Political Ecology Analysis
Concerning Mineral Resource Exploitation
in Greenland

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Abstract

The Arctic region is captivating territory, however conditions presented can be inhospitable, in spite of the inhospitality many actors are drawn to the region especially concerning its potential natural resources. There have been debates presented for many centuries whether the area should be preserved or exploited by different actors, however many governments see it as an opportunity for economic stability. Accordingly, one of the Arctic problem was given when the Greenlandic Government modified uranium legislation in 2009 into a pro mining agenda, the decision made towards exploitation raised some questions, as well as in relation to mineral activities in the region.

Therefore, the master thesis is attempting to investigate mineral resource exploitation in Greenland, as it plays a major role concerning its economy and the opportunity of self-sustainability, however not much of an attention has been made to the topic through the lens of social sciences. The purpose of the master thesis is to identify the political ecology contexts within the social ecology system drawn out by the framework and identify some of the reasons why the arena is dominated by foreign investors as well as examine further impacts and benefits of the operations. The case study of resilience thinking approach with the Isua project conducted by the company of Greenland Mineral Ltd. and the Baffin Island project in Nunavut Canada, which also highlighted the positive pairing of the political ecology theory and resilience thinking approach, provided with an outcome that further emphasis should be put towards principles of resilience thinking. The two case site was chosen due to its operation similarities in excavation of iron ore resources. The research design constructed throughout the study was in a mixed manner, where qualitative data was gathered from various forms, such as government - business reports, legislations, scientific papers and quantitative data was gathered from statistical data of governments, organizations and interactive mining maps.

The research came to the conclusion that according to the resilience thinking approach, Greenland needs to enhance resilience further in the mining activities as companies in Canada have more transparent and resilient approach to the communities living in their exploitation area. On the other hand, further discussions are need to investigate the mineral resource exploitation from a social sciences approach as not enough attention has been directed towards many aspects related to activities of mining operation in Greenland related to the impact of pandemics such as Covid-19, therefore the topic should be further analysed in relation to the exploration and exploitation operations, in order to provide a resilient industry for the country.

Key words: Mineral Resource Exploitation, Greenland, Political Ecology, Resilience Thinking

Contents

Abbreviations

CCSI	-	Columbia Center on Sustainable Investment
EC	-	European Commission
EIA	-	Environmental Impact Assessments
ENTITLE	-	the European Network of Political Ecology
EU	-	European Union
FDI	-	Foreign Direct investment
IBA	-	Impact Benefit Agreement
ICMM	-	International Council on Mining & Metals
IIED	-	International Institute for Environment and Development
IGF	-	Intergovernmental Forum on Mining, Minerals, Metals and Sustainability
IISD	-	International Institute for Sustainable Development
ILO	-	International Labour Organization
GEUS	-	*"De Nationale Geologiske Undersøgelser for Danmark og Grønland"* Geological Survey of Denmark and Greenland
MDA	-	Mine Development Agreements
NGO	-	Non-governmental organization
REE	-	Rare Earth Element
RMF	-	Responsible Mining Foundation
RMI	-	Responsible Mining Index
SEAT	-	Socio-Economic Assessment Toolbox of Anglo American
SDSG	-	Sustainable Development Strategies Group
SDGs	-	Sustainable Development Goals
SEA	-	Strategic Environmental Assessment
SES	-	Social Ecological System
SRC	-	Stockholm Resilience Centre
SSIA	-	Strategic Social Impact Assessments
UNDP	-	United Nations Development Programme
UNDRIP	-	United Nations Declaration on the Rights of Indigenous Peoples
UNCLOS	-	United Nations

1. Introduction

The largest island on earth with an area of 2,130,800 km²[1] contains a vast amount of unexplored opportunities concerning mineral extraction, as previous explorations have shown several sites with rare earth minerals including diamonds, rubies, quartz, sapphires and many others[2] (Thirangoon, 2009). The government of Greenland puts an emphasis on fishing and hunting in their region, however an agenda to develop the region's resource extraction industries also have played a major role in recent years (Fletcher, 2014).

However, the industry of mineral exploitation, which is also highlighted by the Sustainable Development Goals (SDGs) by the UN, has not met the set goals in 2020 according to the Responsible Mining Foundation, where in their report of 2020 with the collaboration of Columbia Center on Sustainable Investment, indicated that sustainable developments within the companies have shown some attention, but it is definitely not the norm of the ongoing processes (UNDP, 2018 and RMF, 2020). The report had a scope of 38 mining companies worldwide with a couple operation sites in the Arctic region, mostly in Russia and Canada, but Greenland was not included (RMF, 2020). As natural resource exploitation plays a major role in Greenland's economy and possibility of self-sustainability, it is considered to be an important and relevant topic to further investigate from a social sciences perspective. Therefore, the master thesis in the next section will identify aims, objectives that will need to be analysed in relation to mineral resource exploitation in Greenland.

1.1 Aims, objectives and problem formulation

The research paper will try to explore and analyse the following questions related to the mineral resource activities in Greenland:

Why is the mining industry of Greenland dominated by international investors, how does it impact locals from political ecological perspectives? Moreover, how did London Mining Greenland A/S enhance resilience with the application of the 7 principles concerning its mining projects compared to other projects in the Arctic region?

2. Literature Review

In this following chapter, the literature review will try to explore and compare the already existing researches of many forms, from different perspectives concerning the mining industry, specially focusing on the ones associated with Greenland, in order to allow the chapter to comprehend gaps in researches among the theme. Furthermore, the literature review chapter will also cover some of the articles published worldwide, particularly from third world countries, related to mining

[1] Facts about Greenland https://naalakkersuisut.gl/en/About-government-of-greenland/About-Greenland/Facts-about-Greenland

[2] Greenland in Figures https://naalakkersuisut.gl/~/media/Nanoq/Files/Publications/Udenrigs/Greenland%20in%20Figures%202018.pdf

conflicts and its relation to political ecology, as it is essential for the research to compare the current discussions of the topic from a multidisciplinary approach.

Political Ecology as a lens of theoretical approach has been progressively applied in order to research the underlying reasons of conflict arising over resource exploitation, however researches have not examined the applications and impacts of environmental impact assessments (hereinafter, EIA) within a political environment and how it is integrated within power relations of a region (Spiegel, 2017).[3] As one of the articles, Spiegel researched the social significance in small scale mining related to EIAs in Zimbabwe, which tests the narratives of the assessments and its connection to politics, moreover the exclusion of others, suggesting that future political ecology researches related to mining should analyse the assessments and power in the region also from a colonial aspect, nevertheless the conflict over extraction activities are associated with control and profit oriented decision making (Spiegel, 2017). It has been further argued in previous research that assessments, correlated with political decision making, fail to implement or even recognize the social impacts of mining projects, such as change in the environment with costs of mineral resources, displacement or livelihood, which can highlight the errorness of the existing system (Bedi, 2013). Therefore, analysing the storyline of the Greenlandic mining industry should portray how power relations, agencies and civil communities intertwine in the Arctic region for mineral resources and engage with socioeconomic needs and whether it emphasises the injustice of distribution.

Firstly gathering research information on sustainability mining concerning the Arctic region, identifying some of the aspects from Jacobsen is essential, where he mentions that mineral exploitation is a quiet complex problem due to the fact that minerals are non-renewable resources, as on the other hand harvesting or hunting the exploitation processes can be renewed or generated in later cycles, therefore sustainable mining has been critiqued by many environmentalists (Jacobsen, 2018).[4] However, there are some scholars who have come to the conclusion regarding sustainability that in some cases of developments it is only indicated in the name of the projects and in reality sustainability is pushed further away from its intentions (Swyngedouw, 2010).

According to late 1990s debates, with a focus on mineral resource exploitation, sustainable outcomes can be reached with a sound integration of the region's institutional frameworks and a combination of economic approach (Östensson and Roe 2017).[5] In the recent years, through international initiatives and organizational efforts several detailed principles and guidance was

[3] Spiegel, S. (2017). EIAs, power and political ecology: Situating resource struggles and thetechno-politics of small-scale mining. Available from: https://reader.elsevier.com/reader/sd/pii/S0016718517302993?token=5FD8461AEC10E57C27A8D257ED37A1197936B6C586099F86F2D584F833232DC8FA00C9CA0119AC946C3674426A001BB7

[4] Jacobsen, M. (2018) "Sustainable Arctic Mining? A Comparative Analysis of Greenland and Nunavut Mining Discourses" [Online] Available from: https://www.thearcticinstitute.org/sustainable-arctic-mining-comparative-analysis-greenland-nunavut-mining-discourses (Accessed at 11 May 2020)

[5] ILO (2017) [Online] Available from: https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---multi/documents/publication/wcms_592317.pdf

given out for governmental actors and companies in order to increase sustainable developments worldwide (ibid). Such frameworks highlighting local developments include the ILO's Tripartite Declaration, the ICMM's Community Development Toolkit (CDT) and the Socio-Economic Assessment Toolbox of Anglo American (SEAT), where the ruler among frameworks is known to be SEAT, as it goes over a whole cycle of mining processes and impacts (ibid). However, some of the research has been critical of frameworks and the above mentioned strategies of non-governmental organizations (NGOs), which may lack rigor, where research conducted on intra relationships of a company can be extremely valuable (Bebbington, 2015). Additionally, according to Bebbington the discussions about cross-regional applications are still not fully developed and the topic needs more comparative studies on mineral resource exploitation, with an emphasis on approaches with different understanding, who would see the mineral resource exploitation as a dispossession and who would look at it as an opportunity (ibid).

Sustainable mineral resource exploitation is an aim as well as a tool to analyse the dimensions of its arguments against and for, where an ecological approach with a sound legislation behind it would not compromise to the economic gains (Kokko et al, 2015). The research that studied Sámi's rights related to mining projects in Finland, Sweden, Norway and Russia, came to the conclusion that however their cultural rights are definitely secured by regulations, it is not quite effective due to the deficit of practices especially in the impositions of law and management, therefore it proposes that the companies should also self-regulate with their original tools (ibid).

In 1988 a controversial legislative decision has been made in Greenland, which allowed the radioactive materials to be mined in the country again, according to some of the reasoning it was to maintain the vitality of Greenland's economy and hopefully resulting in sustainability, stating that on a long term energy production by uranium would be more feasible than operations followed by a higher CO2 emission rates further damaging the Arctic region's environment, however emphasises that application of sustainability and the relations to the political contents should still need to be examined due to the gaps in literature[6] (Gad and Jacobsen, 2018).

Additionally, analysing storylines of uranium mining, another research argues that the activity is the road for Greenland's sustainability, as investments into mineral resource exploitation is also a providing developments for the locals and the economy resulting in independence for Greenland, however the debate might result in political conflict and change in the balance of power (Bjørst, 2016). The paper had a focus on the uranium public debates in the area of Narsaq[7] with particularly two major perspectives: firstly, on the scenarios of destructive effects of uranium mining both locally and globally, which was mainly stated by non-governmental organizations (NGOs) and secondly how these developments in mining can have a positive effect on the communities and the economy of Greenland (Bjørst, 2016).

[6] Krueger, R. and Gibbs, D. (2007) The Sustainable Development Paradox, Urban Political Economy in the United States and Europe Introduction: problematizing the politics of sustainability.
[7] Narsaq, located south on Greenland, the youngest town on the island, founded around 1959 [Online]. Available from: https://visitgreenland.com/destinations/narsaq/

An article concerning Greenland's legislation change over uranium mining highlights that it was quite a surprising move how in a few weeks the government adapted the pro position in the case, where sustainability was raised as the reason for the modification, but the concept is understood differently by the actors (Bjørst, 2017). The government of Greenland views the resource as a way to achieve economic sustainability[8], where the country can be self-reliant, however the social impacts related to the mining are usually undermined, where varieties of stakeholders perspectives are contradicted, therefore in such social impact assessments emphasis are usually put on the increase of employment rather than the actual local impacts (Bjørst, 2017).

Examining the topic from another perspective, the mining industry on rare earth minerals in Greenland was analysed through Chinese investments, in order to find out if major western government communications of China's site selection is as strategic as it was thought to be (Zeuthen, 2017). The research has shown through a thorough analysis of chinese language articles that although the government of China has an interest in the investments in Greenland due to incentives, the mentioned strategic aim is limited with no major master plan (Zeuthen, 2017). Secondly, an article also inspecting China's investors in Greenland, with an analysis of chinese policy making, mentions that understanding actual motivation underlying the investments can be challenging due to the leadership, however it ought to be primarily directed by the incentives that the mining industry can provide itself, such as zinc resources (Andersson et al, 2018).

Examining a commentary from International Institute for Sustainable Development (IISD) which explores sustainability development projects in Greenland, stakeholders had an increasing interest in resource exploitation especially in petroleum minerals and rare earth potentials in the region, although it is still in a very early stage, there are a lot of expectations from the industry (ColcloughPerera, 2013). The author also highlights how policymakers try to prioritise sustainable development in Greenland, however also points out that these safeguards are not necessarily play out as planned in practice, therefore health and safety measurements, preparedness and awareness should play a major role in the development steps (ibid). Moreover, according to IISD commentary, adaptation of Environmental Impact Assessment (EIA) and Strategic Social Impact Assessments (SSIA) are adopted quite adequately in Greenland, which allows policymakers to evaluate a full scale assessment report before licensing any exploitation in the area (ibid). Furthermore, Impact Benefit Agreement (IBA) provides provision of national Greenlandic contract of recruitment and terms of condition on how to use migratory labour in the region for the mining sector. Nevertheless, according to the IISD report one of the missing factors is the preparedness of dealing with sustainability disputes concerning labour, where the social impacts of any accidents can be devastating for the region (ibid).

Additionally, according to Tiainen, frameworks such as the Environmental Impact Assessment, Impact Benefit Agreement and Social Impact Assessment are effective supporting governance

[8] Coalition Agreement (2014)

tools which draw experience from international practices and embed into local conditions, where in the case of Greenlanding governance can benefit from the experience enhancements regarding its mining industry (Tiainen, 2016). Nonetheless, the determination of Greenland becoming an independent country complicates the applications and mechanisms due to the favouring mineral exploitation policies, which has targeted economic gains rather than social or environmental aspects (ibid). Although the approach of economic aspects shows rationality, as in the local context it will provide a boost in employment, the author argues that it is a quite narrow path as environmental and social issues are not prioritized and opt out if it is in the favour of the mining industry (ibid).

According to Jacobsen in Greenland development projects related to mining present how can sovereignty be connected to sustainability, where governmental actors try to aim towards sustainability through establishing an operable economy through their mineral resources (Jacobsen, 2018). Furthermore, Greenland in order to be more self-sufficient and aiming towards independence, became more active in relation to mining activities after the 2000s, using it as a development tool, where the government put the industry in a major position to contribute to the national economy (Tiainen, et al. 2015). Between 2002 and 2012 there has been an increase in granted licences within the country, where in 2010, the turnover of the industry reached approximately DKK 24 million (ibid).

However, also according to a chapter from the Arctic Yearbook in 2015, the public acceptance is debated in relation to weak regulatory frameworks by the government even though in 2014 updated policy documents concerning mining activities were issued which emphasises sustainability in the region (Tiainen, et al. 2015).[9] The main topics which have generated some public debates were especially concerning uranium exploitation and the question of recruitment of foreign labour (ibid). Nevertheless, in order to mitigate further debates the government tried to introduce further impact assessment processes by including public and various stakeholder opinion hearings (ibid).[10] Additionally, mentioned in the report the government needs the support of citizens in order to develop this "new leading industry" their economy and have a balanced co-existence (Government of Greenland, 2014, pp. 90).

Furthermore, according to the Mining Journal[11] in Greenland due to the melting glaciers further opportunities could be provided in the mining industry (Kronenberg, 2013, pp 79). The research has focused on two cases, in which the site areas are distanced about 16,839 km[12] from each other,

[9] Government of Greenland (2014) [Online] Available from: https://naalakkersuisut.gl//~/media/Nanoq/Files/Publications/Raastof/ENG/Greenland%20oil%20and%20mineral%20strategy%202014-2018_ENG.pdf

[10] Government of Greenland (2014) *"7.11 Citizens, local community and stakeholders"* pg 90 [Online] Available from: https://naalakkersuisut.gl//~/media/Nanoq/Files/Publications/Raastof/ENG/Greenland%20 oil%20and%20mineral%20strategy%202014-2018_ENG.pdf

[11] Mining Journal (2008). Breaking more than ice in Greenland. [Online] Available from: http://www.mining-journal.com/leadership/news/1161985/breaking-ice-greenland-08-02-08

[12] Calculated by CalcMaps, [Online] Available from: https://www.calcmaps.com/map-distance/

one in Kyrgyzstan, Kumtor and the other one in Chile, Pascua-Lama, evaluating the protection of ecosystems and its relation to a political setting, where in Kumtor a glacier of a size 39 million m³ was abolished from the site in order to increase effectiveness in mining, however public discussions or debate has been dismissed and local communities did not know about the process, on the other hand in Pascua-Lama major protests have been organized with foreign pressure for a plan of abolition of 0.8 million m³ glacier, which shows how different areas' dynamics of socio-economics and politics may result in failure of social empowerment (Kronenberg, 2013).

Greenland mining activities were also studied through the lens of international law analysis concerning the local communities and particularly focusing on Denmark's and Greenland's post colonial relationship (Johnstone, 2020). The article argues that the decisions in the governance of Greenland has shifted towards mineral resources due to aim for independence and sovereignty (ibid). In 2009 as the Self Government Act[13] noted the people's rights and provided them with autonomy, the act was seen by the governments as an application of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), however from other perspectives it was seen as the government used the legislation towards decision making for mineral resource extraction without any precautions (ibid).

According to the report published by the International Institute for Environment and Development (IIED) between the time of 2012 and 2015 Greenland had emphasized focus towards its independence while the country had some struggles of economy and the local application of this process (Wilson, 2015). The article also recognizes the increase of indigineous activism and how companies need to take more responsibility in relation to the operations of resource exploitation, but highlighted some debates and social issues, such as with artisanal workers concerning ruby mining (ibid). The paper's final thoughts also highlights that for following research it is essential to analyse the related topics and debates in the region inclusively, so that all perspectives can be integrated with also a focus on the silent environmental ones, to elevate the findings and discussion of development in mineral exploitation, which need to be developed by Greenland, however international support may be provided to easen the process, for example with strengthening capacities (ibid).

In Greenland the government within the mining industry is trying to form more private public partnerships in order to develop a better infrastructure in the country (Tiainen, et al. 2015).

3. Methodology

In this chapter of methodology, the researh's approach will be identified from many perspectives, it will identify the research processes applied throughout the study as well as the section will answer the question why the particular case for the thesis was chosen to be examined.

[13] Act on Greenland Self-Government. Act no. 473 of 12 June 2009 [Online] Available from: https://naalakkersuisut.gl//~/media/Nanoq/ Files/Attached%20Files/Engelske-tekster/Act%20on%20Greenland.pdf

3.1 Research Design

The research paper analysed broader scale of political, social and economic factors with the help of political ecology theoretical framework, focusing on activities related to the mining operations in Greenland, moreover the smaller case of Isua and Baffin Island two iron ore mining operation combined with injustices was chosen due its relevance to mineral resource exploitation as well as politics, so that resilience thinking perspective could be used for further studying cases with comparison to each other. The research has a mixed design with exploration of qualitative as well as quantitative data throughout the thesis, due to conception that only using one approach can provide generalisation over the analysed outcomes. Cross regional case study comparison was chosen for the research in resilience thinking approach in order to have a more holistic view on the final outcomes, additionally to find potential similarities underlying the different regions of the world.

3.2 Theory selection

Firstly, the political ecology theory was used based upon its relation of environmental degradation and exploitation of mineral resources, especially to highlight the relation between local and the broader scale of political economy of a global environment. Therefore, the application of political ecology to the country such as Greenland, which was previously colonized, should provide the study a better understanding on underlying reasons and mechanisms on the region's social ecological system. Additionally, as resilience thinking approach principles ought to have a positive output with political ecology, the combination of the two theories was chosen to be applied due to the fact it is also considered to have a positive effect especially related to the case study method.[14] (Quandt, 2016).

3.4 Data usage

The research has used various forms of data available online. Firstly, the literature review gathered peer-reviewed articles about some of the current existing discussions related to the mineral resource exploitation in Greenland or in the Arctic region. Furthermore due to the lack of on site interviewing, the analysis of the research have used existing video interviews from video sharing portals and social media in order to analyse discussions of the topic from many perspectives. Quantitative sources were examined through many portals in order to reveal a better understanding of the region's situation. One of the main data was gathered from GEUS - *"De Nationale Geologiske Undersøgelser for Danmark og Grønland"* in english, Geological Survey of Denmark and Greenland, where interactive maps were studied with relevance to the active licences. The raw data of CSV formats were downloaded from the mineral licence mapping portals and identified companies and their origin who are in possession of active licences. Further data on permits and grant fees were gathered from the official sites of the governments as well as taxation data on corporate activities, especially related to Greenland and Canada according to findings. In order to

[14] Quandt, A. (2016) Towards Integrating Political Ecology into Resilience-Based Resource Management. [Online]. Available from: https://www.mdpi.com/2079-9276/5/4/31/htm

study social and economic perspective also data from the Statistic of Greenland were used in relation to employment rates and industry division. Additionally, qualitative data were mostly examined through legislations, benefit and impact assessments provided by different actors, moreover business reports of mining companies and processes provided on their portals were used in order to examine resilience mechanisms in relation to the mentioned principles.

3.6 Access and data limitation

However, the research may face some limitations due to available data published on the variable platforms, as for example in relation to the pandemic of Covid-19, impacts concerning the mining industry in Greenland are quite scarce, therefore continuous monitoring is essential in the future. Furthermore, reviewing existing data and explorations of relevant information to the theme of the master thesis might have limitations due to language barriers, while translation of documentation in case of not digitalized sources can be time consuming.

4. Theory

The following chapter will present some of the theoretical aspects of the thesis. It will consider and explore the theory of political ecology and its characteristics, where the adaptation of case study analysis will explore the resilience thinking systems, furthermore the chapter will discuss how their combination should help us understand a better environment in social sciences research. The above mentioned two theories will be analyzed and compared, while highlighting their strengths and weaknesses. Moreover, the chapter will come to the conclusion that the method of using contemporary political ecology with a combination of the resilience thinking applications can complement each other for this specific analysis.

4.1 Roots of Political Ecology

Political ecology is a concept with many interpretations, however the roots of it are identified in the book of *"Land Degradation and Society"*[15] by Blake and Brookfield. The focal point of the theory is concentrated upon environmental degradation and exploitation of natural resources, especially to highlight the relation between local and the broader scale of political economy of a global environment. Fundamentally, political ecology is examining how humanity is connected to the environment and how societies relate to it economically. The main background of the theory is derived from capitalist theories exploring economic structures, where it analyses the mixture of actors within the agencies combined with some aspects of cultural ecology (Blaike and Brookfield, 1987). Within its roots of political ecology the main focus according to Walker was a debate over control of national resources, a combination of economic, political and ecological understandings in the change of environment (Walker, 2006). The theory promotes a broad connection within international scholars, however the interpretations can differ widely from political, social sciences

[15] Blake P. and Brookfield, H. (2015) Land Degradation and Society. Available from: https://books.google.hu/books/about/Land_Degradation_and_Society.html?id=HZpGCgAAQBAJ&redir_esc=y

approaches to environmentalists (ibid). In the below table some of the characteristics, strengths and weaknesses is analysed for political ecology:

Table 1: Characteristics Summary for Political Ecology

Characteristics	Main strengths	Weakness
⋙ It possesses a good understanding of relations between economy, politics and social factors; ⋙ The theory also put an emphasis concerning contexts of historical background especially in relation to resource management; ⋙ research methods such as case study analysis and and a process of place based examination as well suited for the theory; ⋙ The connection between power and the environment is well recognised within theory; ⋙ Additionally, the theory recognises that politics is connected to its environment management.	⋙ The theory points out the importance of power politics; ⋙ It also provides a boundary system indicators for the case study analysis; ⋙ The theory also analyses case study problems with a variety of lenses such as cultural, economical political and social factors.	⋙ However, the theory also possessed some weakness where it is criticised for the deficiency of improving ecology vigorously;

Figure 1: Table of Characteristics summary for political ecology with the help of Strengths and Weaknesses (Quandt, 2016)[16]

4.2 Political Ecology and Mining

Political ecology is a tool helping us to analyse problems and conflicts over the environment, as resource exploitation and waste disposal can lead to conflicts, in which power relations is one of the focus themes, therefore we need to examine the distributions of political and economic power in an environmental change to a closer extent, in order to understand who might benefit from the environmental change (Bryant, 1998). Conflict may arise from inequalities and unwanted processes upon disenfranchised locals, where the localised issues in fact are integrated within the institutions, accordingly the set of connections are essential for political ecology to be examined, naturally with an emphasis on the political responsibilities (Barca, 2014)[17]. Mining as the frontier

[16] Quandt, A. (2016) Towards Integrating Political Ecology into Resilience-Based Resource Management. [Online]. Available from: https://www.mdpi.com/2079-9276/5/4/31/htm

[17] See: ENTITLE,[Online]. Available from: www.youtube.com/watch?v=HLVE69QZt5w

of extraction is overlapping on the area of the commons and it can influence the region in an unsustainable manner (Barca, 2014). Therefore, political ecology focuses on the problem of injustices, inequalities and the distribution of power, and construct transformation, enabling the system to change, viewed as an extension of democracy, which places a discussion in a public environment (Martinez-Alier, 2014).

4.3 Political Ecology and Sustainability

In the last decades international policies concerning environmental issues and dilemmas of sustainability had trouble to convert it's worldwide view on how problems can be solved into regional scales, according to Adger *et al*, there are two major discourses in global environment issues, one perspective from a managerial communication and one from a populist perspectives (Adger et al, 2001). According to perspectives on the relation of political ecology and sustainability, it can be considered the seed as the theory supports sustainability research, which pursues progressive ways including local resistance and adaptations instead of using reactive actions (Robbins, 2012). Systems however can go through change which later sustainable management (ibid). According to Blaike, in the process of analysing case study research the main goal should be identifying environmental justice, where sustainability should be prioritised. Furthermore, recognition of development and improvement in the region can highlight the benefits of how political ecology facilitates policy making, especially in connection to local governments and organization actors (Blaikie, 2010). Therefore, the theory in this analysis is promoting contemplation of an interdisciplinary study among socio-economical and environmental transformations, where it is considered to be a sufficient analytical approach for the case study perspective rather than just a theory[18]

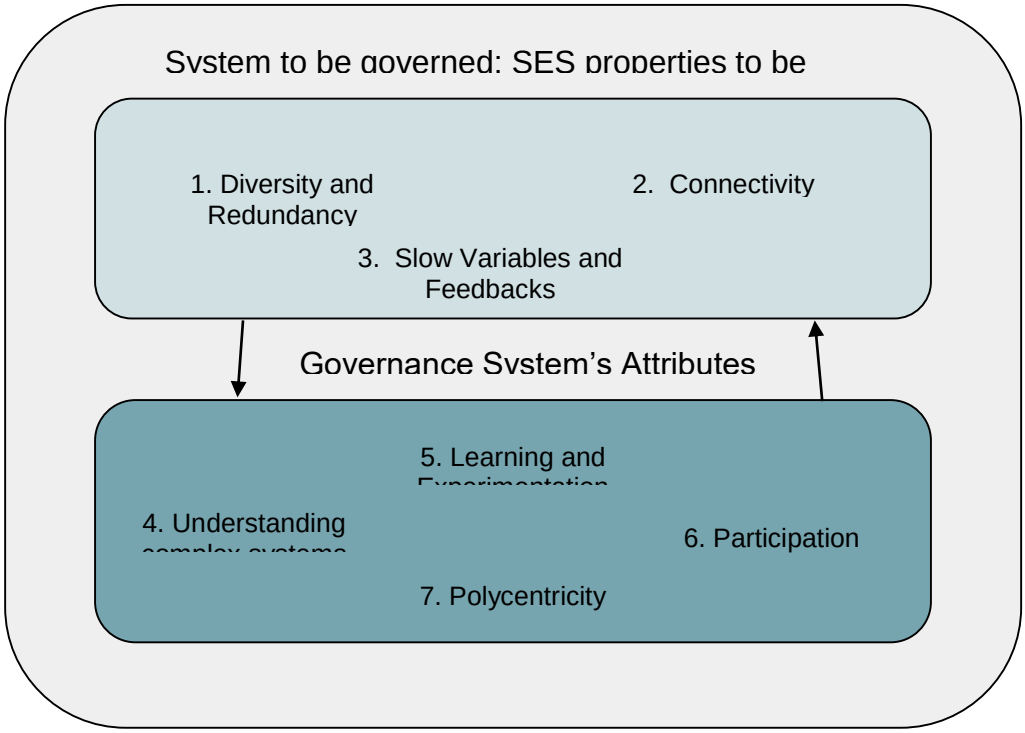
4.4 Resilience Thinking 7 Principles in SES

As building resilience can sometimes be a blurred and confusing concept, the next part of the theory chapter, will provide aspects of the development in the concept and how it was integrated to many fields. The two different but related concepts which may add to the confusion in the social ecological system (SES) one which is more specific and another broader more general (Security and Sustainability Forum, 2016). The specific way we identify a desired set of services in the ecosystem, whether it is in regulation, provision or culture and examine what are the changes that are happening, while identifying the people benefiting and losing from the process, furthermore assessing whether building a resilient system enhance or aggravate the inequalities present in the system (ibid). Therefore, it is essential to gather information concerning the question: what are the key factors of the principle in order to enhance resilience? (ibid, 2016). Resilience thinking perspective has been introduced with many different principles and disciplines, however in the

[18] Political Ecology and Sustainability Course Structure. Lund University, LUMES. Available from: https://www.lumes.lu.se/about/programme-outline/3rd-semester/political-ecology-and-sustainability

latest developments, social-ecological systems approach has been more adopted[19] within some of the policy making processes. The main attribute of the theory is to look at a community while exploring some of the challenges they face with disturbances such as climate change or other system changes (Walker, 2006). The theory recognizes the politics, power relations and current gaps in the system, however it does not wish to be eliminated, but focuses only on resilience enhancement (Security and Sustainability Forum, 2016). According to Biggs, the subsequent aspects must be examined so as to succeed in the goal of an effective social economic system, therefore firstly starting with the three properties that require to be managed: *"1. Maintaining diversity and redundancy; 2. Managing connectivity; 3. Managing slow variables; and therefore the governance system's attributes (4-7): 4. Foster complex adaptive systems thinking; 5. Encouraging learning 6. Broadening participation; 7. Promoting polycentric governance systems"* (Biggs et al, 2012). The identified principles can be viewed accordingly to the following table:

Table 2: Managing Social Ecological Systems



So in order to answer the question how these principles can enhance resilience, the next section will divide the principles into subcategories to examine them further.

4.4.1 Principle 1. Diversity and Redundancy

According to the Stockholm Resilience Centre, hereinafter SRC, some of the key aspects of maintaining diversity and redundancy is to construct a system with various components

[19] Peters, K., Langston, L., Tanner, T. and Bahadur, A. (2016) Resilience Across the Post-2015 Frameworks: Towards Coherence? ODI Working Paper. London: Overseas Development Institute. [Online]. Available from: https://www.odi.org/sites/odi.org.uk/files/resourcedocuments/11085.pdf

(Simonsen et al, 2015). When we discuss diversity we also recognize other elements of the social ecological system, such as stakeholders, landscapes, species and institutions (Security and Sustainability Forum, 2016). Furthermore, diversity can also be divided into two concepts, firstly to response diversity, where the elements can respond differently to transformations and secondly to functional redundancy, where the elements can compensate for each other in case one fails (ibid). The diversity part of the concept is responsible for the provision of many different opportunities to handle change, whereas redundancy is responsible for the capacity performance of these elements in order to compensate for each other in case of failure (Walker, 2006 and Biggs et al, 2012). However, too much diversity can increase the complexity such as different social perspectives leading to disagreement of SES and therefore it can reduce the opportunities of adaptations (Security and Sustainability Forum, 2016).

4.4.2 Principle 2. Connectivity

The connectivity where resources, people - species and actors are linked or interact is the strength of the structure within an environment (Biggs et al, 2012). It provides an information exchange between the multiple types of elements (ibid). Furthermore, connectivity is considered to be a way and a level to which of these elements migrate or distribute in the social ecological system, where it can provide enhancement by building links to recovery sources in case of an unexpected change or transformation happens and provide knowledge with enhancement of trust in social networks (Security and Sustainability Forum, 2016). Unfortunately, the relationship between connectivity and resilience can also be undesirable if the system is overconnected and therefore it needs to be further addressed and analysed as the higher degree of connectivity may have negative effects due to the spread of localized disturbance or due to the homogenized information (ibid). Accordingly, the implications of managing connectivity is not easy to assess.

4.4.3 Principle 3. Slow Variables and Feedbacks

Slow variables's transformation rate are considered to be more gradual than scale of services provisions in the ecosystem, where feedbacks are an effect which curves into its origin (Biggs et al, 2012). Feedbacks are also considered to be the backbone of the system, where it can also provide negative or positive reinforcements (Security and Sustainability Forum, 2016). However, both slow variables and feedbacks are set in various configuration or organizational settings which provide distinct ecosystem services, therefore it might be more difficult to recognize them as we are not able to see the accumulation of slow variables (ibid). Nonetheless, one main example to maintain a resilient system is to regulate services or setting up shadow networks, furthermore to foster complex adaptive system understanding (ibid).

4.4.4 Principle 4. Complex System Thinking

If we start to think about the social ecological systems as a complex adaptive system (CAS) rather than just as a complicated system, we will be able to understand the limits and the

possibilities more rationally and recognize how we can manage it (Security and Sustainability Forum, 2016). The complex adaptive system is characterised and appreciated for its properties especially in non-linear change, uncertainty or in a need for multiple perspectives (ibid). So in order to answer a question, why is it so important to be aware of the difference between a complicated system and the complex adaptive systems, moreover to understand why social ecological systems are also complex adaptive systems too, we need to look at how management adopt approaches that recognize the connectedness, uncertainty or the need for many other perspectives (ibid). Therefore, tools always need to be advanced in order to foster the complex adaptive system thinking especially on a managerial level, so confusion or paralysis can be avoided in case of any kind of disturbance and change needs to be embraced (ibid). Although the expansion to adopt the complex system thinking reduces uncertainty, it will never be able to eliminate it totally, therefore continuous learning is essential in the social ecological system (ibid).

4.4.5 Principle 5. Learning

Learning in the social ecological system can be explained as acquiring relevant new skills, knowledge independently or collectively, but also revising existing ones (Security and Sustainability Forum, 2016). In order to achieve a resilient system, continuous learning is essential, where the learning will be the outcome of experiments (ibid). There are three ways we can differentiate in learning discussions: adaptive management, which can be understood as a more classical way of learning with providing hypothesis and experiments, adaptive co-management which evolves by bringing in more stakeholders in the system and focusing on knowledge sharing between the actors as a more collaborative process which finally forms into an adaptive governance, where bringing in adaptations of continuous learning mechanisms and knowledge sharing results in a resilient social ecological system (ibid). Therefore, findings show that in order to enable adaptation due to uncertainty or changes, learning is essential to implement in the mechanisms especially with experimentation and monitoring, but also cooperation with other stakeholders and actors plays a key role (ibid). Additionally, in case of an effective learning on governance level which can have a positive effect on the system, trust, better relationships with and among institutions are required (ibid).

4.4.6 Principle 6. Participation

The principle of participation is to provide an active stakeholder engagement in the introduced processes concerning management and governance, where it is hoped that participation can shift the attitudes that would help to strengthen the management and enhance different types of knowledge sharing resulting in a more resilient social ecological system (Security and Sustainability Forum, 2016). Furthermore, participation is essential in the process for building trust within agencies and institutions, however the methods of participation need to be noted and conditions which can help to understand whether participation is appropriate (ibid). Therefore, it is important how we select the participants, we want the representative groups to be active, but also need to have participants from a

group who have an expertise concerning the topics (ibid). Managing the stakeholder is not a necessity, however setting goals with the effective way of social networking is essential to build trust within a social ecological system and bring resilience to it (ibid).

4.4.7 Principle 7. Polycentric Governance

At last promoting polycentric governance with multiple agencies, bodies, is essential to enforce the rules of a policy where institutions need to have autonomy (Security and Sustainability Forum, 2016). Horizontally the centricity is embedded in the networks, where the governance receives polycentric structures that can enable resilience enhancement especially through learning, participation, connectivity, diversity and redundancy, however organization and coordination between the acting governance should also have a special focus concerning negotiations, social capital and trust (ibid). Polycentric governance enables a broader level of participation by matching governance to individuals close to the problem so multiple scales can get involved, in order to learn what has worked and failed and solve problems close to its roots (ibid). On the other hand, polycentric governance leads to fundamental challenges, such as overlapping authorities or may lead to degradation of ecosystem services of some scales to benefit others (ibid).

5. Analysis

5.1 Normative Perspectives and Political Ecology (structure and actor oriented)

5.1.1 Introduction dialogues, Who is benefiting from the mining?

According to Jim Cambon the president of Hudson Resources Inc. Greenland can be described as a place which provides an excellent atmosphere to invest, due to its stable political climate, with a clear transparent jurisdiction and corruption free government, furthermore the CEO of AEX Gold Inc. also agrees that Greenland does have a clear legislation and their local labour is efficient and pleasant to work with (Mineral Resource Authority, 2019).[20] Additionally, the Managing Partner of Copenhagen Economics A/S points out that mining is supported by the public in the region, but it is less of a trend worldwide, where jurisdictions may be more complicated and gets less of a public support, moreover Geology Manager of Bluejay Mining PLC. states that there are currently no major players within Greenland, it is a perfect place for junior explorers and companies, as there are a lot of potential surface to be discovered (Mineral Resource Authority, 2019). The geology in Greenland is divergent, some of the projects in the region is related to diamonds, rare earth materials, niobium and anorthosites too, where according to the CEO of Air Greenland starting up an exploration site for a non-Greenlandic company is quite easy process and license can be achieved in a rapid manner (Mineral Resource Authority, 2019). In order to emphasise the time difference in permitting processes worldwide, we need to see that some Canadian companies invest in Greenland due to the fact that in Canada legislation on permitting licenses can be protracted up to 7-10 years, where in Greenland it can be about 24 months (Mineral Resource Authority, 2019). One of the other benefits to invest in Greenland according to the CEO of Greenland Holding A/S is that the country is close to the markets of North America and Europe, where shipping routes covering the area all around Greenland are ideal for logistical costs (Mineral Resource Authority, 2019). Within the country, usually air travel is the most effective way of transportation, where other logistical tasks provided by companies such as Xploration Services Greenland A/S, making sure mining companies' crew, equipment and other utilities are transported and assembled at the site (Mineral Resource Authority, 2019). Accordingly, we can state that actors in the business environment, educations are pro foreign direct investments, as also mentioned on the Greenlandic Government site, the population is pro-mining in the country (Naalakkersuisut, 2020).

On the other side, there might not be a unanimous agreement on foreign mining permits, as one of the Inuit mining entrepreneurs, he does not approve of uranium extraction in the southern areas of Greenland, stating it is not as environmental friendly as his works (DW, 2020). Furthermore, he states that a prior public discussion of how the county's natural resources are mined is missing before the permits are issued to the foreign companies and he finds infuriating how new areas can be explored by multinational companies, where locals should be the focus point for the

[20] See: Explore and invest in Greenland. [Online] Available from: https://www.youtube.com/watch?v=uB3FFqyN8mo

governments, also adding that Inuits should be more assertive regarding the matter and benefit more of the extractions (DW, 2020). Other locals of Nuuk express their concern about the mining of uranium and that its an injustice, as locals should benefit more of the natural resource exploitation in the region, there have also been several protests concerning the issue (DW, 2020). However, the Minister of the Mineral Resource Authority asserts that only foreign companies from the USA, China and Australia have the capability to implement mining projects on such scale, as the projects require in-depth knowledge of processes, several years of experience and most importantly funding (DW, 2020). The Inuit entrepreneur says it is related to a mentality of the Greenlandic population or at least he sees in the older generations, due to the many years of colonisation and he believes this mentality of waiting for someone else should be broken and they need to be more assertive regarding the permits (DW, 2020).

5.1.2 Geology and Mineral Resource Sites and History of Mining in Greenland

In the next part of the research, actors, sites and history of mineral resource exploitation will be examined to understand relation to foreign investments. In order to gather relevant information concerning the development of the mining industry in Greenland as well as analysing their economic and social effects on the country, firstly the research will identify mining sites with the help of available data from *"De Nationale Geologiske Undersøgelser for Danmark og Grønland"* Geological Survey of Denmark and Greenland (GEUS). According to the government interactive mapping the following mineral occurrences can be found in the country: iron and iron alloys, base metals, fissionable minerals, indicator minerals, gemstones, industrial mineral, sulphide mineralisation, precious metals, light metals and speciality metal (GEUS, 2020).

As the research focuses on current active exploitation licensing, it is crucial to summarise the main minerals resources exploited by foreign companies in the country, accordingly the filtered CSV data of the interactive government platform we can identify that currently London Mining Greenland A/S is in possession of an active licensing in the western part of Greenland with an expiry date of 2043-10-24, however further information related to the applicable minerals are not provided by the government site. On the website of the company, London Mining Greenland A/S, we can find further information concerning the projects, the company states that its focus minerals include iron ore and their major mining site is located about 150 km north of Nuuk[21], the company's headquarter London Mining PLC is located in China, which has several subsidiaries all around the world. The government of Greenland also mentions in their news section[22] in 2015 when the project was started, that the company's strategy was to become one of the main suppliers of iron ore with growth and M&A, furthermore the company also has plans to invest in additional exploration in the northern areas (Government of Greenland, 2015). The Impact Benefit Agreement of the project was negotiated by the concerning municipalities of Kommuneqarfik

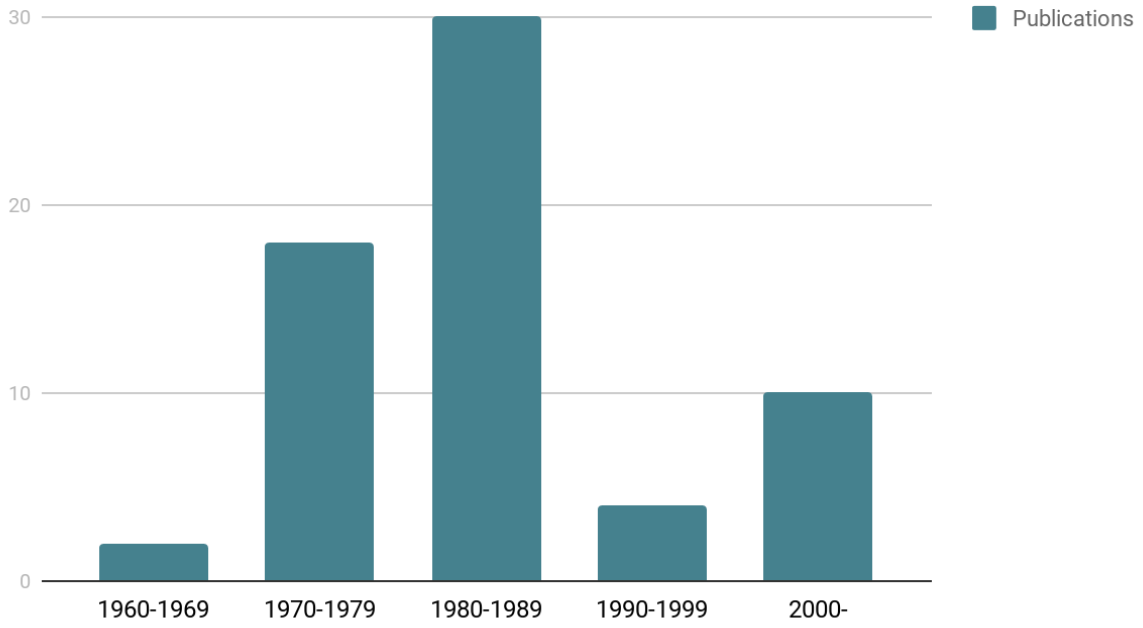
[21] Kleist, K. Presentation of London Mining Greenland A/S. Online Available from: http://www.ga.gl/Portals/0/Projekter/London%20Mining%20Greenland.pdf

[22] Naalakkersuisut (2015) New strong force behind London Mining Greenland. Online. Available from: https://naalakkersuisut.gl/en/Naalakkersuisut/News/2015/01/080115-London-Mining

Sermersooq and Qeqqata Kommunia with the government of Greenland (ibid). Further active IBAs will be later analysed in the research (ibid).

Maps related to geological aspects of Greenland are still published with new discoveries every year, due to technological improvements and interpretations. Accordingly, the recently updated summary map of GEUS within the year of 1967 and 1984 there have been 34 conducted research on mineral resources in the southern west and east side of Greenland, within the year of 1954 and 1999 there have been 19 conducted research mostly related to the west and north side of the country, where after 2000 there have been 9 research conducted in the region of west Greenland. The below graph summarises the published data in order to understand the frequency of research and to provide insights on whether the data can relate to political interest in the region.

Table 3: GEUS Geological Map Publications by decades



From the above findings, we can see that after the 1990s there has been a considerate drop in the research conducted in relation to the geological mapping of Greenland. A publication studying the technological development of the industry through the last 100 years also mentions that after the 1990s there were no mining activities in Greenland, however it does not provide further information concerning the reasons behind it (Secher and Burchardt, 2001).

Mining was presented in Greenland's history since the 1700's, where mining activities were mostly related to coal extractions in the Nuusauq, currently at the Avannaata Municipality (Greenland Institute of Natural Resources, 2020). Mining in Greenland started around the 1850s, where mineral resource exploitation targeted coal, copper, cryolite, graphite, lead and zinc around the southern and western part of Greenland (Johansen and Hansen, 1985). One of the famous historical towns related to mining is Ivittuut's mining site, where there have been cryolites found in the region in 1799 and extracted around the 1940s and the mining activities ceased in 1963

(Johansen et al, 2010). The mine had a carved open pit near the fjord of Arsuk, where the cryolite was mined from around seventy meters down (Johansen and Hansen, 1985). The location is at the southern part of Greenland, now an abandoned site which had a major importance to Greenland economically as well as strategically, where firstly during World War II, there was a base for naval construction by the United States of America, which later was given to Denmark Authorities (ibid). Environmental monitoring[23] and impact assessments were conducted on the site and related locations by Aarhus University, where it showed an elevated level presented concerning lead and zinc concentration in seaweeds within a 4km distance (Johansen and Hansen, 1985). Since the start of monitoring in 1982 at the area there has been a decline concerning lead and zinc found in seaweed and mussels, however after more than 40 years of the closed mining activities the concentration is still presented (DCE and Aarhus University, 2013).

Kvanefjeld is another famous mining site of Greenland, the mine had huge deposits in rare earth elements and uranium, it is known for its possession of different mineral resource elements, its deposits have been discovered around the 1950s, where initial focus targeted the uranium extraction until the government of Denmark made a decision to pause the project due to not pursuing energy sources of nuclear power (Greenland Institute of Natural Resources, 2020).

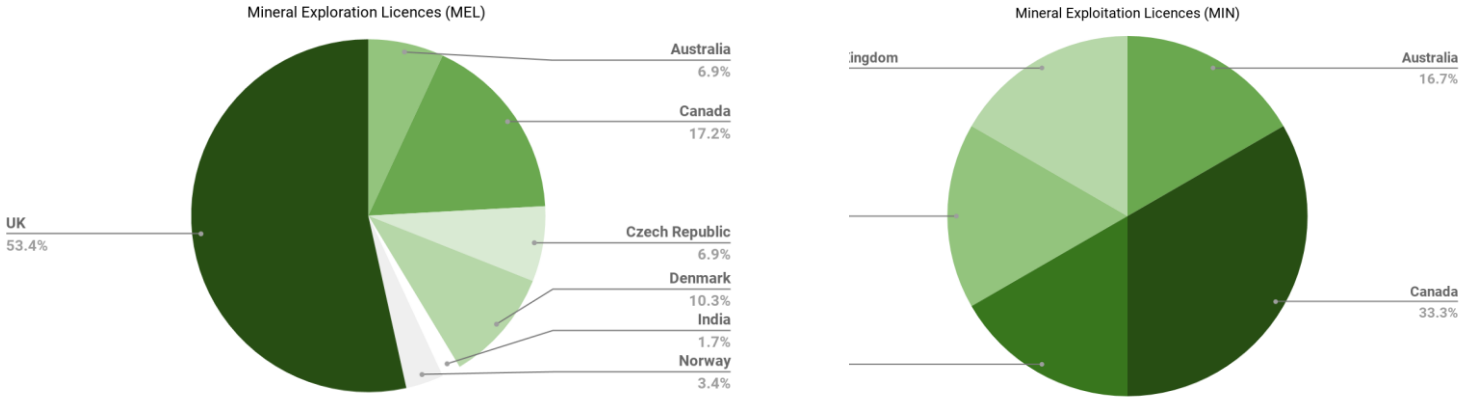
In 2009, it was a major year for the country of Greenland, as it had gained self-governance within the Kingdom of Denmark, which upon the initiatives increased to attract foreign investments, particularly concerning its mining industry (Environmental Justice Atlas, 2019). Although several mines have been closed around the 2010-2013, explorations of mineral resources and new projects have been launched continuously (Greenland Institute of Natural Resources, 2020). Accordingly, the area of Kvanefjeld was obtained by the Greenland Minerals and Energy, currently the project is under Greenland Minerals Ltd. states the resources can make the region one of the leader actor in rare earth element and uranium supplier for many years (Greenland Minerals Ltd, 2020). According to the company processes related to its production includes the following steps, firstly mining exploitation at the site followed by a crusher process and flotation which gives the zinc product to shipment, where on the other hand rare earth elements and uranium product needs further processing of concentration, leaching and solvent extraction (Greenland Minerals Ltd, 2020). With the rise of foreign companies local concerns increased too in some regions, one of the main criticisms has been made toward the Isua Project owned by London Mining Greenland A/S, where it has been argued that the government dismisses debates around ownership of the resources as the area of the mining site overlaps traditional hunting territories in Isukasia (Greenland Institute of Natural Resources, 2020). Accordingly, in the next section, Greenland's mining legislation and related licences will be analysed, additionally to the political climate and the level of corruption will be explored.

[23] DCE and Aarhus University (2014) Environmental Monitoring in 2013 at the Cryolite Mine in Ivittuut, South Greenland. [Online] Available from: https://www.researchgate.net/publication/279176027_Environmental_monitoring_in_2013_at_the_cryolite_mine_in_Ivittuut_South_Greenland

5.1.2 Mining Licenses in Greenland

Currently in Greenland we can identify four types of licenses, Small Scale Exclusive Licences (SSE), Mineral Exploration Licences (MEL), Special Exploration Licence (MEL-S) and Mining Exploitation Licence (MIN), in order to receive any of the licence the following is needed for the applications: 1. Maps and coordinates; 2. Payment of the application fee up to DKK 5,000 in 2020; 3. Filled application form; 4. Further documentation on capabilities both technical and financial and registration in the Central Business Register (CVR) (Government of Greenland, 2020). After the application has been granted a yearly granting fee for exploration licences need to be paid of DKK 36,300, in case of exploitation licence the granting fee is increased to DKK 100,000, where fees differ depending on the licence year scale (Mineral Licence and Safety Authority, 2020). According to the mineral and petroleum licence map[24] the research gathered data concerning current companies which possess already approved licenses and further investigated ongoing applications. Currently according to the exported CSV data of the mineral licence map in Greenland, there are 107 active licences where the following distributions have been found concerning the company's country of origin.

Table 4: Summaries of mining companies origin holding licences in Greenland



From the above tables we can identify that there are mostly foreign investors in the mining arena excluding small scale licences, where most companies are a subsidiary of a registered company under the United Kingdom. Therefore, in the next part it is crucial to identify some of the fees related to foreign mining industry and compare them with ones provided by the Greenlandic government. Due to the fact Canada is in possession of Arctic regions and also has the most percentage concerning mineral exploitation licences in Greenland, the next part will focus on the fees in Canada and compare the opportunities in the headquarter country. Within British Columbia the fee related to the application process for a permit fee with the lowest production tonnes are set

[24] Government of Greenland (2020) Minerals and Petroleum Licence Map. Online. available at: https://asiaq.maps.arcgis.com/apps/webappviewer/index.html?id=819ff201b76f44f99b31da7ef630c18e&locale=en

out to be CAD 4,000[25] which can be converted to DKK 19,215.93[26], up to CAD 32,000 in case of more than 500,000 tonnes of production, which can be converted to DKK 153,768.81 (British Columbia, 2015). Additionally, in Greenland corporate taxation for is amounted in 25% and in case of sales royalties depending on the mineral type in can be up to 5.5%[27], where in Canada companies can file for a depreciated corporate taxation rate from 25%[28]but it varies depending on province legislation and combined taxation can amount to 38% at the highest in Nova Scotia (Government of Canada, 2020). Moreover, income taxation for residents of Greenland is quite high with varying amounts between the municipalities from 42-44%, however in Canada income taxation can also reach high marginal rates varying from 20-54% depending on the region (Government of Canada and Government of Greenland, 2020).

Accordingly, to the above findings, it shows that foreign companies are attracted to the mining industry by the government of Greenland with incentives in order to increase investments in the region, which has been more or less effective as current active licences of mineral exploration are owned by foreign investors with a major percentage rate from the United Kingdom and concerning mineral exploitation licences with a major rate from Canada, China and Australia. Therefore, the next sections will explore and analyse some of the reasons for attracting foreign investors.

5.1.4 Political Environment and Corruption

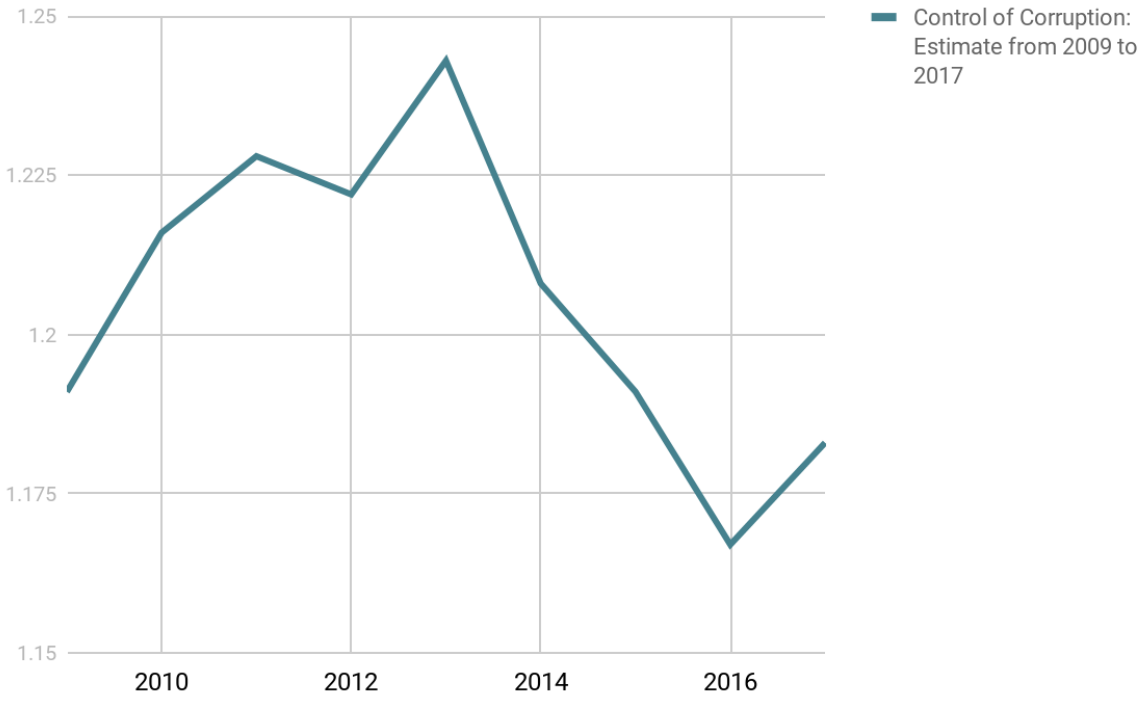
The political environment of Greenland until the 1950s was characterised as a colonial to Denmark, where modifications of the Constitutions was made in 1953 where the country became a body of the Kingdom of Denmark (Government of Greenland, 2020). As the society of Greenland boosted economically and politically, a referendum in 1979 established the Home Rule with a little over 60% majority vote (ibid). Afterwards, a rule which is currently in act, the population of Greenland voted to establish the Self-Government Act with a majority of 75%, this came into effect on 21st of June in 2009 (ibid). The Self-Government Act gave several opportunities to the people including the right to elect their own parliament and administration over several areas such as education, health, fishing and environment related issues, however some areas are still under the jurisdiction of Denmark, including justice affairs, foreign affairs, security of defense, the monetary and financial system as used with the currency of DKK (ibid). The Inatsisartut, the parliament of Greenland has 31 members, elected every 4 years, where currently the government elected is between Siumut - a social democratic party with ideologies to independence and social democracy; Atassut - a liberal conservative party with ideologies towards unionism, liberal conservatism and nordic agrarianism, but supporting international cooperation; and finally of Demokraatit with ideologies towards unionism and social liberalism (ibid). Generally, the

[25] Mines Fee Regulation (2018) Online. Available from:https://www.bclaws.ca/civix/document/id/crbc/crbc/54_2015
[26] Converted on 12.10.2020 with XE. Online. Available from: https://www.xe.com/currencyconverter/convert/?Amount=4000&From=CAD&To=DKK
[27] Government of Greenland (2020) Tax and Royalties. Online Available from: https://govmin.gl/exploitation/start - mining/ tax-and-royalties/
[28] Government of Canada (2020) Mining-Specific Tax Provisions Online Available from: https://www.nrcan.gc.ca/ our-natural-resources/minerals-mining/mining/taxation/mining-taxation-canada/mining-specific-tax-provisions/8892 And KPMG (2020) Corporate tax rates table. Online Available from: https://home.kpmg/xx/en/home/services/tax/ tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html

composition of the government supports cooperation with foreign actors and as they are aiming for independence in the future it can be seen that policies are formed in reference to attract investments to the country, however currently Denmark gives almost a third part of the amount to their financial system.

However, risk of corruption among government actors and companies can result in instability of trust within the social ecological system. Therefore, it is essential to look at risk factors within the organisational structure. Although the Mineral Resource Authority has issued policies on zero tolerance to corruption, in case of increase in exploitation activities it may become relevant to examine and monitor the stakeholders on an ongoing basis. According to the World Bank data provided by the CEICdata[29] Greenland had a control over corruption as indicated in the following table, where we can see, there was a decline in the recent years, however a little increase was shown in the last available data of 2017 with a 1.183 rate in control of corruption.

Table 5: CEIC data on Control of Corruption in Greenland



Other data of perception on corruption in the region was not found as well as Transparency International, an organization against corruption and for transparency, ranks did not provide further data about Greenlandic corruption.

5.1.5 Socio-economic contexts

According to the Greenland School of Minerals and Petroleum the country adapts fast to the need for training mining industry professionals, where their main aim is to provide qualified labour for

[29] CEIC (2017) Control of Corruption: Estimate Online. Available from: https://www.ceicdata.com/en/greenland/country-governance-indicators/gl-control-of-corruption-estimate

the industry, as it is an efficient strategy for foreign investors to hire local people in order to have low costs (Mineral Resource Authority, 2019). The University of Greenland[30] located in Nuuk, provides many educational specialisation for the communities, including Bachelor Degrees of Business Economics, Journalism, Law, cultural and Social History, Teaching, Social Science, Social Worker, Language and Literature, Nursing, Theology additionally Master's education of Cultural and Social History, Social Science, Language and so on, moreover the University is also in possession of a Ph.D School (Ilisimatusarfik, 2020). However, in relation to the mineral industry, KTI[31], the Greenland School of Minerals and Petroleums can provide education to future professionals in mining (KTI, 2020). Some of the specialisations include 1. Iron and Metal Skilled Education; 2. Building and Construction Skilled Education; 3. High School Educations; 4. Arctic Engineering with a collaboration with Danmarks Tekniske Universitet (DTU) (ibid).

In the next section in order to understand Greenland's socio-economic context from a better perspective, trends of employment rates and statistics will be explored throughout time and industries. According to available data of the Statistics of Greenland[32] from 2008 to 2018 in the mining and quarry industry total number of Greenlandic born employees are recorded according to the following, Additionally, the total number of employees born outside Greenland recorded by the statistics are followed accordingly.

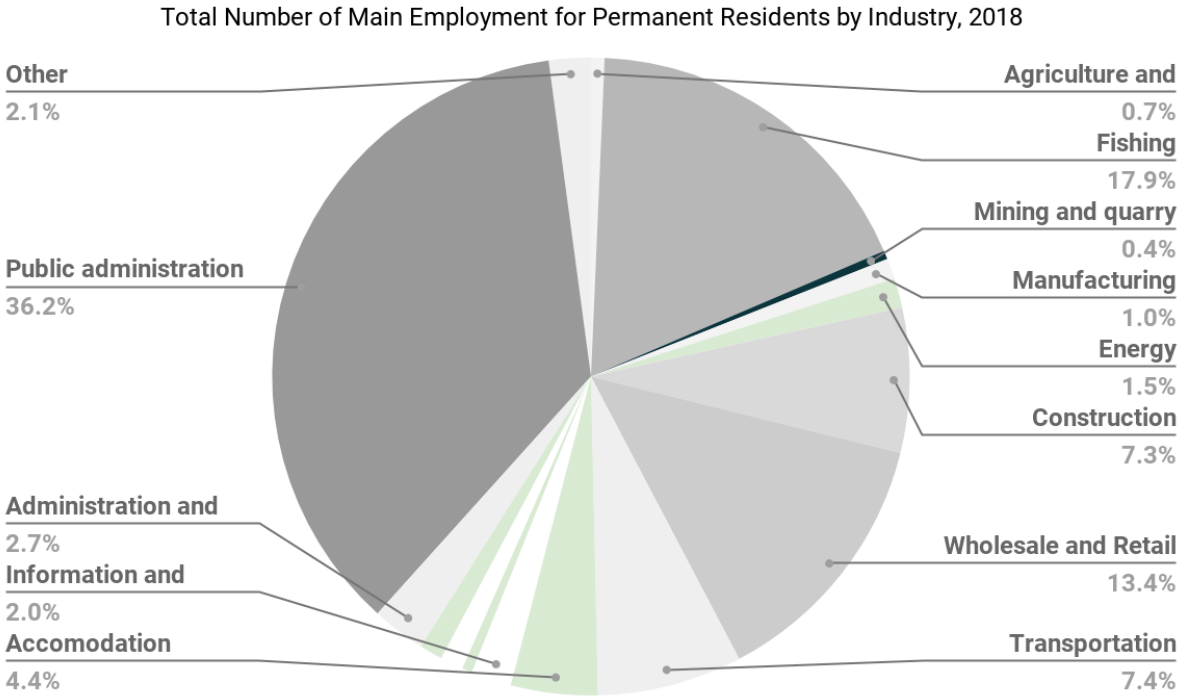
Table 6: Total Greenlandic and Foreign Employment between 2008-2018

By the summary of two data it can be understood that the employment rate of Greenlandic workers generally have a higher rate with around 100 people, only in 2016 the lines has closed a gap with difference of only around 60 employee, however still compared to the employment rate provided from the fishing industry, where employment since 2008 was over 7,000 employees, and in public

[30] Ilisimatusarfik (2020) Uddannelse. Online. Available from: https://da.uni.gl/uddannelse.aspx
[31] KTI (2020) KTI Råstofskolen - Greenland School of Minerals & Petroleum .Online. Available from: https://www.kti.gl/da/uddannelser/raastof
[32] Statistics of Greenland (2020) Main employment for permanent residents by time, industry, gender, age, place of birth and place of residence [AREBFB1]. Online. Available from: http://bank.stat.gl/pxweb/en/Greenland/Greenland__AR__AR30/ARXBFB1.px?rxid=ARXBFB113-10-2020%2018:27:25

administration and other services had a total main employment over 10,000, accordingly mining still does not provide the majority of income in the country for locals. However, the unemployment rate in Greenland is still quite high with more than 1,000 people in the year of 2020 (Statistic of Greenland, 2020). In order to see the difference of employment rates the next graph will summarise the labour market according to the latest data available of Statistics of Greenland divided into industries.

Table 7: Summary of industry division of employed residents



Concerning the pandemic of Covid-19, a study of the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) related to the impact on employment in mining has shown that the pandemic crisis had effects on the mining industries too, however resilience of the industry anticipated to be higher than other industry's resilience, such as tourism (IGF, 2020). The research emphasises that the pandemic affects lower-income countries on a higher rate due to the missing conditions in institutions as well as in regulatory frameworks (IGF, 2020). However, the studies related to Covid-19, was not studied further concerning Greenland, which could be due to the lack of statistical data of employment available to the public, with the latest year of 2018 available through the Statistics of Greenland. On the other hand, it should be

mentioned that in 2020 March 19th, the government of Greenland[33] notified their stakeholders in the mining industry that the country's capital Nuuk closed its borders for more than 3 weeks and employees of the Mineral Resource Authority were to apply home office work environment until further notice, where the section also highlighted that the pandemic would affect current operations and exploration activities in the country (Government of Greenland, 2020). On the other hand in 2020 October 14th according Covid-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU) on Covid-19 cases[34] in Greenland total cumulative cases were counted as 16 with a total of 2 active current cases in the region.

Furthermore, in order to also better understand regional relation and effects of mining the next section will also summarise the currently active Impact Benefit Agreements according to the available documentation through the portals of government of Greenland. These documentations were negotiated within actors of the mining industry, firstly mentioning the applicants, currently four impact benefit agreements are published on the website of the government of Greenland, which related to the following companies: 1. Greenland Ruby A/S; 2. Hudson Greenland A/S; 3. Ironbark A/S; and Tanbreez Mining Greenland A/S[35] (Government of Greenland, 2020). Moreover, the projects included mineral resources of ruby, anorthosites, lead, zinc, eudialyte and other rare earth elements (REE), where the latest impact benefit agreement was related to eudialyte and REEs by Tanbreez Mining Greenland A/S, a company with an origin from Australian headquarter (ibid). As also mentions on the website of Tanbreez and in the report[36], socio-economic aspect for the mining industry in Greenland

However, the Isua Project run by London Mining Greenland A/S had some criticism in the region due to the lack of consultation with local communities within the municipality of Qeqqata the social impact assessment was conducted by a company from the Netherlands, Grontmij A/S (Environmental Justice Atlas, 2019). Social Impact Assessment published according to local environment (ibid).

5.1.6 Environmental Impacts of Mining

On the Kvanefjeld Project, in relation to the environmental impact processes, Greenland Minerals Ltd. targeted minimal after effects of their mining operations, therefore on their portal the project emphasises how feasibility and baseline studies have been conducted in order to provide a better insight of environmental impacts (Greenland Minerals Ltd, 2020). According to the many research conducted by the company, the study shows that concerning the Kvanefjeld Project no major environmental issue is presented or risks for locals residing near the site, however this has not been

[33] Government of Greenland (2020) COVID-19 update. Online Available from: https://govmin.gl/2020/03/covid-19-update/

[34] COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU) Online Available from: https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd4029 9423467b48e9ecf6

[35] Government of Greenland (2020) Active IBAs. Online Available from: https://govmin.gl/exploitation/get-an-exploitation-licence/impact-benefit-agreement-iba/

[36] Tanbreez (2012) Socio-economic aspects Online Available from: http://tanbreez.com/media/1638/Social%20and%20Environmental%20Page%20-%20Socio%20Economic%20Aspects%20and%20Health%20Care.pdf

explained in further details or uploaded to the company's site, only stating that radiation levels occurring due to the project is negligible and it is lower compared to the European levels (ibid). Furthermore, concerning water management of the company, the website states that water related to the mining processes are controlled and under isolation from the outside environment (ibid). On a final note, as the mining projects provide a vast amount of rock waste, the Greenland Minerals Ltd. store this waste in a basin piled to an extent that could be blended into the nature characteristics, the basin is close to the area of Tasaq (ibid).

Concerning the Isua Mining Project by London Mining Greenland A/S, the issued impact assessments of environmental problems were emphasised to be negligible as the mining activities would not affect the environment majorly, however the "ᐊᓕᒐᖅ" Avataq, a Greenlandic cultural organization stated that by their studies the site near the Fjord of Godthaab along with several territories are actually affected by the activities (Environmental Justice Atlas, 2020). The potential risk of operation according to the assessment included 1. Modification of the environment and change in landscape; 2. Potential filling up of the rock waste ponds - tailings, which is a hydrological effect; 3. Alteration in noise levels, which would disturb the locals; 4. moreover, due to the same reason of disruption alterations of animal locations, which would affect hunting effectiveness; and finally 5. Due to the choice of energy usage being fossil fuel a boost in carbon dioxide emissions (ibid).

5.2 Resilience Thinking Perspectives of Cases: Isua and Baffin Island

As mentioned before the resilience thinking approach is especially effective in relation to a case study analysis, therefore in the next section a cross regional comparative case study analysis will try to implement the approach, additionally to the political ecology findings. The research design chose the cross regional manner in order to understand possible similarities between different regions, which could highlight that it can only be effective if it provides a holistic perspective concerning the sections. The two cases were chosen as the following: General Nice Development - London Mining of Isua project of iron ore and also a case related to iron ore mining in Canada at the Baffin Island within the Nunavut territory.[37]

5.2.1 Maintaining diversity and redundancy

The first principle of resilience thinking approach emphasises that a system which has more components can be more resilient to occurring issues (Simonsen et al, 2015). According to the business report published by General Nice Development, the research can get some insights to the diversity structure of the company. In 2013, the company base in the United Kingdom received a licence to exploit iron ore in the western part of Greenland for 30 years, which was described as one of the biggest projects in Greenland (General Nice Development, 2020). The Chinese partnership states that ambitions are still growing due to the economy concerning the Isua project, which would benefit the locals, however further internationally

[37]Environmental Justice Atlas (2020) Iron Ore mining in Baffin island, Nunavut territory, Canada. Online. Available from: https://ejatlas.org/conflict/iron-ore-nunavut-canada

reachable documentation regarding the project was not available online. On the other hand, Baffinland, the Canadian company operating in the Nunavut territory has a transparent view on maintaining the diversity in their team in order to raise their popularity within Inuit locals, stating on their website that the strong relationships between the communities and the company is highly important to them to deliver benefits to locals, therefore the company update residents about operations or employment opportunities and ask for feedbacks on an ongoing basis (Baffinland, 2020). Moreover, the company employs many Community Liaison Officers who are the first level of contact within the region for locals and further cooperate with the Inuit Qaujimajatuqangit to safeguard the environment and acquire a deeper knowledge (Baffinland, 2020).

5.2.2 Managing connectivity

The second principle of the approach highlights that connectivity in a social ecological system can enhance in recovery (Simonsen et al, 2015). Unfortunately, the Isua project led by the London Mining Greenland A/S, got many criticism concerning the missing communication with local communities and the lack of information given out about the project (Environmental Justice Atlas, 2020). Furthermore, these processes lacked prior consultation to the public, it was criticised to be a one sided consultation about awarded licence agreements (ibid). On the other hand, the Baffinland also received some criticism of their processes, according to their sustainability section on their website, the company has been working towards recovering connectivity with many stakeholders (Baffinland, 2020).

5.2.3 Managing slow variables, governance system's attributes

The third principle of the approach points out that slow variables should have monitoring and governance structure which can implement them properly (Simonsen et al, 2015). London Mining Greenland states that thorough analysis of technical research and Impact Benefit Agreements were studied before the continuation of mining activities in Isua (London Mining Greenland, 2020). However, Avataq the organization highlighted that the company has not been following the rules according to the impact assessments, which also boosted some issues over democratic concerns, within the year of 2018, no further steps has been made by the company as financially would not be effective for them, due to the lower iron prices, currently documentation concerning the mine's closure plan should be submitted in 2021 (Environmental Justice Atlas, 2020). On the other hand, according to Baffinland environmental impact assessments and monitoring plays a major role throughout their operation establishments (Baffinland, 2020). The company uses monitoring of the following: aerial surveys, shore based monitoring, ship base observing and relying on environmental assessments in order to monitor narwhals in the regions and avoid their disturbances which could interfere with hunting activities of the local communities (Baffinland, 2020).

5.2.4 Foster complex adaptive systems thinking

The fourth principle of resilience thinking approach emphasises that a management appreciating the connections and complex mechanisms can enhance resilience (Simonsen et

al, 2015). As mentioned before in the Baffinland company in Nunavut, organizations such as IQ related to local community issues are matched with the communication in management (Baffinland, 2020). In the Canadian project there have been implications on how their knowledge is changing in a continuous manner, therefore their behaviour seems to be more active in fostering a complex adaptive system. On the other hand, concerning the Isua project, the main communication in the strategic report of the company were about discussions concerning joint ventures and acquisitions of portfolio enhancement, while working closely with the government of Greenland and banks, rather than working with the local context (London Mining Greenland, 2020).

5.2.5 Encouraging learning

The fifth principle of the approach highlights that continuous learning in a social ecological system can enhance in recovery (Simonsen et al, 2015). In the Baffinland sustainability section, the company provides a learning and development initiative, stating that they are committed to give the best possible education and training for local communities (Baffinland, 2020). The palette includes initiatives such as scholarships which are awarded on an annual basis to Inuit people, work readiness program offering a 60 hour practice on site with mentors, apprenticeship of many areas including carpentry to mechanics, Inuit internship program which offers two positions of many fields, and finally skills - training for employment partnerships (Baffinland, 2020). In the case of London Mining Greenland, no information was found concerning encouragement of learning, only stated in the project social impact report that the company would further provide educational possibilities, however it had the criticism that reality did not meet large scale opportunity yet (Environmental Justice Atlas, 2020).

5.2.6 Broadening participation

The third principle of the approach points out active participation from the relevant stakeholders is necessary to enhance resilience (Simonsen et al, 2015). Participation on the Greenlandic side mostly comes from mobilisation in protest against the company's activities, where in 2012 around sixty locals attended the protest, also highlighting that the government banning the locals to collect gemstones are injustice to the rights and resource allocations (Environmental Justice Atlas, 2020). The Canadian company has a detailed news segment on current issues addressed also mentioning several agreements signed with Inuit associations or authorities, where the last one was signed with the Qikiqtani Association in February of 2020 detailing how their operations are in accordance of Inuit Societal Values with a benefit impact on local communities, which was also translated to the local language (Baffinland, 2020). Additionally, Covid-19 cases and safety measures are also reported on the company's channels (ibid).

5.2.7 Promoting polycentric governance system

And finally, the last principle of the approach highlights that a polycentric governance system should be promoted in order to achieve resilience (Simonsen et al, 2015). Overall we can say

from the above findings that Baffinland, although has some criticism on social ecological issues, many goals of the company to promote the polycentric governance system, where London Mining Greenland does the bare minimum in case of addressing social ecological concerns in their mining areas, mostly only in the driver of profit maximization.

6. Conclusion and recommendations

In order to summarize the finding of the research the conclusion section will answer the questions accordingly. Why is the mining industry of Greenland dominated by international investors, how does it impact locals from political ecological perspectives? The research provides insights through political ecology to many aspects related to the mineral resource exploitation in Greenland, especially focusing on context in a social ecological manner. Firstly, it examined dialogues concerning mineral resource exploitation highlighting the conflicting debates about the topic. Afterwards, identifying geological aspect and histories of the mining sites, as well as licenses provided by the Greenlandic government, which was to better understand the divisions between companies. Moreover, several other socio-economic factor was studies so to identify current trends in employment of the industry and differentiate between resident and foreign employees.

Moreover, answering to the question of how did companies enhance resilience with the application of the 7 principles concerning its mining projects compared to other projects in the Arctic region? The below table summarizes the findings in accordance to the principles.

Table 7: Summary of the resilience thinking approach application

7 Principles	London Mining Greenland A/S Isua Project	Baffinland Baffin Island, Nunavut Project
Maintaining diversity and redundancy	Not available data, apart from government discussions	Transparent connection level through documentation and officers
Managing connectivity	Lack of public information, only one sided	Recovering connection through open discussions
Managing slow variables, governance system's attributes	Delay in impact assessment documentation, should be submitted until 2021	Aerial surveys, shore based monitoring, ship base observing and relying on environmental assessments
Foster complex adaptive systems thinking	Only mentions business approaches in their strategy	Recovering behaviour patterns, enhancement of communication channels
Encouraging learning	No information found, only	Many opportunities for

	theoretically, but in reality no opportunity provided on large scale	trainings and education encouragement
Broadening participation	No prior information about Agreements with the local government	Including Agreements with many stakeholders with previous notifications
Promoting polycentric governance system	No promotion in polycentric governance, only in negotiations with the government	More or less promoting polycentric governance

Concerning the two projects related to iron ore mining, the research found that although both companies received criticism by local communities the Canadian case has an attempt in recovering lacking information around social or environmental issues, however in Greenland the Chinese company has not met any of the resilience thinking principles goals, due to their attitude towards the county, more or less only based on profit orientation. However, it should be mentioned that due to the lack of information on London Mining Greenland operation it might not be the exact case, further monitoring of the two projects is essential in the future. Additionally, according to the mentioned report from London Mining Greenland, it is also mentioned that one of the mining subsidiaries went bankrupt due to the ebola virus, therefore further investigations on impacts of pandemics such as Covid-19 should be continuous due the currently scarce data available. However, it is essential as it could provide further debates and discussions to governance of the mining activities in Greenland.

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8. Appendix

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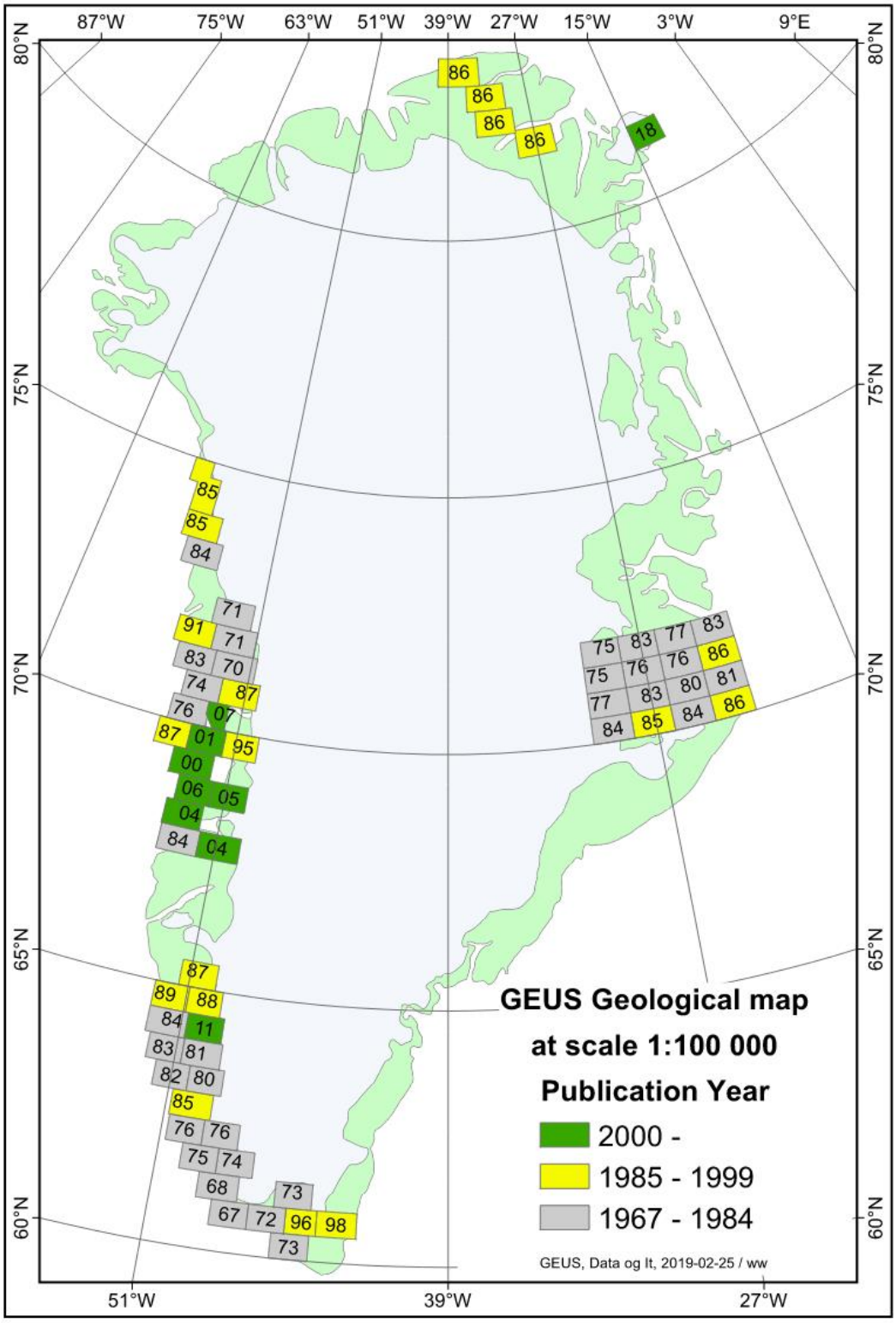

Government of Greenland (2020) Data gathered from Minerals and Petroleum Licence Map. [Online]. Available from: https://asiaq.maps.arcgis.com/apps/webappviewer/index.html?id=819ff201b76f44f99b31da7ef630c18e&locale=en

Licence Code	Owner name	Licence Type	Licence Status	Official area	Granting Date	Expiry Date
MEL 2006-10	Nalunaq A/S	Mineral Exploration Licence (MEL)	Active License	292	2006.01.01	2022.12.31
MEL 2007-01	Platina Resources Limited	Mineral Exploration Licence (MEL)	Active License	107	2007.01.01	2025.04.27
MEL 2007-45	Rimbal Pty. Ltd.	Mineral Exploration Licence (MEL)	Active License	50	2007.01.01	2019.12.31
MEL 2008-01	Greenland Ruby A/S	Mineral Exploration Licence (MEL)	Active License	38	2008.01.01	2020.12.31
MEL 2008-46	Greenland Ruby A/S	Mineral Exploration Licence (MEL)	Active License	75	2003.01.01	2021.12.31
MEL 2010-02	Greenland Minerals A/S	Mineral Exploration Licence (MEL)	Active License	80	2005.01.01	2020.12.31
MEL 2010-17	Greenland Feldspar Aluminium Resources ApS	Mineral Exploration Licence (MEL)	Active License	31	2010.01.01	2023.12.31
MEL 2010-24	Rimbal Pty. Ltd.	Mineral Exploration Licence (MEL)	Active License	44	2005.01.01	2020.12.31
MEL 2010-45	FBC Mining (BA) Limited	Mineral Exploration Licence (MEL)	Active License	103	2005.01.01	2021.12.31
MEL 2010-49	Greenland Vanadium Energy Resources ApS	Mineral Exploration Licence (MEL)	Active License	76	2010.01.01	2023.12.31

MEL 2011-31	Disko Exploration Ltd.	Mineral Exploration Licence (MEL)	Active License	107	2011.01.01	2020.12.31
MEL 2011-53	CGRG Ltd.	Mineral Exploration Licence (MEL)	Active License	168	2011.01.01	2020.12.31
MEL 2011-54	North American Nickel Inc.	Mineral Exploration Licence (MEL)	Active License	2799.48	2011.01.01	2021.12.31
MEL 2012-25	Platina Resources Limited	Mineral Exploration Licence (MEL)	Active License	16	2012.01.01	2021.12.31
MEL 2012-28	North American Nickel Inc.	Mineral Exploration Licence (MEL)	Active License	296	2012.01.01	2022.12.31
MEL 2012-29	Disko Exploration Ltd.	Mineral Exploration Licence (MEL)	Active License	194	2012.01.01	2021.12.31
MEL 2013-04	Graphite Fields Resources Ltd.	Mineral Exploration Licence (MEL)	Active License	16	2013.01.01	2023.12.31
MEL 2013-06	Obsidian Mining Ltd	Mineral Exploration Licence (MEL)	Active License	48.31	2013.01.01	2022.12.31
MEL 2013-21	Greenland Silver Moly Resources ApS	Mineral Exploration Licence (MEL)	Active License	19.15	2013.08.29	2024.12.31
MEL 2014-11	Copenhagen Minerals Inc.	Mineral Exploration Licence (MEL)	Active License	12	2014.01.01	2024.12.31
MEL 2015-08	Dundas Titanium A/S	Mineral Exploration Licence (MEL)	Active License	87	2015.01.01	2024.12.31
MEL 2015-17	Nalunaq A/S	Mineral Exploration Licence (MEL)	Active License	78	2015.01.01	2025.12.31

MEL 2016-13	Greenland Gold s.r.o	Mineral Exploration Licence (MEL)	Active License	72	2016.01.01	2020.12.31
MEL 2016-14	Greenland Gold s.r.o	Mineral Exploration Licence (MEL)	Active License	92	2016.01.01	2020.12.31
MEL 2017-01	Bluejay Mining Plc	Mineral Exploration Licence (MEL)	Active License	28	2017.01.01	2021.12.31
MEL 2017-06	Longland Resources Limited	Mineral Exploration Licence (MEL)	Active License	305.58	2017.01.01	2021.12.31
MEL 2017-26	Zawar Natural Resources Pvt. Ltd.	Mineral Exploration Licence (MEL)	Active License	113	2017.07.29	2021.12.31
MEL 2017-27	Resource 500 FeVTi Ltd.	Mineral Exploration Licence (MEL)	Active License	73.14	2017.06.26	2021.12.31
MEL 2017-29	White Eagle Resources Limited	Mineral Exploration Licence (MEL)	Active License	61	2017.07.29	2021.12.31
MEL 2017-41	White Fox Resources Limited	Mineral Exploration Licence (MEL)	Active License	17.26	2017.08.30	2021.12.31
MEL 2018-11	GREENLAND RESOURCES Inc.	Mineral Exploration Licence (MEL)	Active License	88	2018.01.01	2023.12.31
MEL 2018-16	Disko Exploration Ltd.	Mineral Exploration Licence (MEL)	Active License	1698	2018.01.01	2022.12.31
MEL 2018-17	Nalunaq A/S	Mineral Exploration Licence (MEL)	Active License	170	2018.02.19	2023.12.31
MEL 2018-19	Greenfields Exploration Ltd	Mineral Exploration Licence (MEL)	Active License	31	2017.12.20	2022.12.31

MEL 2018-21	North American Nickel Inc.	Mineral Exploration Licence (MEL)	Active License	63	2018.01.01	2023.12.31
MEL 2018-25	White Eagle Resources Limited	Mineral Exploration Licence (MEL)	Active License	88.46	2018.02.05	2022.12.31
MEL 2018-32	21st NORTH ApS	Mineral Exploration Licence (MEL)	Active License	310	2018.02.19	2023.12.31
MEL 2019-11	Northground Ltd.	Mineral Exploration Licence (MEL)	Active License	121.14	2019.04.05	2023.12.31
MEL 2019-113	Nalunaq A/S	Mineral Exploration Licence (MEL)	Active License	266	2019.09.26	2024.09.25
MEL 2019-114	Dundas Titanium A/S	Mineral Exploration Licence (MEL)	Active License	19	2019.08.12	2023.12.31
MEL 2019-115	Anglo American Exploration Overseas Holdings Limited	Mineral Exploration Licence (MEL)	Active License	1671	2019.09.02	2023.12.31
MEL 2019-116	Disko Exploration Ltd.	Mineral Exploration Licence (MEL)	Active License	695	2019.08.30	2023.12.31
MEL 2019-162	Greenland Gold Resources Ltd.	Mineral Exploration Licence (MEL)	Active License	34	2010.07.26	2023.12.31
MEL 2019-18	Stallion Resources Limited	Mineral Exploration Licence (MEL)	Active License	276	2019.03.28	2023.12.31
MEL 2019-59	Challenge Holdings Ltd	Mineral Exploration Licence (MEL)	Active License	827	2019.09.25	2025.12.31
MEL 2019-79	Anglo American Exploration Overseas Holdings	Mineral Exploration Licence (MEL)	Active License	2434	2019.07.15	2023.12.31

	Limited					
MEL 2019-80	Anglo American Exploration Overseas Holdings Limited	Mineral Exploration Licence (MEL)	Active License	4792	2019.07.15	2023.12.31
MEL 2020-02	Bright Star Resources Limited	Mineral Exploration Licence (MEL)	Active License	218	2020.01.01	2024.12.31
MEL 2020-06	Disko Exploration Ltd.	Mineral Exploration Licence (MEL)	Active License	586	2020.02.27	2025.02.26
MEL 2020-10	Disko Exploration Ltd.	Mineral Exploration Licence (MEL)	Active License	288	2020.02.25	2025.02.24
MEL 2020-21	Challenge Holdings Ltd	Mineral Exploration Licence (MEL)	Active License	1072	2020.05.19	2025.12.31
MEL 2020-26	Black Angel Mining A/S	Mineral Exploration Licence (MEL)	Active License	52	2020.05.28	2025.12.31
MEL 2020-30	Bright Star Resources Limited	Mineral Exploration Licence (MEL)	Active License	70	2020.01.01	2024.12.31
MEL 2020-31	Nalunaq A/S	Mineral Exploration Licence (MEL)	Active License	818	2020.05.28	2025.12.31
MEL 2020-36	Nalunaq A/S	Mineral Exploration Licence (MEL)	Active License	1889	2020.06.24	2025.12.31
MEL 2020-48	R500 Greenmin Ltd.	Mineral Exploration Licence (MEL)	Active License	46	2020.08.17	2025.08.16
MEL 2020-49	Bright Star Resources Limited	Mineral Exploration Licence (MEL)	Active License	86	2020.09.16	2025.09.15

MEL 2020-64	Longland Resources Limited	Mineral Exploration Licence (MEL)	Active License	161	2020.09.29	2025.09.28
MEL-S 2018-01	Greenfields Exploration Ltd	Special Exploration Licence (MEL-S)	Active License	2231.73	2017.12.20	2020.12.31
MEL-S 2018-03	Greenfields Exploration Ltd	Special Exploration Licence (MEL-S)	Active License	1156.97	2017.12.20	2020.12.31
MEL-S 2018-05	Greenfields Exploration Ltd	Special Exploration Licence (MEL-S)	Active License	1251	2017.12.20	2020.12.31
MEL-S 2019-38	Longland Resources Limited	Special Exploration Licence (MEL-S)	Active License	4215	2019.07.12	2021.12.31
MIN 2003-05	Nalunaq A/S	Mining Exploitation Licence (MIN)	Active License	22.21	2003.04.24	2033.04.24
MIN 2013-31	London Mining Greenland A/S	Mining Exploitation Licence (MIN)	Active License	290.46	2013.10.24	2043.10.24
MIN 2014-21	Greenland Ruby A/S	Mining Exploitation Licence (MIN)	Active License	17.39	2014.03.10	2044.03.07
MIN 2015-39	Hudson Greenland A/S	Mining Exploitation Licence (MIN)	Active License	95.77	2015.09.22	2045.09.22
MIN 2016-30	Ironbark A/S	Mining Exploitation Licence (MIN)	Active License	123.13	2016.12.16	2046.12.16
SSE 2015-02	Ilannguaq Olsen	Small Scale Exclusive Licence (SSE)	Active License	1	2014.11.14	2020.12.31

SSE 2015-03	Aqqalu Kreutzmann	Small Scale Exclusive Licence (SSE)	Active License	1	2014.11.14	2020.12.31
SSE 2015-04	Mike M2lgaard	Small Scale Exclusive Licence (SSE)	Active License	1	2014.11.14	2020.12.31
SSE 2015-05	Hans Berthelsen	Small Scale Exclusive Licence (SSE)	Active License	1	2014.11.14	2020.12.31
SSE 2015-06	S0ren Simonsen	Small Scale Exclusive Licence (SSE)	Active License	1	2015.01.01	2020.12.31
SSE 2015-23	Palle M-ller Andersen	Small Scale Exclusive Licence (SSE)	Active License	1	2015.08.17	2020.12.31
SSE 2015-24	Lars Jepsen	Small Scale Exclusive Licence (SSE)	Active License	1	2015.08.10	2020.12.31
SSE 2016-01	Ilannguaq Olsen	Small Scale Exclusive Licence (SSE)	Active License	1	2016.01.01	2018.12.31
SSE 2016-02	Aqqalu Kreutzmann	Small Scale Exclusive Licence (SSE)	Active License	1	2016.01.01	2018.12.31
SSE 2016-06	Lars Schou	Small Scale Exclusive Licence (SSE)	Active License	1	2016.01.01	2021.12.31
SSE 2016-07	Niels Madsen	Small Scale Exclusive Licence (SSE)	Active License	1	2016.01.01	2021.12.31
SSE 2016-16	Erik Palo Jacobsen	Small Scale Exclusive Licence (SSE)	Active License	1	2016.05.27	2021.12.31
SSE 2016-17	Lars Jepsen	Small Scale Exclusive Licence (SSE)	Active License	1	2016.08.12	2021.12.31

SSE 2016-20	Lars Jepsen	Small Scale Exclusive Licence (SSE)	Active License	1	2016.08.12	2021.12.31
SSE 2016-26	Niels Madsen	Small Scale Exclusive Licence (SSE)	Active License	1	2016.07.20	2021.12.31
SSE 2018-09	Alexander Nielsen	Small Scale Exclusive Licence (SSE)	Active License	1	2018.01.01	2020.12.31
SSE 2018-14	Martin Kassner	Small Scale Exclusive Licence (SSE)	Active License	1	2018.01.01	2020.12.31
SSE 2018-15	Falke Mikailsen	Small Scale Exclusive Licence (SSE)	Active License	1	2018.01.01	2020.12.31
SSE 2018-22	Knud Seblon	Small Scale Exclusive Licence (SSE)	Active License	1	2018.01.01	2020.12.31
SSE 2018-26	Paviaaraq Heilmann	Small Scale Exclusive Licence (SSE)	Active License	1	2018.03.19	2020.12.31
SSE 2018-27	Herluf Gr1nlund and Nuunu Olsen	Small Scale Exclusive Licence (SSE)	Active License	1	2018.03.19	2020.12.31
SSE 2018-29	Paviaaraq Heilmann	Small Scale Exclusive Licence (SSE)	Active License	1	2018.03.19	2020.12.31
SSE 2018-34	Lars Jepsen	Small Scale Exclusive Licence (SSE)	Active License	1	2018.01.01	2020.12.31
SSE 2018-43	Johan L-vstrsm	Small Scale Exclusive Licence (SSE)	Active License	1	2018.08.15	2020.12.31
SSE 2018-44	Johan L-vstrsm	Small Scale Exclusive Licence (SSE)	Active License	1	2018.08.15	2020.12.31

SSE 2018-46	Gert M2ller	Small Scale Exclusive Licence (SSE)	Active License	1	2018.08.06	2020.12.31
SSE 2019-02	Herluf Gr1nlund	Small Scale Exclusive Licence (SSE)	Active License	1	2019.01.01	2021.12.31
SSE 2019-03	Herluf Gr1nlund	Small Scale Exclusive Licence (SSE)	Active License	1	2019.01.01	2021.12.31
SSE 2019-04	Nuunu Olsen	Small Scale Exclusive Licence (SSE)	Active License	1	2019.01.01	2021.12.31
SSE 2019-05	Nuunu Olsen	Small Scale Exclusive Licence (SSE)	Active License	1	2019.01.01	2021.12.31
SSE 2019-07	Alexander Nielsen	Small Scale Exclusive Licence (SSE)	Active License	1	2019.01.01	2021.01.01
SSE 2019-123	Jens Johan Broberg	Small Scale Exclusive Licence (SSE)	Active License	1	2019.09.02	2021.12.31
SSE 2019-124	Jens Johan Broberg	Small Scale Exclusive Licence (SSE)	Active License	1	2019.09.02	2021.12.31
SSE 2019-125	Jens Johan Broberg	Small Scale Exclusive Licence (SSE)	Active License	1	2019.09.02	2021.12.31
SSE 2019-126	Jens Johan Broberg	Small Scale Exclusive Licence (SSE)	Active License	1	2019.09.02	2021.12.31
SSE 2019-149	Jens Johan Broberg	Small Scale Exclusive Licence (SSE)	Active License	1	2019.09.02	2021.12.31
SSE 2019-41	Herluf Gr1nlund	Small Scale Exclusive Licence (SSE)	Active License	1	2019.06.17	2021.12.31

SSE 2020-16	Knud Seblon	Small Scale Exclusive Licence (SSE)	Active License	1	2020.02.27	2023.02.26
SSE 2020-28	Bent Olesen	Small Scale Exclusive Licence (SSE)	Active License	1	2020.01.01	2022.12.31
SSE 2020-29	Pitsi H-egh	Small Scale Exclusive Licence (SSE)	Active License	0.91	2020.05.07	2022.12.31