. Both graduates that were interviewed in this study did not apply for jobs in other sectors than the oil and gas, and none of them have jobs based on their degree from PG&P. The interviews with them did not provide information about their reasoning for not applying in other sectors. If

the mineral sector was to be highlighted as a possible career path, it might open the opportunity for the graduates to expand their search for jobs which might increase the possibility to get employed based on their education.

Employment in the oil and gas industry is expected to decrease globally in the medium and long term, where you already see trends of this in Europe (Czako, 2020). This is based on the global trend but might not affect employment in the oil and gas industry in Uganda because the industry is still young, and they just started production. The President of AfDB, Akinwumi Adesina, says that African countries need space to industrialize to facilitate access to electricity (Ighobor, 2022) and the Director of LCA at the PAU, Ali Ssekatawa, says that Uganda will produce oil for the next fifty years at minimum (Ssekatawa, 2020). This indicates that there will be employment opportunities in the oil and gas industry in Uganda for the next fifty years.

But it is also important to consider that the global trend is decreasing regarding employment in the oil and gas industries, where the transition to more environmentally friendly sources of energy could further impact employment in the oil and gas sector, also in Uganda. Therefore, it can be important to prepare for a future where employment in oil and gas industry is decreasing, where it also will be important to find new sectors of employment to those who educated themselves in petroleum studies. A transition away from the oil and gas industries may also result in stranding of human capital if the workforce lack mobility to get jobs in other industries, which may affect entire regions and communities (Caldecott et al., 2016). How the energy transition might influence employment in the oil and gas industry in Uganda will be further discussed in chapter 6.4.

6.3 Oils Impact on Uganda

The Visions states that they want to transform Uganda from a peasant society to a modern and prosperous country, and have identified the oil and gas industry as one of their strategic opportunities to trigger economic growth and create employment (GoU, n.d.). Six out of seven of the students and both the graduates explained that their motivation to enroll was that they wanted to take part in the development of Uganda through the oil and gas sector, and four of the students mentioned that it was a chance to increase both their own and their family's living standards. As explained in chapter 3.2, there are two theories that explain different scenarios of a country's development based on their resource wealth, namely the resource blessing and the resource curse.

Both based on the description in the Vision of the desired benefits from the oil and gas sector and the student's motivation to enroll, it implies that they want to chase the outcomes of what's explained through the resource blessing scenario.

Ogwang and colleagues (2018) consider that it is possible to achieve the goals in the Vision but that it depends on critical policy choices and that the oil revenues is used in the right way like infrastructure and social development. Some of these policy choices revolves around the local content policies, and Byakagaba and others (2019) highlights the importance of the implementation of local content policies to build capacity among local people so they can effectively participate in the oil and gas industry. On the other hand, we can see that most of the participants in Fox's (2021) study were dismissive towards the impacts of the local content regulations in Uganda.

Like seen in chapter 3.1.3 and 3.1.4, both the Upstream and Midstream Regulations imposes requirements on the licensees in the oil and gas industry in Uganda. Some of these requirements are the percentage of recruitment of Ugandan citizens, skill and knowledge transfer, and that they should provide support to education institutions in the country (GoU, 2016a; GoU, 2016b) like previous discussed. Uganda's local content policy has been praised by their neighboring country Tanzania and described as a robust framework for the oil and gas sector (PAU, 2023). Based on how the local content regulations are described and acknowledged, this should indicate that it will contribute to create employment for Ugandans and economic growth for the country.

Further on, the Director of Economics and National Content Monitoring at the PAU, Ms. Peninah Aheebwa, says that 92% of the employed people in Uganda's oil and gas sector is Ugandans (PAU, 2023). This gives an even stronger indication that the oil and gas industry in Uganda offers employment opportunities for its citizens and that it is contributing to the welfare of the Ugandan people. Although it seems that the employment in the oil and gas sector in Uganda is majorly possessed by Ugandans, the PAU or the GoU don't share information about what types of jobs that are included in these numbers or any more detailed information.

Employment among locals were also highlighted in the discussion group with the students, where they knew locals were already benefitting from the oil and gas industry regarding jobs in constructing and infrastructure development. Increased opportunities for employment and higher incomes as a result of the oil and gas discovery and production were also some of the expectations from the local people in the Albertine region (Ogwang et al., 2018).

On the other hand, some of the local people in the Albertine region were also skeptical in their expectations to how the oil and gas industry would affect them (Ogwang et al., 2018). Increased wage rate and employment opportunities was also the least mentioned socio-economic impacts by locals in two villages in the Albertine region (Byakagaba et al., 2019). The students were also skeptical regarding this subject during the discussion group and based most of their skepticism on the level of corruption in the country. In addition, the percentage of how many graduates that they think gets employed in the oil and gas sector after graduation differ among the participants in the interviews, but they are relatively low. It is also hard to gain information about how many that get jobs after graduation because the DGPS does not obtain records about the employment status of their graduates. Both the students and the graduates highlight the importance of knowing somebody in the industry to get a job, and that people are favored because of their social network. In addition to this, a study shows that the majority of graduates from oilengineering are either unemployed, employed in low paying jobs or gone back to study (Kaguhangire-Barifaijo, 2022).

Based on the different aspects of the discussion in this section, it is difficult to conclude to what extent the oil and gas industry leads to creation of employment. We can see that the PAU is fronting a story of success regarding employment among Ugandans in the oil and gas sector, but we also see signs from other studies and the results from the interviews that both petroleum engineers and locals struggle to get employed into the oil and gas industry in the country. There is also hard to find more information about the percentage of Ugandans employed in the oil and gas sector in the country disregarding the PAU website, and the DGPS does not obtain records of employment status of their graduates.

Given the uncertainty and mismatch in the findings regarding employment of Ugandans in the oil and gas industry, this may indicate the need of more transparency in the industry to make information about the industry more obtainable. Mawejje (2019) argues that it is important to account for people's access to information to achieve local economic development, where a limitation of information shared with the public might lead to uncertainty and rumors which further could result in conflict. Sen (2020) also explains that annual and quarterly reports from the licensees is not available for the public, where this could have provided aspiring suppliers with information about the licensees planned procurements of locally produced goods and services, and enhanced the transparency in the industry. Like seen in chapter 3.1.3 and 3.1.4, the licensees are

also supposed to deliver plans regarding recruitment and training to the PAU. If these plans where available for the public, there would have been easier to conclude and see how many Ugandan citizens that gets employed in the oil and gas sector in Uganda.

Even though the local content policy in the oil and gas sector in Uganda have been getting praised by their neighboring country (PAU, 2023), it have been criticized because of the vague definitions, which have resulted in foreign companies out-competing Ugandan companies (Byaruhanga & Langer, 2020). Sen (2020) also explain different obstacles that Ugandan oil and gas suppliers encounter, and recommends that the GoU and the international oil companies should take responsibility together to enhance Ugandan supplier companies.

Because of the uncertainty and different information given from the PAU and found in the results and other studies regarding employment in the oil and gas sector, it is hard to conclude if Uganda's development tends to lead to either the resource blessing or resource curse. The fact that they just recently started production of oil and gas makes it even harder, and it may take time to see the real impacts of the oil and gas sector in Uganda.

6.4 Impacts of the Energy Transition

The energy transition is seen as one of the pathways to achieve the goals of the Paris Agreement, which also Uganda sign under on in 2015 (UN, 2015). Data from the from United States Environmental Protection Agency shows that the majority of the greenhouse gasses emitted by human activity is from industrial processes (EPA, 2023). Regarding the energy transition in Uganda, one of the lecturers agreed that the energy transition will happen in Uganda at some point and that both the DGPS and students must prepare for this (Linda, lecturer).

When it comes to when the energy transition will happen in Uganda and when it will have an impact on the employment in the oil and gas sector, the views of the participants in this study differ between 10 to 50 years. Their reasoning is that the energy transition can't happen fast, and one of the lecturers explained that they need money through production of commercial oil and gas to fund the renewables (Linda, lecturer). This view is also shared with the President of AfDB who says that African countries need space to industrialize and that a shift from fuelwood to gas will reduce emissions in African countries significantly (Ighobor, 2022). Further on, the Director of LCA at

the PAU says that the global energy transition won't harm the oil and gas industry in Uganda, because crude oil still is a major and important source of energy in the global energy mix (Ssekatawa, 2020). He also states that Uganda will produce oil for the next fifty years.

Even though both the President of AfDB and the Director of LCA at the PAU says that the global energy transition won't harm African countries and Uganda for the coming years, they are not against the transition. The President of AfDB says that they are doing everything to get renewable energy sources but that renewables are currently variable and not reliable in Africa (Ighobor, 2022), and The Director of LCA also states that Uganda will join the rest of the world in a transition to renewable, even if they continue to produce oil (Ssekatawa, 2020). Regarding the transition, one of the lecturers explained that there is an investment and technological problem for Uganda to achieve the transition to renewable energy (Linda, lecturer). Therefore, it seems that Uganda and other African countries might struggle to transition renewable energy sources fast, because of lack of technology and not reliable renewable energy sources, but not on the lack of will.

One of the students explained that the development of energy transition in Uganda should be a just transition, so Uganda will be able to catch-up with the western countries through industrialization (Josephine, student). As seen in chapter 2.5, the concept of just transition tries to avoid the production of winners and losers that can happen through the energy transition, and the concept also recognize that some countries or regions lack the capacity to transition without causing a disturbance. Nalule (2019) also explains that the energy transition should be understood as a process that differs based on which country or region it concerns, because the energy transition evolves around technical, social and economic advancements. Based on how the concept of just transition is understood, this might be an appropriate way for Uganda to handle their transition towards renewable energy sources.

Ogwang with colleagues (2018) points out that Uganda is depended on investments from companies to fund the oil and gas projects in the country. It is also possible that this will be necessary if Uganda will be able to transition to renewable energy sources in the future because they lack the capacity themselves. Atteridge and Strambo (2020) then suggests that international financial assistance could be offered to those countries who are incapable to transition on their own. A combination of industrialization through production of oil and gas with international financial assistance to renewable energy could therefore be a possible pathway for Uganda to

develop technically, socially and economically to achieve the transition towards renewable sources of energy.

The global trend of energy transition toward renewable energy might result in a decrease in the demand and market price of carbon-intensive energy, which might make oil and gas resources commercially unviable (Manley et al., 2017). Further could this result in entire nations to become stranded because of their dependency on revenues from the oil and gas industry. If this scenario becomes a reality in the future, it is important for Uganda to not develop a dependency on their oil and gas resources but to also follow the global development towards renewable and commercially viable resources.

Garrett-Peltier (2017) shows that renewables generate more full time jobs on average than fossil fuel industries. This indicates that a transition to renewable sources of energy will have an even bigger influence on the creation of employment in Uganda than the oil and gas sector does. But it is also important to be aware that these jobs in the renewable energies not necessarily emerge in the same regions where oil and gas does, so a fast transition from oil and gas to renewables might cause loss and suffering to the communities that rely on oil and gas (Atteridge & Strambo, 2020). In Uganda, both of their oil and gas projects is in the Albertine region. Therefore, it is important that they are aware of the described impacts that the transition might have on the communities in this region if the renewable energy sources is not located in the same area. This is even more important if the community lacks mobility to get jobs in other industries or sectors, where closing of an entire industry might result in stranding of human capital (Caldecott et al., 2016).

Given that the energy transition may impact those who lack the mobility to get jobs in other sectors or industries, it is important that the students in PG&P have a diverse education to give them the ability to get employed in other sectors, like discussed in chapter 6.2. Towards employment in the renewable energy sector, the graduates highlight geothermal exploration as a possible career path that is in the renewable energy sector and suits their knowledge and education. Currently, content about the energy transition is not included in the curriculum at the program, but one of the lecturers thought it will be included the next time the program is being reviewed (Linda, lecturer). The lecturer, Daniel, has also designed a new standard that is up for approval that involves energy transition and sustainable development in the context of a PG&P. This would be in line with how

Meehan (2021) thinks the job of a petroleum engineer will change, where he highlights sustainability as one of the emerging areas of competences for the future petroleum engineer.

6.5 Summary of Discussion

The structure and quality of the PG&P program and domestic local content regulations was discussed in light of educational literature and research connected to implementation of local content policies in the first section of this chapter. In the second section was the participants views of the mobility and ability of graduates from PG&P to get employed in other sections presented, where the importance of diversity in the education and mineral sector was highlighted. The participants views on the possible impact of the oil and gas sector on the development of Uganda were discussed in the third section, where factors like creation of employment and transparency were important aspects. In the fourth section, the discussion revolved around the participants view on the impact of the energy transition on the oil and gas sector in Uganda, where their views were seen up against the global trend toward renewable energy sources.

7 Conclusion and Recommendations

This chapter will first repeat the research questions and further be divided in two sections. The first section will answer the research questions, before the last section will present recommendations for future research.

1. How are the petroleum geoscience and production program and domestic local content regulations designed to ensure that graduates get employed in the domestic oil and gas industry?
2. How do the students, graduates, and lecturers view the possibility for graduates to get jobs in other sectors than the oil and gas sector?
3. What are the students, graduates, and lecturers views on the possible impact of the oil and gas sector on the development of Uganda?
4. What are the students, graduates, and lecturers views on the possible impact of the energy transition on the oil and gas sector in Uganda?

7.1 Conclusion

The PG&P program was initially designed in consultancy with a company in the oil and gas sector and with guidance from a government institution. It was further designed to be broad to ensure that graduates can get jobs beyond the oil and gas sector. Oil and gas companies are also involved in reviewing the content and structure of the program every third year to secure that the graduates have the required skills and competences. However, there seemed to be limited involvement from the oil and gas industry regarding transfer of knowledge and technology, access to the oil regions and rigs, and educational support to the PG&P program. In addition, there is no funding from the GoU regarding funds to buy relevant equipment, where this results in absence of new and relevant educational equipment and funds for field trips.

The GoU has put in place favorable conditions for both direct and indirect employment of Ugandan citizens through various local content regulations for the oil and gas sector and related sectors such as the mineral sector. Yet, there are other factors influencing the possibility of securing employment among PG&P graduates. These factors include among others; vague descriptions of local content policies and willingness among oil and gas companies to find loopholes in the

regulations, limited practical experience and exposure to the work due to a limited connection to the oil and gas industry and funding, and access to professional networks. Consequently, these factors influence the competitiveness of the graduates on the job market, where there is a limited demand for professional and skilled PG&P graduates.

Both the students and the graduates knew someone who had been employed in other sectors than the oil and gas after graduating from the PG&P program. The mineral and the water sector were especially mentioned, in addition to geothermal exploration and education. They explained that these sectors and other possibilities of employment were relevant because of their similarity to the oil and gas, where they can apply the same knowledge. Both lecturers highlighted the importance of the diverse and broad education, so the graduates have possibilities for employment in other sectors as well.

Considering the students and graduates motivation to enroll to the PG&P program reveals optimism towards how the oil and gas industry might impact the development of Uganda. Creation of employment among the locals in the oil and gas regions were also mentioned, were the participants noticed improvements. However, corruption was mentioned as one of the obstacles that could affect the development in a negative direction. The participants also thought that a relatively limited number of PG&P graduates get employed in the oil and gas sector after graduation, which indicates that the sector can't absorb every graduate.

All the participants thought that the energy transition will occur in Uganda, but not in the near future. Lack of investments and technology were some of the mentioned reasons, in addition to a call for just transition. However, content about the energy transition is not a part of the curriculum in the PG&P program, but the lecturers thought it will be included in the future.

7.2 Recommendations for Future Research

Because of the recent start of the oil production in Uganda, there is a big possibility that the conditions in the domestic oil and gas sector and higher education institutions will change in the coming future. Therefore, it could be relevant to conduct more studies following the development of the sector and education in Uganda, and study to what degree it leads to creation of employment for Ugandan citizens and possible improvements in the education.

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Appendix

Appendix 1 = Interview guide, students

Appendix 2 = Interview guide, graduates

Appendix 3 = Interview guide, lecturers

Appendix 4 = Interview guide, discussion group

Appendix 5 = Informed consent

Interview guide, students

- When did you enroll?
- Have you studied anything before, do you have other degrees?
- What was your motivation to enroll to petroleum studies?
- What are your career expectations after graduation from this program?
- What kind of factors were important for your decision to enroll into this program?
- Which type of skills have you gotten from the program that is relevant for a job in the oil- and gas sector in Uganda?
- How would you explain your experience of this course so far?
- How do you experience the relevance of the course towards the jobs that you can get when you graduate?
- How do you experience the balance between theory and practical learning in this course? Is it something you feel are missing?
- Do you know of anyone who have gotten a relevant job after graduation from this course?
- Is it something you think could have been better about this course that could increase the chance to get a relevant job?
- Do you think that you are able to get a job in another sector then the oil- and gas sector with your competence from this course?
- Which other sectors or types of jobs do you see yourself in, if not in the oil- and gas sector?
- How do you experience the possibility to get other jobs than in the oil- and gas sector through this course?
- What are your thoughts regarding how the energy transition might impact the oil and gas sector in Uganda?

Interview guide, graduates

- When did you start and when did you finish your studies?
- What was your motivation to enroll to petroleum studies?
- What kind of factors were important for your decision to enroll into this program?
- Do you have any other degrees? Have you studied something else than petroleum?
- What is your employment status today?
- How would you describe the program from your experiences?
- How did you experience the balance between theory and practical learning through your program?
- How do you experience the relevance of the program towards the jobs that you can get when you graduate?
- Do you know of anyone who have gotten a relevant job after graduation from this course? If yes, which companies/institution do they work for? How many who graduated the same time as you got a relevant job?
- Is there anything you feel like is missing from the program? Is there anything that could have been better to increase the chances to get a job after graduation?
- In which sectors did you apply for jobs after graduation?
- What kind of jobs did you look for / apply for after graduation?
- In your opinion, what were important factors for your employment?
- Do you think that you are able to get a job in another sector then the oil- and gas sector with your competence from this course?
- Which other sectors or types of jobs do you see yourself in, if not in the oil- and gas sector?
- How do you experience the possibility to get other jobs than in the oil- and gas sector through this program?

Interview guide, lecturers

- How long have you worked in this program or with petroleum?
- What kind of cooperation do you at the department have with the oil- and gas industry?
- How would you describe the balance between theory and practical learning in this program?
- In your opinion, what is the most important that the students learn from this program that gives them an advantage when applying for work in the oil- and gas industry in Uganda?
- Do you know of many who have gotten a job in the oil- and gas sector after graduation from this program? In case yes, which companies, institutions, sectors?
- How would you describe the student's ability to get a job in other sectors than the oil- and gas industry after graduating from this program?
- Do you know of any who have gotten a job in other sectors than the oil- and gas sector after graduation from this program? In case yes, which sectors/industry do they get a job in?
- In your opinion, how does this program offer knowledge to the students that can help the students get jobs in other sectors or industries?
- Which other sectors do you think is most relevant for a petroleum student, other than the oil- and gas sector?
- How would you say that the faculty is changing in terms of curriculum and direction because of the green shift and the sustainable development?
- How would you describe the programs position toward a green shift?
- How would you describe the programs relevance for Uganda to achieve sustainable development and a green shift?
- How do you think the green shift could influence the students and the graduates regarding their employment status in the future?

Interview guide, discussion group

- What do they know/learn about the green shift, the UN's Development goals and sustainable development through university and school?

- How well known would you describe that knowledge about these kinds of topics is for the citizens in Uganda?

- In case these problems are known for the students, where do they get the information about the green shift or the development goals?

- From the UN's sustainable development goals, which do you feel are the most important, and why?

- As a petroleum student, how do you think the green shift can influence you and your future employment situation?

- How do you think your education can help/take part in sustainable development and the green shift?

- What are your perspectives on the extent to which the green shift and sustainable development is relevant or achievable in Uganda?

Informed consent

Are you interested in taking part in the research project

***Employment among petroleum students in Uganda*?**

Purpose of the project

You are invited to participate in a research project where the main purpose is to find out about the employment situation among petroleum students in Uganda.

The research questions for this project is based on petroleum students, graduated petroleum students and university administrations perspectives on employment in the oil- and gas sector in Uganda, the mobility or ability to get jobs in other sectors than the oil- and gas sector, and their perspectives on the green shift and if its relevant or achievable for Uganda.

This project is a part of a master thesis.

Which institution is responsible for the research project?

Institute of Geography at NTNU is responsible for the project (data controller).

Why are you being asked to participate?

The sample for this project is selected based on the objective of the project, which is regarding petroleum students and university administration for the petroleum studies. I received contact information from my supervisor and contacted the administration at the university to get in contact with the students that are attending now. I also got the contact information on the former students from my supervisor.

What does participation involve for you?

If you chose to take part in the project, this will involve that you take part in an interview. It will take approx. 30 to 45 minutes. The survey includes questions about your perspective on

employment after graduation. The interview will be recorded with a sound recorder and I will also take notes during the interview.

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

It will not affect your treatment at the university or your relationship with the teachers at the university. Furthermore, it will not affect your future employment.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified here and we will process your personal data in accordance with data protection legislation (the GDPR).

- It will only be me and my supervisor who will have access to your personal data
- To ensure that no unauthorized persons can access the personal data, I will replace your name and contact details with a code. The list of names, contact details and respective codes will be stored separately from the rest of the collected data.

You will not be recognizable in the master thesis. The only personal information that will be published are gender and that you are a student/former student at the petroleum studies.

What will happen to your personal data at the end of the research project?

The planned end date of the project is 15th of May. The personal data and digital recordings will be deleted from the secure server at the end of the project.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with the Institute of Geography at NTNU, The Data Protection Services of Sikt – Norwegian Agency for Shared Services in Education and Research has assessed that the processing of personal data in this project meets requirements in data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- Institute of Geography at NTNU Sindre Thorsbakken at sindrsth@ntnu.no . You can also contact my supervisors Haakon Lein at or haakon.lein@ntnu.no, and Charlotte Anne Nakakaawa-Jjunju at charlotte.jjunju@ntnu.no.
- Our Data Protection Officer: Thomas Helgesen (93079038, thomas.helgesen@ntnu.no)

If you have questions about how data protection has been assessed in this project by Sikt, contact:

- email: (personverntjenester@sikt.no) or by telephone: +47 53 21 15 00.email: (personverntjenester@sikt.no) or by telephone: +47 53 21 15 00.

-

Yours sincerely,

Project Leader Sindre Thorsbakken

Haakon Lein

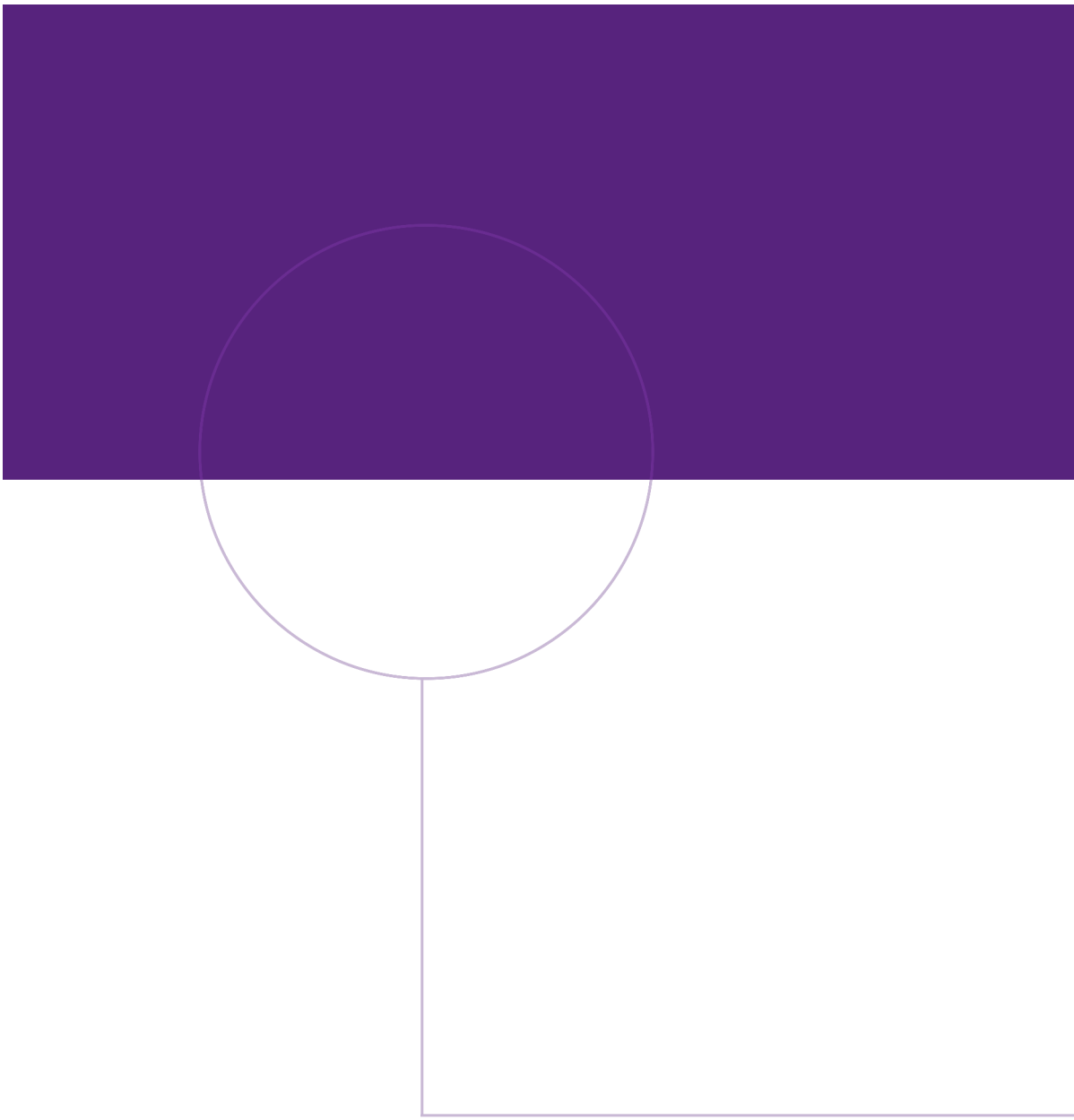
Consent form

I have received and understood information about the project Employment among petroleum students in Uganda*]* and have been given the opportunity to ask questions. I give consent:

- ☐ to participate in an interview

I give consent for my personal data to be processed until the end of the project.

(Signed by participant, date)



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