



**NAALAKKERSUISUT**  
GOVERNMENT OF GREENLAND

# **Report to Inatsisartut, the Parliament of Greenland, concerning mineral resources activities in Greenland**



**2012**

**Report:**

Mineral resources activities 2012

June 2012

**Greenland Self Government**

**Greenland Bureau of Minerals and Petroleum**

[bmp@nanoq.gl](mailto:bmp@nanoq.gl)

Imaneq 29

Post-box 930

DK-3900 Nuuk

Kalaallit Nunaat

Greenland

Tel.: +299 34 68 00

Fax +299 32 43 02

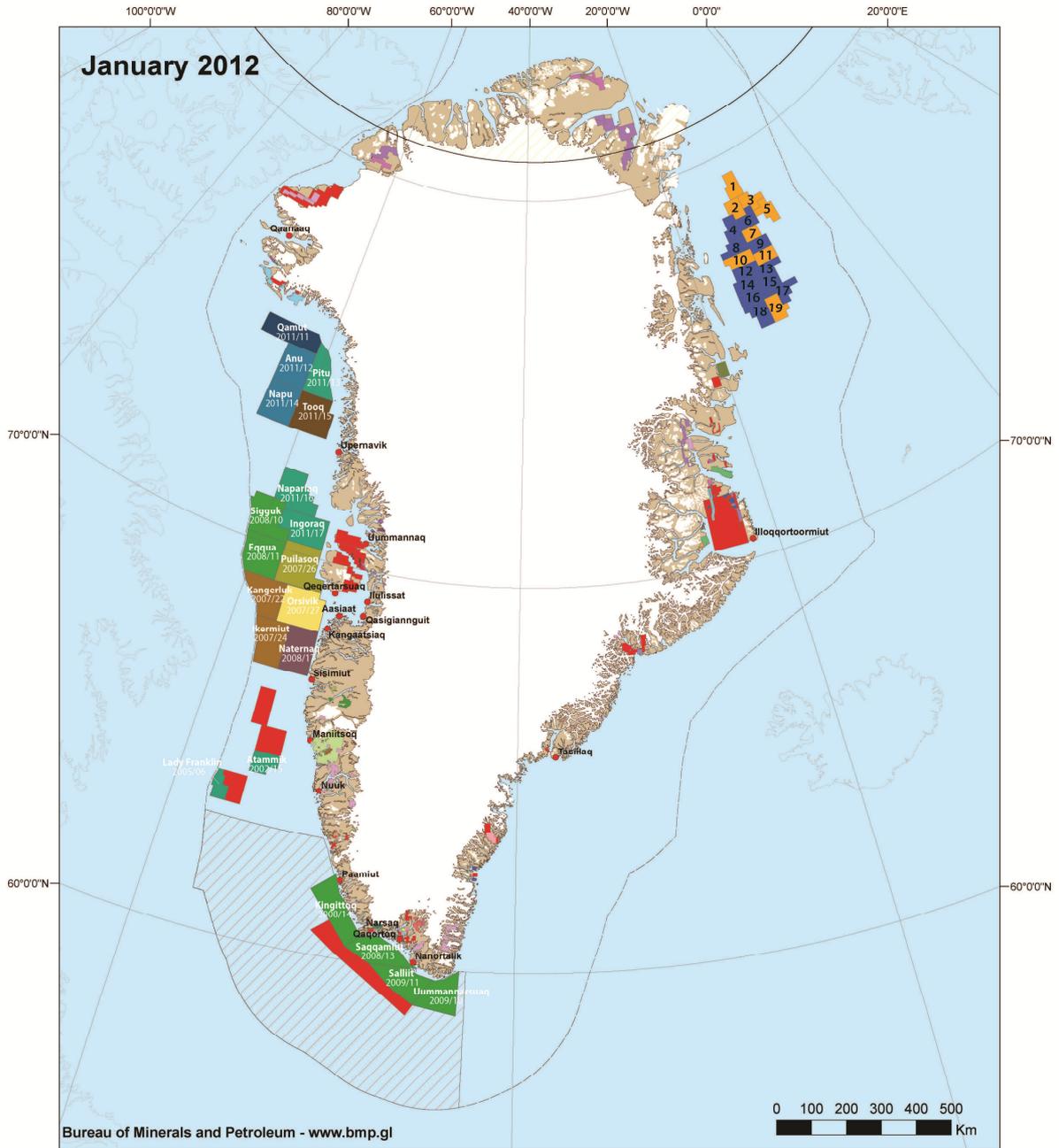
**Frontpage photo:**

Ocean Rig Corcovado – Drilling Ship.

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Map of exclusive licences, under application, and granted



## 1.0 Preface



2011 and early 2012 have been busy and productive for the Greenland Bureau of Minerals and Petroleum. Exploration for hard minerals (zinc, gold, iron, etc.) as well as oil has been satisfactory, and many exploration projects have now come so far that it is realistic to expect applications for exploitation licences in 2012. If this turns out to be the case, it will mean new jobs, more tax revenues, and ultimately better welfare for everyone in Greenland.

This mineral resources report deals with several topics, including:

**Hard minerals:** In 2011, the number of licences applied for and granted reached record heights. More precisely, there are now as many as 142 licences, and nothing suggests that this positive trend will end at any time soon; rather the contrary.

**Cairn Energy:** The year 2011 saw the largest and most extensive drilling programme in Greenland's history. The oil company Cairn Energy was responsible for this programme, which explored for commercially viable quantities of oil in the Baffin Bay area. In 2011 alone, the company spent around DKK 5,000,000,000 on this.

**Information:** In 2011, a wide array of information measures were arranged to ensure that everyone - the public, companies, institutions, and politicians alike - could receive information about mineral resources projects. In addition, a newspaper supplement was prepared exclusively on the topic of oil exploration drilling. Furthermore, as a new initiative, the Bureau commissioned a series of informative films on Greenlandic mineral resources which will be broadcast by the Greenlandic Broadcasting Corporation during 2012.

**Economy:** In 2011, Greenland benefited socio-economically from the large-scale mineral resources exploration projects. Cairn Energy's drilling programme alone meant extra revenues in the form of taxes from foreign employees and subcontractors of more than DKK 150 million. Furthermore, the drilling programme provided orders for local companies of more than DKK 350 million.

If you want to read more about these topics, please read the entire report on the various mineral resources activities that took place in Greenland in 2011 and early 2012. This will also give you an idea of what will happen in the mineral resources sector in Greenland in 2012 and beyond.

Ove Karl Berthelsen  
Minister for Industry and Mineral Resources

## 2.0 Hard minerals

The year 2011 saw extensive foreign interest in exploration for hard minerals in Greenland. This chapter is about existing projects, especially projects that are well underway. The chapter also provides a status of the environmental assessments and inspections carried out in 2011. Finally, the chapter provides statistics on developments in the mineral resources area.

### 2.1 Status on mineral licences

On 31 December 2011, a total of 142 licences had been applied for or granted, including the following types:

**Table 1:** Mineral licences, status 31.12.2011

<b>As per 31 December 2011, the following licences had been applied for, or granted:</b>	
Preliminary investigations	25
Exploration licences	87
Exploitation licences	4
Small-scale licences (with and without exclusive rights)	7
Pending applications	19
<b>Licences in total</b>	<b>142</b>

#### 2.1.1 Status on mineral licences

As can be seen from table 1, at the end of 2011 a total of four exploitation licences had been granted. The four projects are the gold mine in Nalunaq, the lead/zinc mine in Maarmorilik, the Malmbjerget project on Jameson Land, and the olivine mine in Fiskefjorden. See table 2 for a more detailed description:

**Table 2:** Overview of the exploitation licences

<b>Mine</b>	<b>Employment</b>	<b>Expected useful life</b>	<b>Expected start</b>	<b>Status</b>
Nalunaq gold mine	60-80	About 2 years		In production
Seqi olivine mine	Currently none			Under decommissioning
Malmbjerget molybdenum project	About 500	17 years		Pending better market conditions
Maarmorilik led/zinc mine	About 100	At least 20 years	2013/14	Under construction

### 2.1.2 Exploration, preliminary investigations, and small-scale licences

The year 2011 was a good year in respect of licences granted. As is evident from the table below, several companies applied for, and were granted, licences. These companies represent many different countries. In addition to Greenland, these include Canada, Australia, Iceland and the Czech Republic.

The licences are located throughout Greenland - not only in the traditional mineral resources areas in West and South Greenland, but also more distantly in e.g. East and North Greenland. Areas in South-East Greenland, in particular, have spurred the interest of many companies, and East Greenland is attracting increasing exploration interest.

This development is in step with the dual strategic goal of 1) exploring the relatively unknown exploration area in South-East Greenland, and 2) increasing companies' interest in the area as a potential exploration target.

**Table 3:** Exploration, preliminary investigations and small-scale licences applied for in 2011

Licence no.	Company / person	Type	Area
2011/03	Hunter Minerals Pty Ltd.	Exploration	240km <sup>2</sup>
2011/04	Gold Member Pty Ltd.	Exploration	62km <sup>2</sup>
2011/05	Gold Member Pty Ltd.	Exploration	68km <sup>2</sup>
2011/18	NunaMinerals A/S	Exploration	83km <sup>2</sup>
2011/19	NunaMinerals A/S	Exploration	123km <sup>2</sup>
2011/20	NunaMinerals A/S	Exploration	156km <sup>2</sup>
2011/23	Greenland Minerals & Energy Ltd.	Exploration	486km <sup>2</sup>
2011/24	RAM Resources Ltd.	Exploration	568km <sup>2</sup>
2011/25	NAMA Greenland Ltd.	Exploration	1,013 km <sup>2</sup>
2011/26	Greenland Minerals & Energy Ltd.	Exploration	68km <sup>2</sup>
2011/27	Greenland Minerals & Energy Ltd.	Exploration	67km <sup>2</sup>
2011/28	Ironbark Zinc Limited	Exploration	461km <sup>2</sup>
2011/31	Avannaa Exploration Ltd.	Exploration	112km <sup>2</sup>
2011/32	Ironbark Zinc Limited	Exploration	1,419 km <sup>2</sup>
2011/33	Ironbark Zinc Limited	Exploration	909km <sup>2</sup>
2011/53	CGRG Ltd.	Exploration	476km <sup>2</sup>
2011/54	North American Nickel Ltd.	Exploration	4,841km <sup>2</sup>
2011/58	Pinnacle Nominees Pty. Ltd.	Exploration	179km <sup>2</sup>
2011/30	Avannaa Exploration Ltd.	Special exploration	4,093km <sup>2</sup>
2011/39	Avannaa Exploration Ltd.	Special exploration	1,498 km <sup>2</sup>
2011/40	Avannaa Exploration Ltd.	Special exploration	1,072 km <sup>2</sup>
2011/51	CGRG Ltd.	Special exploration	1,025 km <sup>2</sup>
2011/07	True North Gems Inc.	Preliminary investigations	West Greenland
2011/50	CGRG Ltd.	Preliminary investigations	East Greenland
2011/52	CGRG Ltd.	Preliminary investigations	West Greenland
2011/56	NAMA Greenland Ltd.	Preliminary investigations	West Greenland
2011/29	Small-scale no. 7	Small-scale with exclusive right	1km <sup>2</sup> south of Nuuk

### 2.1.3 Exploration projects well under way

In the minerals area, a number of exploration projects are already well progressed. It is expected that the projects listed below can transition into exploitation projects within the next 1-5 years. These projects include (in random order):

**Table 4:** Projects most progressed

Project	Geographic location	Expected application for exploitation licence	Expected employment (in production)	Expected employment (construction)
Eudialyte / Rare earth elements	Killavaat Alannguat (Kringlerne) – between Narsaq and Qaqortoq	2012	60-80	About 100
Ruby/sapphire	Qeqertarsuatsiaat/ (Fiskenæsset)	2012	50	About 80
Iron	Isukasia (Isua) – north of Nuuk	2012	700	About 2,100
Zinc / lead	Citronen Fjord - North Greenland	2012	200-300	-
Rare earth elements	Kuannersuit (Kvanefjeld) - Narsaq	2012	700	About 2,000

#### ***The Rare-earth-elements project at Killavaat Alannguat (Kringlerne) in South Greenland***

Tanbreez Mining Greenland A/S is exploring for rare earth elements at Killavaat Alannguat between Narsaq and Qaqortoq. The deposit is characterised by a high content of niobium, tantalum, zirconium, feldspar and rare earth metals. These minerals are used in mobile phones, aircraft engines and in glass.

The deposit has been estimated to contain more than 4 billion tonnes of ore, which is enough for several hundred years of production.

Field work over the past couple of years has focussed on collecting data for the profitability study, which was submitted to the Bureau of Minerals and Petroleum in a draft version at the beginning of 2012.

On the basis of current information, it is expected that the construction phase will employ around 100 people, and the operational phase between 60 and 80 people. Furthermore, it is expected that 75% of the employed workforce will be local, while 25% will be foreign.

#### ***The Ruby/sapphire project at Qeqertarsuatsiaat (Fiskenæsset)***

True North Gems Inc. is exploring an area at Qeqertarsuatsiaat for rubies and sapphires. Surveys have yielded positive results, and the company is working to prepare a final application for exploitation. In addition to submitting a profitability study and an EIA (Environmental Impact Assessment), the company must submit an SSA (Social

Sustainability Assessment), which describes the expected impact of the project on socio-economic conditions in Greenland.

The main locality is named Aappaluttoq, where the mineralised zone is between 1m and 2m wide. The plan is to mine for both rubies and sapphires.

The company estimates that a possible mine will be constructed as an open-pit mine, and that it will be able to employ around 50 people.

#### ***The Iron project at Isukasia (Isua) north of Nuuk***

London Mining Greenland A/S has been investigating the iron potential at Isua, north-east of Nuuk, for several years. Today, the deposit has been estimated at more than 1 billion tonnes of ore.

In April/May 2012, the company handed in a draft profitability pre-study, including draft EIA and SSA reports. Preliminary figures show the Isua project to be viable. The company has therefore notified the authorities about their decision to apply for an exploitation licence during 2012.

It is estimated that a possible mine will produce 15 million tonnes of ore annually for many years, and the company expects to employ as many as 2,100 people in the construction phase and 700 in the production phase. The company's current plan is to construct an open-pit mine, a processing plant near the mine, as well as an iron ore pipeline and road leading from the mine to a harbour facility at Qussuk, from where they plan to ship the iron ore.

#### ***The Zinc project at Citronen Fjord in North Greenland***

Ironbark Zinc Limited is exploring the zinc and lead potential at Citronen Fjord in North Greenland. This resource consists of more than 100 million tonnes of ore. A total of 200 exploration wells have been drilled since 2010.

The company has previously presented plans for both open-pit and underground mining models. The project is expected to comprise the establishment of harbour facilities, roads, landing strip, accommodation, processing plant, tailings deposit, energy supply, etc.

The company anticipates an annual production of 250,000 tonnes of zinc concentrate and 30,000 tonnes of lead concentrate over the mine's estimated life of 16 years. These figures may be subject to adjustments in connection with the preparation of the profitability study, which is expected to be completed during autumn/winter 2012. Possible start-up of production can therefore be expected in 2014/2015, employing around 200-300 people during the production phase.

#### ***The Rare-earth-elements project at Kuannersuit (Kvanefjeld), near Narsaq***

Greenland Minerals & Energy is exploring for rare earth elements near Narsaq. In addition to rare earth elements, the deposit also contains zinc and uranium. The zero-tolerance policy against mining for uranium and other radioactive elements is still in effect in Greenland. Any future mining operations at the deposit at Kuannersuit can therefore only be allowed, if this policy is changed.

The company is currently completing a profitability study, including EIA and SSA reports, expected to be ready in autumn 2012. In connection with collection of data for the application, a number of stakeholder meetings have already been held in South Greenland. A number of public meetings have moreover been held over the course of the years, at which the public has been informed about the project.

In recent years, the company has discovered several new, interesting deposits, adding to the known resource. Drilling has been conducted in the area since 2005.

#### **2.1.4 Uranium**

Naalakkersuisut is maintaining a zero-tolerance policy against exploiting minerals with radioactive elements such as thorium and uranium. In 2010, Naalakkersuisut approved new exploration licence terms. This now provides opportunity to apply for approval to conduct environment, safety, and health studies when preparing profitability studies involving deposits which contain radioactive elements exceeding the background radiation level.

Behind Naalakkersuisut's approval of these types of study is a wish for greater knowledge about the environmental and health-and-safety-related conditions of projects in which the radioactive values exceed the background level.

Naalakkersuisut expects it will take a position on the future policy in this area before the end of this election period.

## **2.2 Environmental protection and inspections**

An important aspect of exploring for and exploiting minerals in Greenland is the fact that any impacts on the environment and on other use of the natural resources are assessed in order to minimise the impact.

A number of regulations therefore exist to regulate activities linked to exploration, including so-called field regulations which in turn include a special section on "areas of importance to animal life".

If a company wants to exploit a given mineral deposit, it has to prepare a report on the possible impacts on the environment (Environmental Impact Assessment, EIA). The company will also have to prepare a plan for how possible impacts can be avoided or minimised. Before preparation of an EIA report, the environmental status of the area must be mapped by collecting a number of samples. Samples of mussels, trout and lichen, for example, are collected and recorded to document the status of the area before any mining operations.

This work is commenced two to three years prior to preparing an EIA report. The long time span is to allow for comparing environmental impacts over time. These types of studies are called baseline studies.

Baseline studies and EIA reports must follow the guidelines prepared by the National Centre for Energy and Environment, DCE (the former National Environmental Research Institute). The specific objective of these guidelines is to protect the environment in as optimal a way as possible.

Furthermore, the DCE has a database of environmental data and samples. This is a public database, to which companies operating in Greenland are obliged to hand over their environmental data. The database is useful in particular for authorities as well as companies planning activities in areas where environmental studies have previously been carried out. The database has been used with great success in connection with new exploration projects in areas such as Citronen Fjord, Kangerlussuaq (East Greenland), Maarmorilik, Killavaat Alannguat (Kringlerne), and Kuannersuit (Kvanefjeld), where good use was made of environmental data collected from previous projects.

### 2.2.1 *Environmental studies and inspections*

In 2011, the National Centre for Energy and Environment prepared environmental studies for the following locations:

**Table 5:** Environmental studies

Project	Location	Environmental impact assessment	When
The Nalunaq gold mine	Kirkespirdalen	Weak impact	April and August
The Seqi olivine mine	Fiskefjorden	Weak impact - but only locally	Summer
Stone crushing plant	Nuuk, Sisimiut, Qaqortoq and Kangerlussuaq	Report under way	August and September

**The Nalunaq gold mine:** The National Centre for Energy and Environment collected samples of lichen, trout, sculpin, common mussel and seaweed from the area around the mine. As in previous years, the samples were analysed for 11 relevant chemical elements.

In previous years' studies, the mining operations were assessed to have only a weak impact on the Kirkespir River. Previous years' studies of seaweed, mussel and sculpin in the marine aquatic environment showed only slightly raised concentrations of some metals at the two innermost stations near the river's mouth.

**The olivine mine at Seqi:** Previous years' studies have documented a local impact on the area surrounding the olivine pit, primarily in the form of dust. Moderately raised concentrations of chromium and nickel have been found in seaweed and mussels in the sea, however only at a few sites near the discharging quay.

**Stone crushing plant:** The National Centre for Energy and Environment has measured noise, collected lichen samples for measuring the spread of dust and metals into the environment, and has set up dust collectors. Noise measurements were performed near installations in operation. The spread of noise to the surroundings was calculated and the noise levels were compared with existing industrial limit values for noise. In order to assess whether the stone crushing plant is causing the spreading of heavy metals in the environment, dust collectors were set up and lichen was collected. Lichen is today used in environmental monitoring of mining activities. The National Centre for Energy and Environment will prepare a report on this subject at the end of 2012.

### ***2.2.2. Inspection by the Bureau of Minerals and Petroleum***

The Bureau of Minerals and Petroleum conducts extensive supervision of mineral resources projects in Greenland. The regularity of inspections depends on the activity level of the individual project, including the type of activity in the relevant year.

A mine in operation will receive inspection visits at least four times a year. If an ongoing project wants to achieve approval for additional activities, the frequency of inspections may be increased correspondingly, if this is deemed relevant.

The Bureau of Minerals and Petroleum inspects plant and installations as well as safety, health and environmental conditions. The latter is performed by Naalakkersuisut's independent consultants in the environment area, the National Centre for Energy and Environment.

In 2011, the Bureau of Minerals and Petroleum conducted the following inspections:

**Table 6:** Inspection by the Bureau of Minerals and Petroleum

<b>Project</b>	<b>Number of inspections</b>	<b>Area of attention</b>
The Nalunaq gold mine	5	Trial runs before production approval
The olivine mine at Seqi	1	Shutdown inspection
The Maarmorilik lead/zinc mine	2	Health and safety
Malmbjerget molybdenum project	None - inspections temporarily suspended	
Miscellaneous exploration projects throughout Greenland	A number of inspections from April to October	Emergency response plans, drilling locations and camps

**Maarmorilik:** In addition to general inspections, a key topic was to establish safety measures on the ladders from the helicopter platform at the top of the mountain. The ladders are the only means of access to the upper station building.

The company chose to establish entirely new means of access in the form of staircase and landings in accordance with the building regulations.

### 2.2.3 Exploration projects

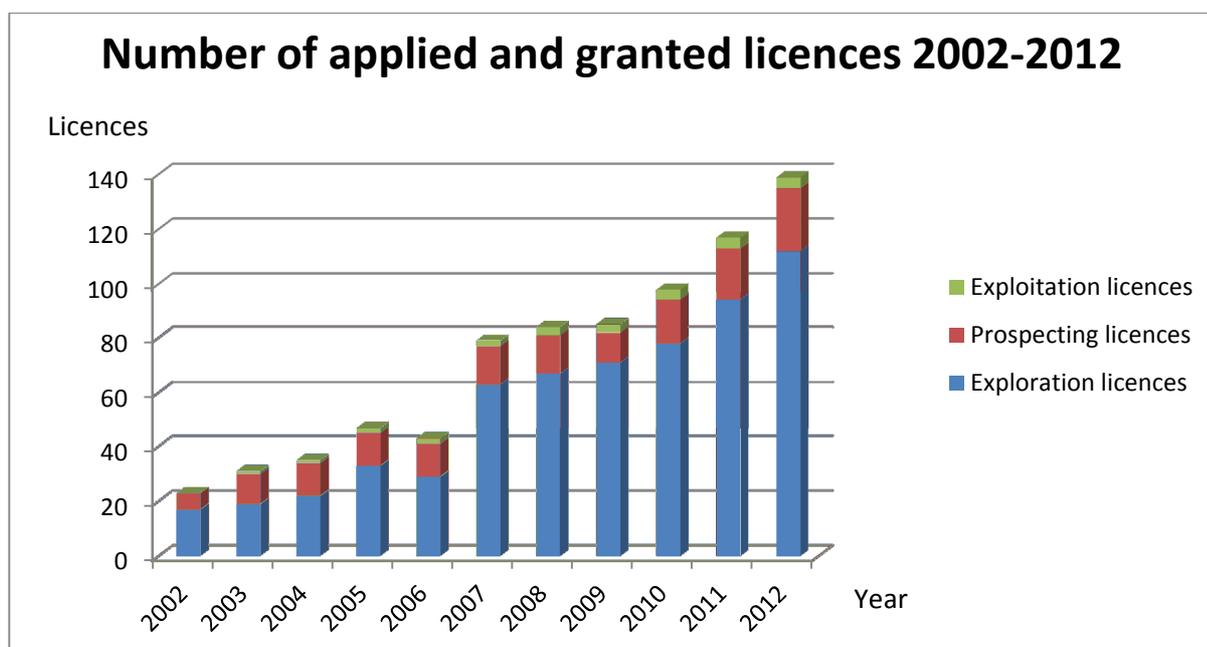
As in previous years, active exploration projects have been subject to continuous inspection. Inspections are based on the work programmes of the mining companies. On this basis, the Bureau of Minerals and Petroleum performs a number of inspections, primarily during the field season (from April to October). In 2011, South Greenland was selected as the area for attention, with inspection visits e.g. to the deposits at Motzfeldt Lake, Kuannersuit (Kvanefjeld) and Killavaat Alannguat (Kringlerne). Furthermore, inspections were carried out at the Isua project in Godthåbsfjorden.

## 2.3 Minerals statistics

The year 2011 was a good year for mineral exploration and exploitation in Greenland, see figures below. The general trend in the minerals area has seen an increase in the number of mineral resources activities and licences granted, a trend which we expect will continue in 2012. Interest in new licences, in particular, increased during 2011.

The figures below show the trend in mineral resources activities with different focus, from the number of mineral licences to exploration costs and country of origin. First, the development in the number of mineral licences:

**Figure 1.** The trend in prospecting licences, exploration licences and exploitation licences from 2002 to 2012

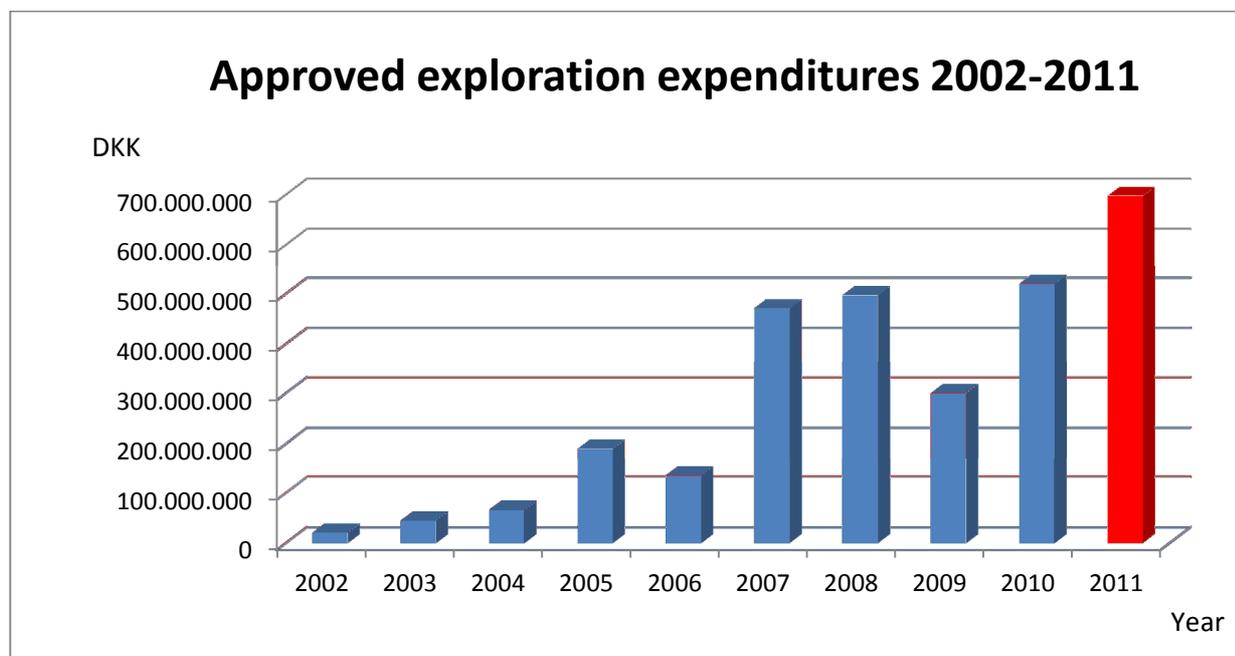


**Mineral licences:** Figure 1 shows the trend in the number of active mineral licences over the last ten years. From 2002 until today, the trend is clear: The number of licences has gone up significantly, which is due to an extremely positive development in the number of exploration licences granted.

The positive trend is going to continue in 2012; as per 31 December 2011, 19 applications had been submitted, which are still being processed. It is therefore anticipated that the companies will continue their investments in Greenland, which we suspect will mean a continued positive trend in licences in the years to come. This anticipation is based on discussions with the industry at trade fairs and conferences abroad, in e.g. Canada and Australia. Several companies, however, have experienced, during the process, that it has become more difficult to get financing for the different projects.

**Exploration costs:** Figure 2 below shows exploration costs for the years 2002-2011. The final figures for 2011 for exploration costs are expected on around June 2012.

**Figure 2.** Total exploration costs from 2002-2011.

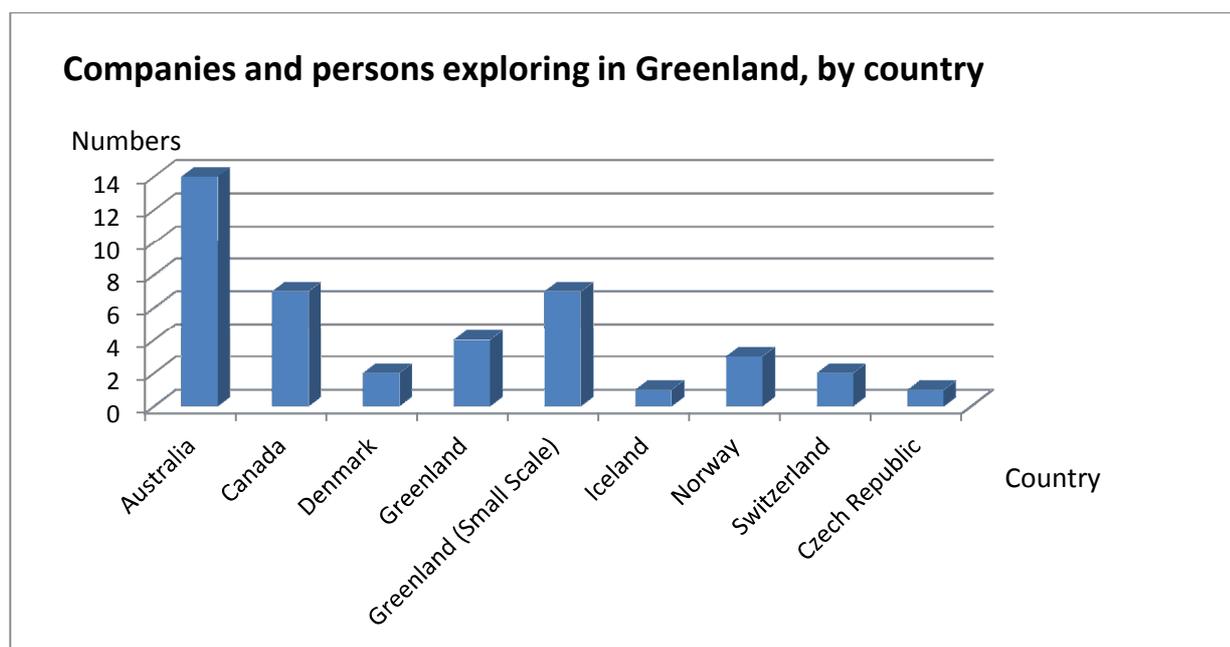


Exploration costs concern expenditure on exploration, laboratory work, desk work in the form of, for example, environmental reports and profitability studies etc. Especially from 2007 and onwards (except for 2009), exploration costs have amounted to around DKK 500,000,000, which must be considered satisfactory, not least considering the economic crisis.

**Country of origin of the companies:** In figure 3, the companies have been broken down by their country of origin (i.e. their country of registration) or by where the persons associated with the company live. Specifically 7 of 12 Greenlandic companies/persons are small-scale licence holders.

As can also be seen from the figure, apart from the Greenlandic companies, the companies carrying out exploration in Greenland are primarily Australian and Canadian. For example, 14 different Australian mineral companies are currently registered in Greenland. The interest from Australian companies in particular is probably a result of the fact that the Bureau of Minerals and Petroleum has been intensifying its marketing efforts in Australia since 2008. As recently as in December 2011, a small delegation from the Bureau hosted a Greenland Day in Perth in Australia, at which several possible projects were presented, primarily to the Australian minerals industry.

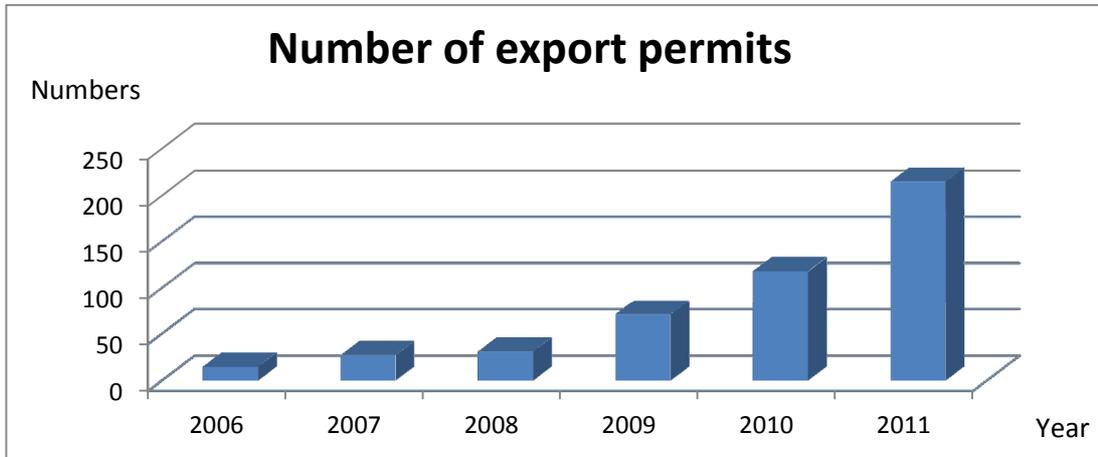
**Figure 3.** Companies and persons exploring in Greenland, by country



## 2.4 Export licences

In 2011, the Bureau of Minerals and Petroleum issued 213 export licences: to oil and minerals companies, to scientific expeditions, and to citizens in Greenland. Figure 4 shows the trend in the number of export licences issued.

**Figure 4.** The number of export licences issued from 2006-2011 (oil and minerals). Note that the rules for issuing export licences were changed in the period.



Many of the export licences that are issued by the Bureau of Minerals and Petroleum concern scientific expeditions. During 2011, export licences were granted to 18 scientific expeditions, compared with 22 expeditions in 2010. Licences have been granted to Danish research institutions in particular, however also research teams from the UK and the US have visited Greenland over the years. Both in the export area in general, as well as in the scientific area, considerable activity is anticipated in 2012.

## 3.0 Hydrocarbons 2011

### 3.1 Exploration drilling

In 2010, Cairn Energy completed an encouraging exploration drilling campaign with many important results. Therefore the company decided to submit an application for a further licence for up to seven exploration drillings in 2011.

The licence to commence exploration drilling was issued to the company by Naalakkersuisut on 8 May 2011.

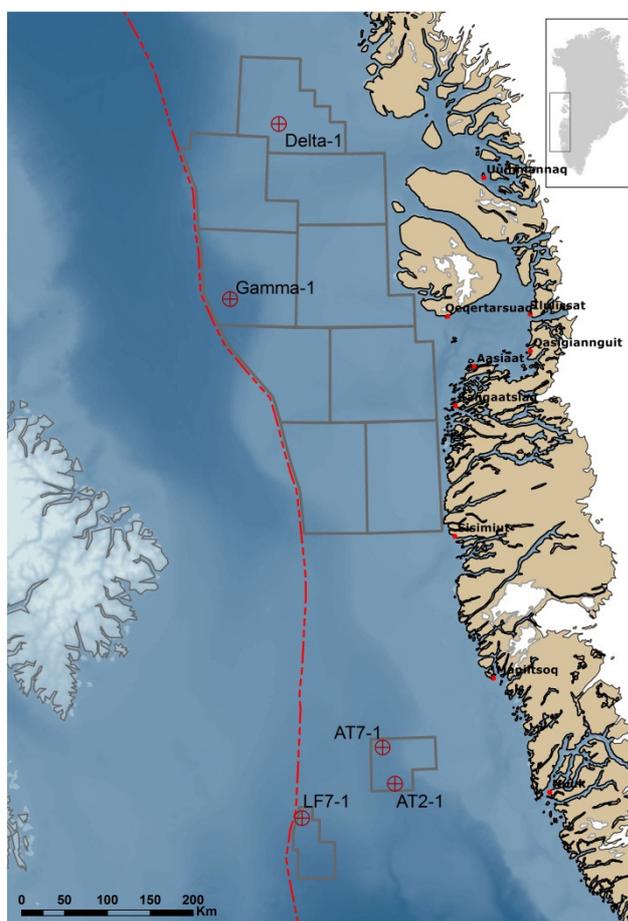
The application for a licence to carry out exploration drilling was accompanied by environmental impact assessments and social sustainability assessments as well as a number of detailed documents and reports regarding safety, health and emergency response etc., as required pursuant to good international practice.

The authorities required observance of the Norwegian NORSOK standards for oil drilling. These include regulations for drilling operations, safety procedures, equipment etc. Further to this, there were also requirements for establishment of an ice-management system pursuant to best Arctic standards, environmental requirements pursuant to recommendations by the Arctic Council etc.

The application and assessments were subject to an extensive consultancy process with all relevant public authorities and were also in public consultation.

During the direct authority process, a number of authorities and organisations, including the Bureau of Minerals and Petroleum, the National Centre for Energy and Environment, the Greenland Institute of Natural Resources and the Geological Survey of Denmark and Greenland (GEUS), as well as a number of other authorities and organisations, were

**Figure 5** - the figure shows where the companies have received licences for their exploration drilling



involved, including the Emergency Response Committee. The Emergency Response Committee includes Greenland Command, the police, the High Commissioner of Greenland, the health service and others. A number of emergency response meetings and exercises have been held to prepare for the drilling season.

### **3.2 Geological results of oil drilling in 2011**

In 2011 Cairn Energy continued its drilling campaign in Greenland by drilling five exploration wells in four licence areas of their 11 exclusive licences in the offshore area west of Greenland. This was a follow-up to the company's 2010 drilling season and it means that Cairn Energy has now drilled eight wells in Greenland. These wells were drilled into different sedimentary basins offshore West Greenland, and in several of the wells Cairn Energy encountered minor quantities of oil and gas, however not enough for commercial exploitation.

In 2011, the exploration wells AT7-1, AT2-1 and LF7-1 were drilled in the licence areas "Atammik" and "Lady Franklin" west of Nuuk. These wells are the first to be drilled in the two licence areas. The three wells reached expected Cretaceous sediments, and in the "Atammik" licence area the well revealed sandstone with reservoir potential. Furthermore, all three wells also encountered minor quantities of gas.

The Delta-1 well in licence area "Napariaq" and the Gamma-1 well in licence area "Eqqua" are the two northern-most wells drilled during Cairn Energy's 2011 drilling programme. The Delta-1 well is situated immediately north-east of the Alpha-1 well, which was drilled in 2010, and which encountered minor quantities of oil in Tertiary volcanic sediments

Of all wells in this year's drilling programme, Gamma-1 in the licence area "Eqqua" was drilled at the greatest sea-depth (1,508m). The well is situated south-west of the T8 well, which was drilled in 2010, and in which gas was detected.

### **3.3 Safety and inspection**

All oil activity in Greenland is carried out in accordance with best international practice. This means that activities are only approved, if the company can document that the environmental and safety aspects as well as the technical and emergency response procedures and equipment are at the very highest level.

The Mineral Resources Act stipulates that the licence holder must identify, assess and reduce, as much as is practicable, safety and health risks in connection with offshore installations used for exploration.

The risk assessment must be documented in a health and safety report, which also includes an evacuation analysis. This should demonstrate that the personnel on an offshore installation can be evacuated efficiently and effectively to a safe place in the event of a critical situation.

In other words: Oil companies are not approved in Greenland unless they can meet the comprehensive and stringent requirements for safety and emergency response. If, against expectations, an accident should occur, the oil company itself is responsible for combating the accident, including clean-up and remediation operations after an oil spill caused by their activities. In this situation, the task of the authorities is to ensure that this actually happens.

Therefore, there is also a requirement that oil companies must make significant financial guarantees for remediation before they are approved.

### **3.3.1 Inspection in 2011**

Inspection of oil activities in 2011 has followed a comprehensive programme. Both drilling units were inspected before arrival in Greenlandic waters. After this inspections have been carried out at pre-spud and at well shutdown, as well as monthly inspections of each drilling unit and inspections of onshore activities. Norwegian experts have assisted in inspections.

The objective of the inspections was primarily to check that drilling approvals were being observed. This was at 17 inspections for emergency response regarding ice, oil, H<sub>2</sub>S etc., primary and secondary barriers, health and safety etc.

In addition to inspection on rigs and onshore facilities, the Bureau of Minerals and Petroleum has held daily meetings with the management of the rigs and Cairn regarding the progress of the drilling programmes, the ice situation, the safety and environmental situation, as well as operational issues etc.

Overall, drilling operations in 2011 have progressed in accordance with the approved plans, including the safety and health plans.

## **3.4 The environment and inspection**

There is a statutory requirement that all activities must be conducted in accordance with best international practice<sup>1</sup>.

The marine environment off Greenland is vulnerable and the sea is the very foundation of fishing and hunting in Greenland. Oil exploration is therefore regulated at a high international standard, so that activities take place with the least possible impact on the environment, fisheries and hunting. The guidelines for companies drawn up by the

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<sup>1</sup> On behalf of the Greenland Self-Government, National Centre for Energy and Environment has prepared guidelines for an environmental study to be carried out in connection with oil activities, including collection of seismic, drilling operations, exploitation etc. The guidelines are based on recommendations from the Arctic Council for offshore activities.

National Centre for Energy and Environment state that there are very rigid environmental requirements. In order to ensure this, several years ago extensive work was initiated to conduct strategic environmental surveys and analyses, and to prepare regulations. These surveys are carried out in collaboration with the National Centre for Energy and Environment and the Greenland Institute of Natural Resources.

Strategic environmental impact assessments are thorough elucidations of how nature and the environment can be affected and of how these effects can best be limited. Environmental impact assessments are an important part of the basis for political decisions on whether an area should be opened for oil exploration. In collaboration with the Greenland Institute of Natural Resources, the National Centre for Energy and Environment prepared strategic environmental impact assessments of the areas west of Disko island, in Baffin Bay and in the Greenland Sea off North-East Greenland etc., before opening these areas for oil tendering procedures. The strategic environmental impact assessments describe the environmental consequences of oil activities throughout the area and indicate the measures to be implemented to secure environmentally responsible oil activities.

The National Centre for Energy and Environment completed several inspections regarding compliance with the environmental requirements for drilling operations. In particular, the National Centre for Energy and Environment took part in inspection of the seabed during well shutdown, including video recording as well as collection of sediment cores and traps.

### 3.5 Oil exploration in 2012

The map below shows which oil companies have applied to the Bureau of Minerals and Petroleum for approval to conduct exploration, and in which areas.

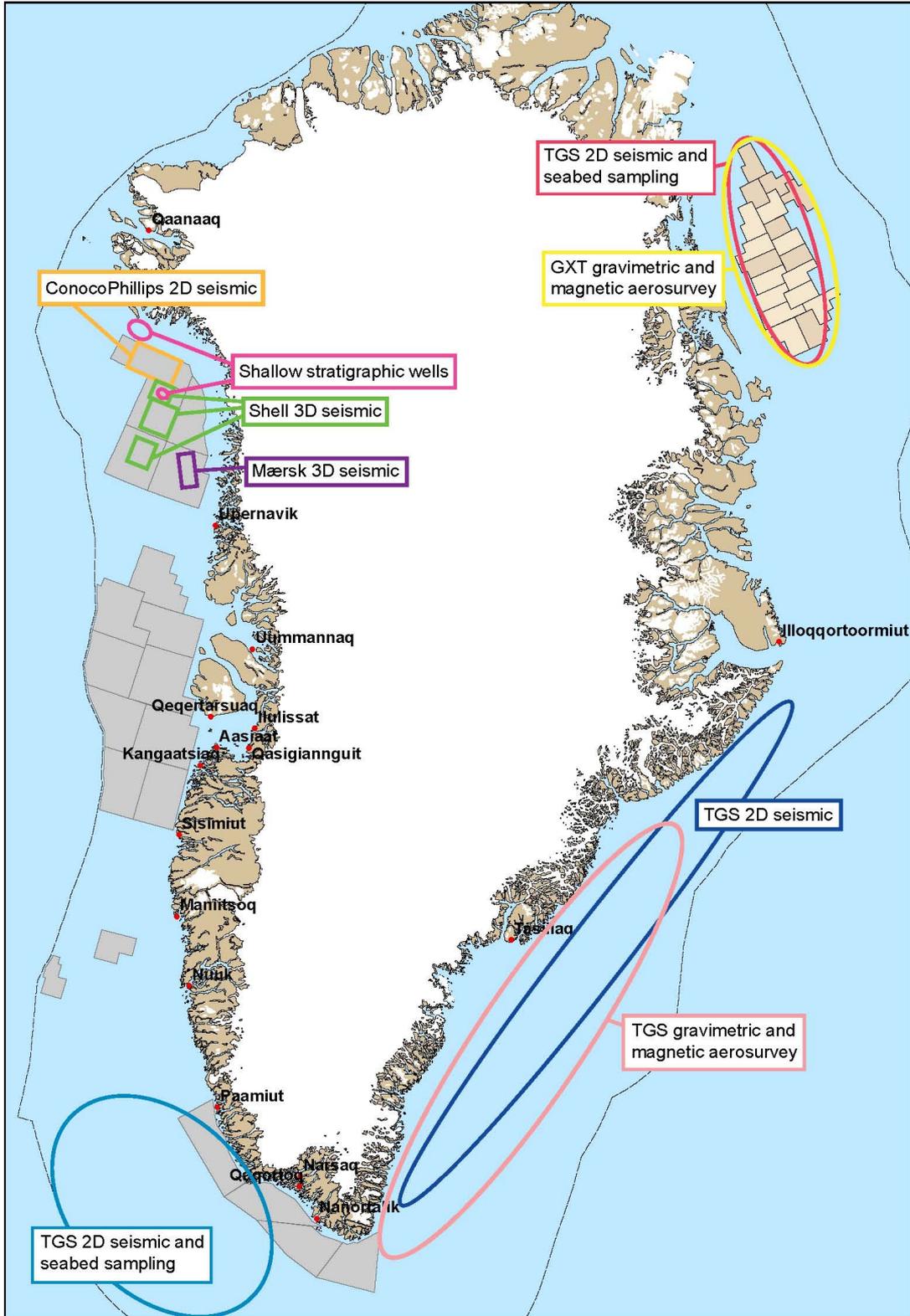


Figure 6 the companies' applied activities for 2012.

Eight oil companies have joined in a stratigraphic drilling consortium, which has applied for approval to carry out stratigraphic drillings in seven sites from the end of July to early October. The drilling consortium is composed of the companies Shell, Statoil, GDF Suez, DONG, ConocoPhillips, Mærsk, Cairn Energy and NUNAOIL, all of which are licence holders in Baffin Bay.

Further approvals of three seismic data collection operations in the Baffin Bay area have been applied for. The three companies are ConocoPhillips, Shell and Mærsk. ConocoPhillips wants to collect 3,047 line kilometres of 2D seismic data in the period from August to September in exclusive licence 2011/11 "Qamut". In exclusive licences 2011/12 "Anu" and 2011/14 "Napu", Shell wants to collect 8,637 km<sup>2</sup> and 1,650 km<sup>2</sup> 3D seismic data, respectively, in the period from the end of July to mid October. In exclusive licence 2011/15 "Tooq", Maersk Oil Kalaallit Nunaat wants to collect approx. 1,900 km<sup>2</sup> 3D seismic data and take seabed samples in the period mid July to late September.

In the 'open-door' area in South West Greenland, TGS-Nopec has applied for approval to collect 5,000 line kilometres 2D seismic data and collect seabed samples from 70 sites in the period from mid August to mid October. In South-East Greenland, TGS-Nopec Geophysical has also applied for approval to collect 51,000 line kilometres of airborne gravity and magnetic data in the period from May 1<sup>st</sup> to September 30<sup>th</sup>. In North-East Greenland, TGS-Nopec Geophysical has applied for approval to collect 5,000 line kilometres 2D seismic data and collect seabed samples from approx. 120 sites in the period from August 15<sup>th</sup> to October 15<sup>th</sup>. Furthermore, GX Technology Corporation has applied for approval to collect 30,000 line kilometres of airborne gravity and magnetic data in the period from April 1<sup>st</sup> to August 30<sup>th</sup>.

### 3.6 Statistics for the hydrocarbon area

**Table 7** Costs of seismic data collection

Year	Costs of seismic data collection offshore Greenland in the period 2002-2012, DKK million
2002	3.2
2003	10.3
2004	4.0
2005	8.8
2006	16.7
2007	5.3
2008	461.3
2009	321.0
2010	260.6
2011	411.6

Cairn Energy's drilling operations in 2010 and 2011 did cost about DKK 6 billion in total.

### **3.7 Report on the future strategy and organisation of NUNAOIL**

Following the introduction of the Greenland Self-Government Act (*selvstyreloven*) and the increase in oil and gas exploration activities, Naalakkersuisut has focussed on creating clear framework conditions for how NUNAOIL A/S is to develop and the tasks it is to be responsible for.

The need to assess NUNAOIL A/S's development strategy and framework arose in connection with introduction of Self-Government when the Greenland Self-Government became the sole owner of NUNAOIL A/S. This meant a significant change in relation to the company's potential impact on the Self-Government economy. Firstly because revenues from mineral resources etc. in NUNAOIL A/S are set off against the block subsidy from the Danish state, and secondly because the Greenland Self-Government has to pay for possible loans and capital injections for NUNAOIL A/S in connection with participation in development of the first commercial hydrocarbon find(s).

The changes in the ownership structure also make it relevant to consider how the company is to develop. Today, the development strategy of the company rests on the assumption that during the 14-20 years after the first commercial find, the company is to develop into an operational Greenlandic oil company, with capacity as an operator to explore, develop and exploit hydrocarbon licences - operating for Greenland in much the same way as Statoil does for Norway. This assumption is underpinned by the fact that mineral resources legislation and related regulations allow for NUNAOIL A/S to develop into an operational Greenlandic oil company. Development of an operational oil company is a complicated and expensive process. In Naalakkersuisut's assessment, so far the prerequisites for developing NUNAOIL A/S into an operational oil company in the short term are not in place, and it therefore important to consider which alternatives exist to facilitate the company's development into an operational Greenlandic oil company.

Because transactions by NUNAOIL A/S can significantly affect Greenland society, it is important to establish policies for dividends, investment and lending for the company, which ensure democratic control of the company's most important transactions. The goal of the dividend, investment and lending policies outlined is to ensure that the company is harmoniously incorporated into Greenlandic society and so that revenues from extraction of oil/gas from Greenland's subsurface provide the greatest possible socio-economic returns and contribute to ensuring that Greenland becomes economically self sustainable.

NUNAOIL A/S will be a part of the overall socio-economic model which is to ensure that Greenland gets the best possible return from its potential oil and gas deposits. This report provides an analysis that forms the framework for Naalakkersuisut's policies with regard to the role of NUNAOIL A/S in Greenland in future years. The report was prepared jointly by the Ministry of Finance, the Bureau of Minerals and Petroleum and the Premier's Office.

On the basis of an overall assessment, it is recommended that administration of the Greenland Self-Government's ownership interests be organised in a non-operational oil company with primary focus on managing ownership of shares in licences in a compact and flexible organisation. This type of non-operational oil company, which administers the state's ownership interests in licences, is well known in other countries. The organisations

are staffed by a relatively limited number of people with expertise on the oil industry, especially within the commercial field.

The Greenland Self-Government believes that a non-operational oil company will safeguard the Self-Government against any undesired economic risks from participation in oil and gas development and production, and that it will allow development of the organisation into an operational oil company at a later stage should this prove advantageous.

Choosing this development model does not exclude the Greenland Self-Government from developing NUNAOIL into a operational oil company in accordance with the Statoil model at a later stage, if this model should prove of interest as economic and social framework conditions change.

## **4.0 Social sustainability**

Naalakkersuisut's goal is that exploitation of our mineral resources is to be one of the cornerstones of our future business structure. However, it should be on the condition that it is socially sustainable.

When Greenland took over the mineral resources area, a new Mineral Resources Act entered into force on January 1<sup>st</sup> 2010. Some of the most important requirements (section 76(1) and (2)) for companies in relation to ensuring social conditions is that they have to carry out a social sustainability assessment (SSA). Briefly, companies have to examine their positive and negative impacts for society. In the event that there are negative impacts, they must draw up proposals for how these can be minimised.

As a follow-up to this plan, a cooperation agreement must be established between Naalakkersuisut, the municipality(ies) affected, and the company. This cooperation agreement is known as an Impact and Benefit Agreement (IBA). The cooperation agreement should account for how the project will contribute to the development of Greenlandic society, primarily with jobs (directly with the licensee or via subcontractors), involvement of local enterprises, knowledge transfer and education, work experience, and other initiatives in sociocultural areas. The cooperation agreement should be accompanied by detailed plans for how the targets in the cooperation agreement are to be reached.

A number of mining companies are under way in this process in order to submit an application for exploitation in 2012. For example True North Gems, Tanbreez Mining Greenland and London Mining Greenland. These companies are already working on the SSA process.

### **4.1 Social benefits from Cairn Energy's activities**

In some circumstances, activities in the exploration phase can be so extensive that oil and mining companies need to prepare additional analyses of the social consequences of the activities they intend to carry out. Cairn Energy has applied to do this, and was subsequently granted approval to complete a drilling programme with up to seven oil exploration drillings in 2011.

It was deemed possible that the drilling programme could have significant social impacts. An SSA was therefore submitted and sent for public consultation via the Self-Government's consultation portal.

On the basis of the SSA, on behalf of Naalakkersuisut, Ove Karl Berthelsen, Member of Naalakkersuisut for Business and Minerals, entered into an Impact Benefit Agreement; the second in the history of Greenland. The IBA was established between the Greenland Self-Government, the municipalities of Qaasuitsup, Qeqqata and Sermersooq, and Cairn Energy.

The IBA for 2011 included the following:

Greenlandic enterprises were involved in the exploration through sub-supplier contracts. These include Air Greenland, Arctic Base Supply, Polar Oil and others. Secondly, much of the local labour force was employed via Arctic Base Supply and Cairn. Furthermore, there have been a large number of indirect jobs in service, the harbour, waste management, ice management and infrastructure. Finally, a training fund was set up, as well as a community development fund. Institutions and the public have been able to apply for support for training or sports and cultural activities, respectively; especially for children and young people.

## **4.2 Legislation for large-scale projects**

Focus in 2011 was on development of large-scale projects, including the special issues and challenges raised by these. The main issue has been whether there is a need to assess the social sustainability separately in the construction phase. This has turned out to be necessary because the construction phase can be large enough and intensive enough to have significant social impacts.

For example, the construction phase for the iron mine at Isukasia would be very different from an operating period because the labour required would be 2-3-times greater during construction than during operation. The need for labour in the construction phase would be such that it would not be possible to meet demand with Greenlandic labour. Therefore the question is whether a licence should be granted to import labour from outside on special conditions.

During 2012, Naalakkersuisut intends to present a proposal for special construction legislation for large-scale projects which would enable utilisation of foreign labour during the construction phase. The bill will also contain provisions aiming at maximising utilisation of local labour during the construction phase.

The table below lists the expected construction and production phases as well as the expected labour requirements for the various projects. Construction and production phases as well as labour are based on estimates by the Bureau of Minerals and Petroleum and information from the companies and therefore may be subject to uncertainty as the final form of the project has not been decided in many cases.

It is estimated that 2,000 – 3,000 people or more may be employed in the mining sector for some years. Many diverse skills are required by the mining sector, ranging from unskilled and skilled, to highly qualified geologists and engineers, specialist technicians, administrative personnel and managers. A concerted skills-development effort should mean that the majority of positions could be occupied by Greenlandic labour.

**Table 8** Status of the most mature exploration and exploitation projects

<b>Location (and minerals)</b>	<b>Licence holder</b>	<b>Expected construction and production phase</b>	<b>Labour in construction phase</b>	<b>Labour in production phase</b>
Citronen Fjord, North Greenland (lead and zinc)	Ironbark Zinc Ltd.	- Expected profitability study 2012 - Possible construction phase 2013-2016 - Possible production from 2016	*	200-300
Isukasia (Isua) (iron)	London Mining Greenland A/S	- Expected profitability study/application for exploitation licence spring 2012 - Possible production from 2015	2,100 (peak)	700
Killavaat Alannguat, South Greenland (eudialyte and rare earth metals)	Rimbal Pty Ltd. (Tanbreez Mining Greenland A/S)	- Expected profitability study/Application for exploitation 2012 - Possible production from 2014	100	60-80
Fiskenæsset (rubies and sapphires)	True North Gems	- Expected application for exploitation 2012 - Possible production from 2014	50	80
Maarmorilik (lead and zinc)	Black Angel Mining A/S	- Exploitation licence granted - Expected production from 2014	-	100
Nalunaq (gold)	Angel Mining (Gold) A/S	- Exploitation licence granted - Production started January 2010	-	60-80
Skærgården, East Greenland (gold and PGE)	Platina Resources Ltd.	- Pre-profitability study 2012 - Possible production from 2015	*	300-500
Sarfartoq, Kangerlussuaq (rare earth elements)	Hudson Resources Inc.	- Construction phase - not determined - Possible production from 2015	200-300	300-500
Kuannersuit (Kvanefjeldet) Narsaq (rare earth metals, uranium, zinc)	Greenland Minerals and Energy (Trading) A/S	- Expected application - 2012 - Possible construction phase from 2013 - Possible production from 2015	2000	700
Malmbjerg	Malmbjerg Molybdenum A/S	- Pending	600	500

\* number not available

### 4.3 Information on mineral resources

There was much activity in 2011, with a number of initiatives focussing on information, cooperation, exchange of experience, and development of future partnerships. These initiatives have been directed towards the general public, politicians, interest organisations, Greenlandic and foreign enterprises and companies in the minerals sector.

In parallel, a number of outreach events have been held, aiming at securing a close link between mining companies, the Greenlandic business community and employees. In January 2011 a supplier seminar was held at which a number of minerals companies and a broad representation of the Greenlandic business community took part.

In August 2011 a four-day mineral resources seminar was held for members of the Inatsisartut business committee at which members heard talks from companies, public authorities and interest organisations.

In September 2011 a two-day "Joining Forces" conference was held about the developments within mineral resources and hydrocarbons (oil/gas) as well as possible future projects in Greenland. The conference was a joint event between Kommuneqarfik Sermersooq, the Greenland employers' association (*Grønlands Arbejdsgiverforening*) and the Bureau of Minerals and Petroleum. More than 230 people took part in the conference. Participants came from a number of countries, including from the Canadian oil-producing province Newfoundland and Labrador, as well as from other parts of Canada, Iceland, Norway, the Faeroe Islands, South Korea and Denmark.

In December 2011 there was a special event on large-scale projects for members of Inatsisartut. All mature projects (mining and oil) were presented in detail at the event.

Furthermore, the Bureau of Minerals and Petroleum has published a newspaper supplement about oil emergency response plans etc. The background for this initiative is that there was great international interest in oil exploration drilling operations, from companies to civil society organisations (e.g. Greenpeace, ICC and Avataq) and the public.

Further to the greater activity in the mineral resources area, the public has demanded more information on the topic. Therefore, the Bureau of Minerals and Petroleum has initiated production of six information films about the mines expected to submit an application for exploitation in the near future.

The six films cover the following themes:

- 1) Exploration and exploitation of mineral resources in Greenland (general introduction)
- 2) Consultation processes and involvement of the public
- 3) Small-scale activities in Greenland
- 4) Benefits for society
- 5) The environment and rare earth metals
- 6) Health and safety

#### **4.4 Taxes and royalties etc. (extraction of oil and gas)**

Possible revenues from oil and gas activities in Greenland can be crucial for the economic capabilities of Greenland. Calculations show that possible revenues from oil and gas activities could have unprecedented impacts on the Greenlandic economy.

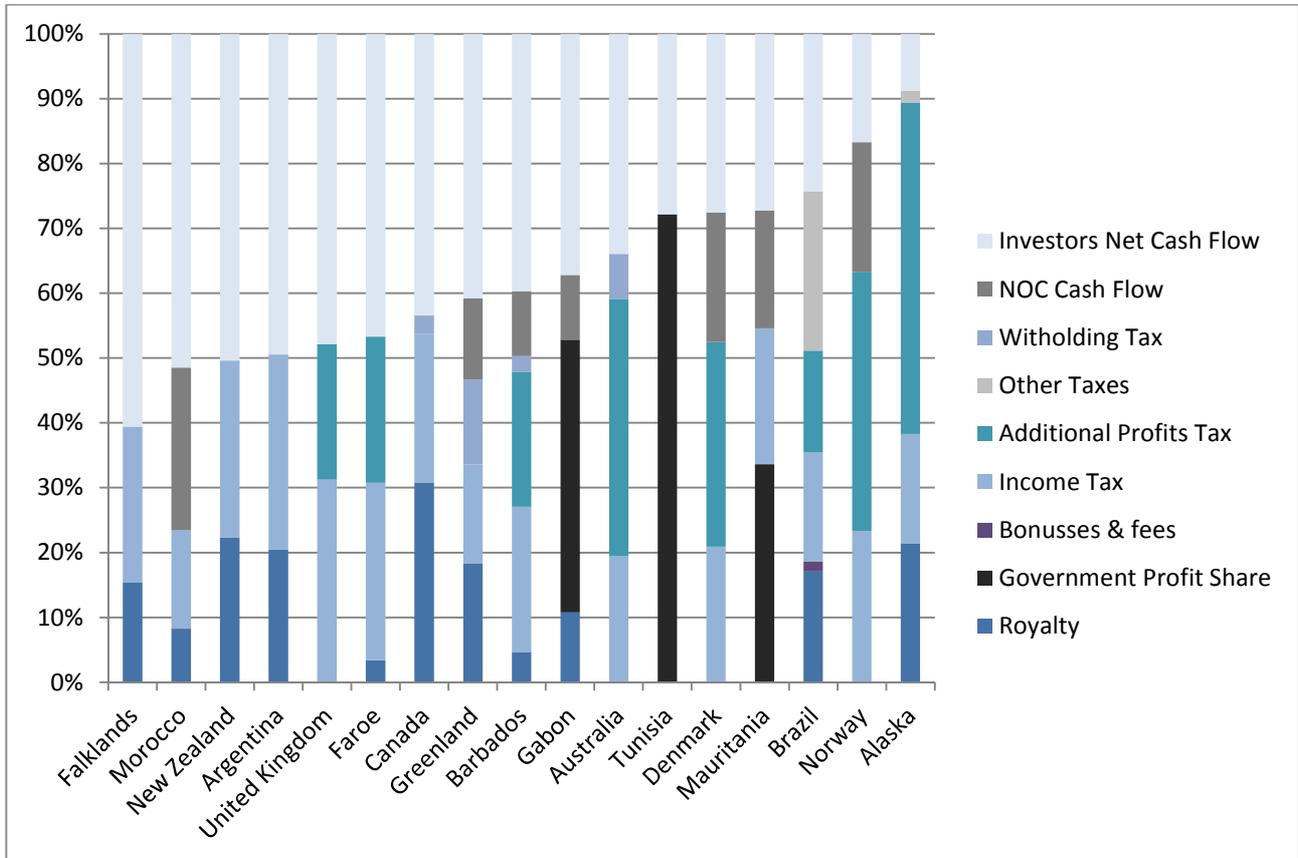
Payback from oil exploration activities already in progress can already be felt by the domestic business community. Future returns from activities can only rise in line with the expected increasing activity in the mineral resources area.

Before the state purse receives revenues in the form of income and corporation taxes, the Greenland Self-Government is applying a number of economic incentives to secure the treasury further public revenues from oil activities. The instruments used in Greenland are collectively known as a government take model. Government take is a collective term for taxes, royalties, duties, fees as well as bearing of publicly owned oil companies.

In collaboration with international consultancy companies, on several occasions the Bureau of Minerals and Petroleum has completed an appraisal of the government take for the oil area in Greenland. This appraisal also contains a comparison with a number of other relevant countries.

The analyses show that Greenland demands more government take than countries such as Canada, the Faeroe Islands and the United Kingdom. A benchmark analysis by IHS Energy and PwC of the economic terms is illustrated in the figure below,

**Figure 7:** Benchmark analysis of the government take of selected countries



The figure shows that countries demand different types of taxes and duties and that the total government take varies from country to country. Greenland has the following taxes etc.:

- Corporation tax and withholding tax
- A progressive royalty on profits, i.e. an increased royalty is demanded as profits increase
- 12.5% interest for NUNAOIL A/S in the exploration phase
- Diverse taxes and charges to cover costs of case processing by the authorities

In collaboration with PwC has carried out three calculations based on a field of 500 million barrels of oil, 1 billion barrels and 2 billion barrels, respectively. The amounts state expected government-take revenues for Greenland, broken down between taxes, royalties and payments to NUNAOIL A/S.

The calculations show that a field with 2 billion barrels could bring the treasury about DKK 309 billion over the next 30 years.

The assumptions behind the calculations are a sales price of USD 75, a production period of about 30 years, as well as costs of production, operation, transport and decommissioning set on the basis of relevant international references.