

# LOW COST, LARGE AND SUSTAINABLE REES FROM GREENLAND

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## **Abstract**

### ***Kvanefjeld – Sustainable Rare Earth Production form Greenland***

*Greenland Minerals is developing the world class Kvanefjeld rare earth project in Southern Greenland. The project hosts one of the largest deposits of rare earths globally while also containing by-product uranium, zinc and fluorspar. The project is well advanced with an updated Feasibility Completed in 2016 and optimised in 2019. The optimised Feasibility study outlined a >30,000 tonnes per year of REO production at a capex of US\$505M and an opex of <US\$4/kg REO. Rigorous metallurgical testwork has been completed which has produced a low cost and relatively simple process. The process has been well tested with pilot plant operations completed with assistance from the EURARE project. Extensive environmental baseline surveys have been completed to produce a comprehensive environmental impact assessment for permitting. Other permitting aspects such as social and marine transport assessments have been completed. Access to downstream processing for the rare earth product has been secured through co-operation with Shenghe Resources. Shenghe are a leading producer of rare earths elements based in China and with sales throughout the world. Rare Earths produced in Greenland will undergo separation and further value adding with Shenghe Resources to provide a path to market for the main rare earth product. Other by-products produced by the project will include uranium, zinc and fluorspar. The project is currently in the permitting phase with public consultation expected in 2020 with the mining licence awarded in 2021. From this point development plans will be finalised through detailed design and bankable studies.*

A combination of favourable metallurgy, location and by-products will result in Kvanefjeld being a large, low cost and sustainable long-term producer of rare earths.

# 1. Introduction

GML is an Australian mining company based in Perth and listed on the Australian Securities Exchange. Greenland Minerals A/S (GMAS) is the Greenlandic subsidiary of GML and is headquartered in Narsaq. GML acquired a majority stake in GMAS, the holder of the license to explore the Kvanefjeld REE project (the Project), in 2007. In 2011 GML acquired the outstanding shares of GMAS and thereby assumed 100% ownership of the Project.

GML proposes to develop a mine and integrated minerals processing facility at Kvanefjeld. In addition to producing significant quantities of REE products, the Project will also produce, as by-products, small but commercially valuable quantities of uranium, zinc concentrates and fluorspar.

The Project is located within the Kommune Kujalleq, the Municipality of southern Greenland (Figure 1). The mine (the Mine) and processing plant (the Plant) will be located approximately 7.5 km to the north of the town of Narsaq with a new port facility (the Port) to be developed for the Project approximately 1 km to the west of Narsaq.



**Figure 1** Map of Kommune Kujalleq showing towns and settlements (Source: [www.kujalleq.gl](http://www.kujalleq.gl))

Mining operations will involve conventional open pit mining – blasting, loading and hauling. Blasting will produce broken ore which will be transported by truck to a concentrator where a rare earth mineral concentrate (REMC) will be produced together with zinc concentrate and fluorspar. The REMC will be further processed in the refinery to produce REE products and uranium oxide.

Two streams of tailings (waste produced during processing activities) will be generated: a flotation residue and a chemical residue. Both will be stored in tailings storage facilities (TSF) to be located in the Taseq basin. The tailings in the TSF will be covered with a water cap throughout operations. The Project design also maintains a water cap over the tailings after operations have ceased.

There will be a dedicated road between the Plant and the Port on the shore of Narsap Ilua. The road will be used to transport goods and personnel between Project facilities. Saleable products will be transported by truck to the Port where they will be stored until export in vessels chartered by the Project.

Permanent accommodation (the Village) for employees working on the Project will be constructed adjacent to the town of Narsaq.

## **2. Key Project Outcomes**

### **2.1 Project Information**

- Kvanefjeld will be a long term, low-cost large-scale producer of REs and uranium
- The Project has the capacity to expand should market conditions permit
- The Project will produce revenue generating by-products including uranium, zinc and fluorspar
- Across three deposits - Kvanefjeld, Sørensen and Zone 3 – the total Project Resource (JORC 2012) is 1.01Bn tonnes containing 11.13M tonnes of RE oxide (REO) and 593Mlbs of U<sub>3</sub>O<sub>8</sub>.
- The resource in the main Kvanefjeld deposit is 673M tonnes (7.4M tonnes of REO and 368Mlbs of U<sub>3</sub>O<sub>8</sub>)
- The Kvanefjeld resource contains 143M tonnes in the Measured (JORC 2012) category @ 403 ppm U<sub>3</sub>O<sub>8</sub>, 1.4% REO and 0.24% zinc.
- Total Proven and Probable Mine Reserves (JORC 2012) in the Kvanefjeld deposit are 108M tonnes @ 362 ppm U<sub>3</sub>O<sub>8</sub>, 1.43% REO and 0.26% zinc.
- The flowsheet for the Project is based on:

- Beneficiation to produce a high grade REE-U mineral concentrate, a zinc concentrate and fluorspar
  - Conventional atmospheric acid leach, solvent extraction and precipitation to separate uranium oxide and RE products
  - Separation of lanthanum and cerium in Greenland with other REs reporting to a high value intermediate product.
- At the 3Mtpa mining rate the Project will have the capacity to produce approximately:
    - 9,900 tpa of critical mixed RE oxide (MREO, middle and heavy REO)
    - 6,100 tpa of lanthanum oxide
    - 5,300 tpa of a mixed lanthanum/cerium oxide
    - 9,800 tpa of cerium hydroxide
    - 517 tpa of uranium oxide (UO<sub>4</sub>, equivalent to 475 tpa U<sub>3</sub>O<sub>8</sub>)
    - 15,000 tpa of zinc concentrate
    - 16,000 tpa of calcium fluoride (fluorspar)
    - 19,000 tpa of sodium hypochlorite solution (at 12%vol).
  - A low average unit cost of production for REO - US\$7.01/kg REO (after by-product credits) makes the Project one of the lowest cost RE producers.

## 2.2 Project Benefits for Greenland

- The peak construction workforce in Greenland is expected to be approximately 1,170 workers. It is expected that at least 200 Greenlanders will be employed during the construction phase.
- During the operations phase it is anticipated that the Project will initially provide employment for approximately 320 Greenlanders, out of a total workforce of approximately 780.
- The company will contribute ~US\$100 million dollars per year in corporate taxes and income tax to the Government of Greenland.
- Greenland is an emerging mineral province. It is politically stable and seeking to become increasingly financially independent from Denmark.
- The Company is in full legal compliance with all of its current development activities and exploration work programs, and has been actively working with the Greenland Government to secure an Exploitation License for the Project.
- Community support is critically important to the successful development of the Project and the Company is mindful of its need to respect the land, the environment and the wishes of the local people. The Company has completed environmental baseline studies and is well advanced in social impact studies. The Company's Environmental Impact

Assessment (EIA) and Social Impact Assessment (SIA) have been submitted to the Government of Greenland for review.

### 3. Tailings Management

#### 3.1 Introduction

The management of tailings produced in the Plant has been engineered to ensure minimal impact on the environment. Tailings management incorporates all aspects of the tailings system, including the design of the tailings storage facility (TSF), its operation and its closure at the completion of the Project. The TSF, which consists of two separate dams; the flotation tailings storage facility (FTSF) and the chemical residue storage facility (CRSF), will be located within the Taseq Basin.

The tailings management system was designed by independent consultant AMEC Foster Wheeler (AMEC).

The Project will produce two tailings streams during operations:

- **Flotation Tailings:** A solids residue stream arising from the physical separation of gangue minerals from ore in the beneficiation circuit. Flotation tailings represents >90% of the ore mined. These are stored in the FTSF.
- **Refinery Tailings:** A solids residue stream remaining after the REs and uranium are chemically separated from the REP concentrate and representing <10% of ore mined. These are stored in the CRSF.

The Project will also produce two treated water releases during operations:

- **Concentrator Treated Water Placement (TWP):** An inert saline water stream composed of treated water from the concentrator and tailings facilities.
- **Barren Chloride Liquor:** A saline water stream composed of treated water from the refinery. The stream has been neutralised with potential contaminants removed.

Tailings from the beneficiation circuit are mostly unaltered natural minerals allowing for relatively simple management. For the FTSF, thickened tailings will be pumped from the Plant via a pipeline and discharged below water into a natural basin (Taseq). In order to be able to store the estimated volume of tailings generated over the life of mine, an engineered embankment will be constructed at the outlet using locally quarried rocks. The embankment will be successively raised during the life of the Project.

The key advantages of underwater tailings storage are the mitigation of radon gas release and the mitigation of dust generation. There will be sufficient capacity for

storage of flotation tailings, in the FTSF, in the Taseq basin for the design life of mine production.

Flotation tailings still contain immobile values such as uranium, thorium, zirconium and heavy REs which may be re-processed in the future.

For the CRSF, the tailings will be transported to the concentrator site by truck. They will be re-slurried and pumped into a fully lined tailings dam. The CRSF will be double lined to prevent migration of mildly radioactive solid tailings.

### **3.2 Tailings Storage Facility Site Selection**

The site of the TSF has been carefully selected by the Company after a number of studies, investigations, workshops and site visits. The Company has engaged independent consultants to investigate options for residue storage for the Project. Coffey Mining completed a preliminary study in 2009 which evaluated locations selected by Risø in the 1970's. AMEC was subsequently engaged to further develop the residue storage facility concept in 2010 and 2011. Several potential site options were subsequently identified.

A technical team visited Kvanefjeld to assess potential TSF sites. The identification of potential sites for the Project's TSF focused on locations adjacent to the Kvanefjeld mineral deposit and the proposed plant site. A total of seven TSF sites were identified which were subsequently assessed based on the following criteria:

- Geotechnical factors
- Impact on the natural environment
- Impact on social/environment position of the local communities
- Area requirements and topography
- Accessibility
- Distance from a likely plant site

Application of the above criteria clearly identified the Taseq basin as the most suitable location for long term management of the tailings streams generated by the Project. In particular the Taseq basin was selected for the following main reasons:

1. It allows the lowest and most stable embankment walls
2. It is an impermeable basin
3. There is no competing land use
4. There is no linkage to drinking water systems
5. It is at a safe pumping distance and height from the Plant
6. It allows for water cover to prevent dust emissions
7. It is located on the intrusion so the area already displays elevated radioactivity
8. It is not visible from fjord marine traffic.

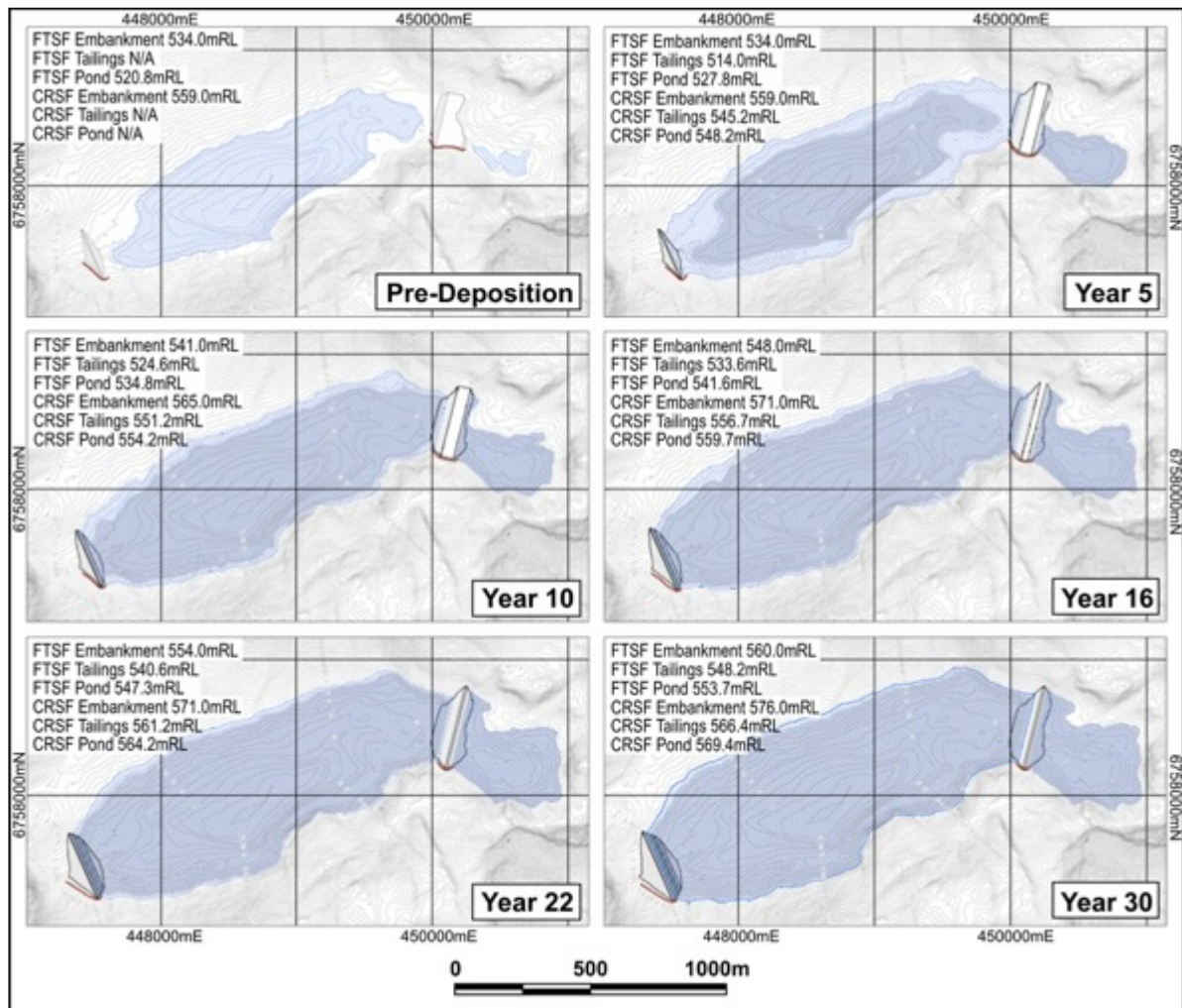
### 3.3 Residue Storage Facility Design

The tailings dam freeboard (distance between water level and top of embankment) is designed to comfortably contain runoff from a 1 in 10,000 year rainfall event. In addition a 50% buffer has been applied to allow for summer floods arising from snow melting.

The FTSF confining embankment will be formed on the western “rim” of Taseq’s outlet. The confining embankment for refinery slurry discharged into the CRSF will be constructed inside an eastern "neck" within the upstream catchment of Taseq, at an estimated invert of 530 m above sea level. The FTSF and CRSF facilities will be operated together. The facility has been designed to withstand a 1;10,000 maximum credible earthquake and still maintain integrity.

To reduce the initial capital cost of the Project, embankments will be raised in stages. At all times the RSF will maintain a retention volume suitable for the safe storage of the annual and ultimately final tailings production tonnages together with capacity for the 1 in 10,000 year rainfall event.

The location and staged development of the respective embankments is illustrated in **Error! Reference source not found..**



**Figure 3.1:** Staged construction of embankment walls for the tailings dam over the life of the project.

The embankments will be constructed of local rock from the following sources:

- Borrow areas located within the TSF environs
- FTSF and CRSF runoff diversion works
- Open pit and process plant works

All topsoil and unsuitable foundation materials will be excavated from the footprint areas. Embankments will be protected with rockfill on the downstream face for erosion protection during operation.



To prevent embankment seepage a double liner has been designed consisting of a high density polyethylene (plastic) geomembrane and a geosynthetic clay liner. The CRSF will be fully lined.

The geosynthetic composite system was selected because of the following factors:

- It provides two layers of protection against seepage
- Ease of installation
- The self-healing properties of the clay
- Excellent case history precedence for polyethylene systems for rockfill dams.

## **4. Permitting Process**

### **4.1 Environmental and Social Impact Assessments**

In order to apply for an Exploitation Licence (EL) for a project it is necessary for the proponent to submit a feasibility study, an environmental impact assessment (EIA) and a social impact assessment (SIA) to the Mineral Resources Authority (MRA) in Greenland. The purpose of the EIA is to identify and analyse the potential environmental impact of proposed project activities. Similarly, the SIA will identify and analyse the potential social impact of proposed project activities.

In order to ensure the impact assessments meet the MRA's requirements, the EL applicant and the Greenlandic Environment Agency for Mineral Resources Activities (EAMRA) and the Ministry of Industry Labour and Trade (MILT) must agree on Terms of Reference (ToR) for each of the assessments. The ToR documents outline the contents of the EIA and SIA and the processes by which they will be prepared.

The Company agreed ToR with the relevant authorities after public consultation in 2014. Draft EIA and SIA documents were prepared and submitted to the Government of Greenland in December 2015.

In order to ensure that the drafts incorporated international best practice, the Company used a wide range of internationally recognised independent consultants to perform the assessments.

Impact assessment feedback, from the Government of Greenland, was received progressively over 2016, 2017 and 2018. Multiple revised versions of the EIA and SIA were prepared by the Company and their independent consultants. The SIA was accepted for use in the public consultant process in March 2019. An advanced version of the EIA was submitted to the Government of Greenland in June 2019 for the public consultation phase.

## 4.2 Stakeholder Engagement

The identification of stakeholders and the development of a comprehensive stakeholder engagement plan are essential to ensure that relevant stakeholders are appropriately engaged in the development of any project. The Company has always recognised the importance of comprehensive stakeholder engagement and has been active with early engagement since 2007.

The Company's stakeholder engagement process has been designed to ensure that all potential issues regarding the Project are identified, at an early stage, enabling integration of all relevant activity planning and impact assessments.



**Figure 4.1:** Community Information Meeting to present information on the Kvanefjeld Project 2013.

## 4.3 Baseline studies

The Company has undertaken annual environmental baseline studies since it commenced work on its exploration license in 2007. The scope of these studies has included:

- Biological sampling of soil, water and sediment from lakes, marine and terrestrial locations
- Archaeological surveys
- Hydrological monitoring
- Monitoring of climate and air quality, including dust

- Radiation sampling
- Geochemical characterisation of waste rock and tailings
- Hydrocarbon spills
- Local land use
- Drinking water
- Taseq risk assessment.

A number of social impact studies have also been completed which have been used to allow the Company and its consultants complete the Social Impact Assessment. These include social studies into:

- Traditional living conditions in south Greenland
- Local land use
- The potential impact of the Project on health outcomes
- Opportunities created by the Project and the need for planned coordination of infrastructure development.

The environmental and social baseline information for the Project, in conjunction with stakeholder consultation, will allow the Company to minimise and avoid adverse impacts to the land and local communities.

## **5. Environmental Impacts**

All environmental impacts for the Project have been evaluated by studies completed by independent consultants. The Company is committed to operating to the highest levels of environmental standards at all stages of the exploration, development, mining and rehabilitation processes. The main environmental impacts identified are:

- Physical Impacts – Land will be disturbed through the construction of roads, infrastructure and process plant facilities. The overall footprint of the project is small. Noise and light generated by the project will be negligible to the community.
- Atmospheric Impacts – All dust generated by the project will land in the vicinity of the mine and processing facilities. Modelling shows emissions generated by diesel combustion are not significant and below relevant environmental criteria. Additional releases of radioactive gases are expected to be negligible.

- Radiological Impacts – The project area is already relatively elevated in radiation due to the local geology. The additional radiation caused by the project will be very low. No additional harm to people or the environment is expected. In the extremely rare event of a tailings leak the tailings will be contained by the natural topography with low amounts of additional radiation released.
- Visual Impact – Some of the project facilities will be visible from the town of Narsaq. This includes the roads, port and refinery. The mine, tailings dam and concentrator site are not visible from Narsaq. No parts of the project will be visible from the Eriks's fjord to the south of the project site.
- Impacts on the Water Environment – No water will be released to the rivers and lakes. A relatively small amount of water from the Narsaq River is used as a fresh water source for the project. No water will be released from the tailings dams during operations. Excess process water is placed into Bredefjord to the north of the project site. This placed water is treated to remove potential contaminants and is compatible with the receiving waters. Extensive analysis has shown the water shedding off the waste rock stockpile requires modest dilution to reach the composition of the local fjord water and therefore no impact predicted. Any possible water spray from the Tailings Dams will have a minimal effect on the water supply for Narsaq.
- Water Management Impacts – Modern waste handling facilities and procedures will be incorporated. Impact on the environment is assessed to be very low as they will improve on existing practices.
- Biodiversity – Noise and visual changes during operations and construction will only cause localised disturbance to non-threatened terrestrial birds and mammals. Modifications to local waterways is limited and adequate flow is maintained for flora and fauna. All tailings are isolated from the environment and any water collection in the tailings facilities is recycled to the processing plants for re-use and treatment. No threatened or rare species of flora or fauna are impacted.
- Tailings design, location and management has been applied to minimize environmental risks during operation, during decommissioning and after closure
- Rehabilitation – At the end of project operations the site will be returned as closely as practically possible to the baseline condition. All equipment will be removed from site. The tailings facilities will be closed as dam lakes with water with is compatible with the environment.
- Local Use – There is limited completing land use for the areas to be utilised for the project. A local sheep farm will be closed and used by the project as construction facilities. Hunting in the general area can continue, with the project areas being restricted and fenced.

- Heritage – Impact will be minor to a small number of heritage sites, they will be catalogued and studied before removal. Local UNESCO world heritage areas will experience no impact from the project as they are located far away.

These issues are comprehensively addressed in the Company's EIA which is available on the Company's website.

## **6. Social Impacts**

The Company has engaged with the local community from early in the project development. Community days and baseline studies commenced in 2009. Ongoing community consultation has been performed through town hall information sessions and government meetings. In 2015 the independent consultant Niras completed the first version of the Social Impact Assessment (SIA). This was submitted to the GoG in November 2015. Since this time, the Company has had on-going dialogue with the GoG to refine the contents to suit the specific requirements. In 2019 a final version of the SIA was compiled by the independent consultant Share Services and accepted by the GoG as suitable for public consultation. The SIA highlighted the following key social impacts:

### **6.1 National Economy**

The project will provide fiscal revenue to the Government of Greenland commencing in the construction stage. Employee taxes for both imported and local workers will be payable in Greenland during construction.

During the operations phase, the fiscal revenue to the GoG will increase with the ramp up and profitability of the project. Taxes and import duties will total approximately US\$100M (DKK 650M) during a typical operating year in real terms. The Company will make all taxes paid public information through its disclosure requirements for the Australian Stock Exchange.

### **6.2 Local Economy**

Benefits generated for the local economy will be both direct and indirect. Direct benefits are where the commercial exchange is directly with the Company. Indirect benefits flow from local businesses which receive increased economic activity. This may be in the form of supply contracts for goods and services.

During construction and operations, it is expected that 200 direct jobs will be filled by a Greenlandic workforce. Other jobs of approximately 100 will be created indirectly through local businesses winning supply contracts for goods and services for the project and other businesses.

A portion of employment taxes are paid directly to the local municipality of Kommune Kujalleq. This will provide fiscal revenue from direct and indirect employment generated.

To improve the equitable distribution of economic benefits and social risks the company will implement the following measures:

- Publicise all taxes paid on an annual basis
- Contracts will be simplified and divided to increase the likelihood of Greenlandic business performing the services
- Community development efforts to assist vulnerable households and groups within the community
- Extensive training programs for local potential workforce
- Workforce conditions which are fair and attractive

### **6.3 Workforce Accommodation**

A large workforce will be accommodated during construction and operations. The introduction of imported workforces from different cultures into a small community has the potential to generate a range of impacts. These include social tension, accommodation shortages and price escalation. Local services may also come under some strain.

The company will mitigate such effects with the following actions:

- Imported workers will be agree a code of conduct to regulate their behaviour and interaction with residents of Narsaq
- Maximise the use of Greenlandic Labour
- Marine vessel short term accommodation can be employed to reduce competition for accommodation with Narsaq
- Renovation of housing/accommodation within Narsaq

### **6.4 Land Use and Related Livelihoods**

The footprint of the project will restrict access to a portion of the local area. This potentially may affect specific land based activities in the location area such as gemstone collection and some tourist activities. It is also recognised that livelihood impacts may be encountered due to perceptions related to mine contamination of local produce. The following socio-economic measures will be applied by the company to obviate such issues:

- Land acquisition and compensation (where proven significant) may be undertaken where appropriate and according to best practice.
- The project will acquire the Ilua Valley Farm through a negotiated settlement with the owner
- Engagement and consultation with all land users
- Promotion of tourist activities in the area

## **6.5 Ocean Resources and Ocean Based Livelihoods**

It is recognised that fishing and ocean activities are a key part of Greenlandic culture. Such activities include commercial fishing, seal hunting and other traditional hunting. The Company has extensively studied the impact of the project on the ocean resources and can identify no cause for negative impact. No economic displacement of fishermen, either commercial or subsistence is anticipated from the Project.

## **6.6 Occupational Health and Safety**

The project was evaluated to determine the workforce exposure to acute (safety) and chronic (radiation dose) hazards. Specific controls which are commonly used in mining industry will be developed as part of the Company's health and safety management plan.

Evaluations by competent and independent consultants has shown the expected radiation doses for project workers are well below international dose limits and similar uranium mines internationally. GMEL will be implementing a range of best practice measures and systems to minimise the risk to workers and the public.

## **6.7 Community Health and Safety**

The company has assessed the community's exposure to health and safety issues which may result from the Project. Such risks include dust, noise, radiation, traffic movements and disease.

Dust will be generated from the mining related activities during the life of the mine. Air quality modelling shows the dust will be deposited within and close to the mining areas. There are no adverse health effects to the public expected from the dust produced.

All other gas emissions from the project are below Greenlandic guidelines and not expected to impact the health of the community.

The additional radiation exposure from the project was evaluated to be negligible compared to the baseline. Therefore, no radiation health effects on the public are expected.

The project will be upgrading and maintaining roads in the area which will be trafficked by Company vehicles. Community risk will be reduced with speed restrictions, clear signage, smaller convoys and safety campaigns.

Diseases may be introduced by the large imported workforce required to construct and operate the project. The following measures will be implemented by the project to reduce the risks associated with communicable diseases:

- Construction workers will be accommodated away from the town of Narsaq
- Operations workers will be in a secluded, security-controlled environment.
- Health assessments will be performed on all workers prior to being introduced to site. Ongoing medical testing will be performed.

The project will have a positive impact on the non-communicable diseases by encouraging good health. The Company will introduce and maintain the following programs to manage these diseases:

- Strict non-smoking policy while on site for workers
- Random alcohol testing for workers before commencing their shift
- Random drug screen tests – counselling programs available for early offenders
- Workforce accommodation will include exercise areas with participation encouraged
- Healthy food options will be provided in the dining facilities and on the job, food packages

## **6.8 Social and Emotional Well-Being**

The project will have a positive impact on the social and emotional wellbeing of the local community. New opportunities will develop from the increased economic and social activity in the town. In addition, increased affluence will encourage local business and residents to invest in Narsaq. This will see an increase in the quality of housing and facilities.

The Company will generate hope in the community by providing meaningful and long-term jobs. These jobs will include training, upskilling and career advancement. The Company will foster further positive social development through the following programs:

- Engaging with local health providers to assist with mental health issues
- Developing work policies which provide equal opportunity instead of non-tolerance of discrimination
- Actively promoting successful Greenlandic employees and business partners
- Communicate clearly and honestly with the community regarding company activities and news flow
- Work with the local municipality concerning supporting community initiatives and infrastructure

## **6.9 Social Structure and Community Life**

The project has the potential to generate impacts on social structures and community life. This will be caused by changes to demographics, infrastructure, service level,



service availability, traditional knowledge, vulnerable groups and existing social hierarchies.

The following areas have been identified as having the potential for impact:

- In Migration – large contingent of imported workers. Fly in and fly out workforce will minimise community interaction. The Company will engage with the local municipality to support local health services.
- Protection and Promotion of Traditional Knowledge – The Company places high importance on the protection and promotion of traditional cultures and knowledge. Greenlandic language and culture will be considered for the design and operations.
- Vulnerable Groups and Social Issues – The project has the potential to positively impact vulnerable groups through training, employment and increased incomes. The Company will stimulate positive impacts by encouraging potential vulnerable groups to participate in the project's benefits.

### **6.10 Impact Benefit Agreement**

Part of the mining project permitting process involves the agreement of an Impact Benefit Agreement (IBA). This agreement is between the following groups:

1. The Company
2. The local municipality (Kommune Kujalleq)
3. The central government department the Ministry of Mineral Resources and Labour

This agreement is a formal agreement to manage impacts of the project and share economic benefits with local stakeholders.

The Company will collaborate with the relevant stakeholders to ensure local facilities are not under resources and that the local community realises sustainable benefits from the project development.



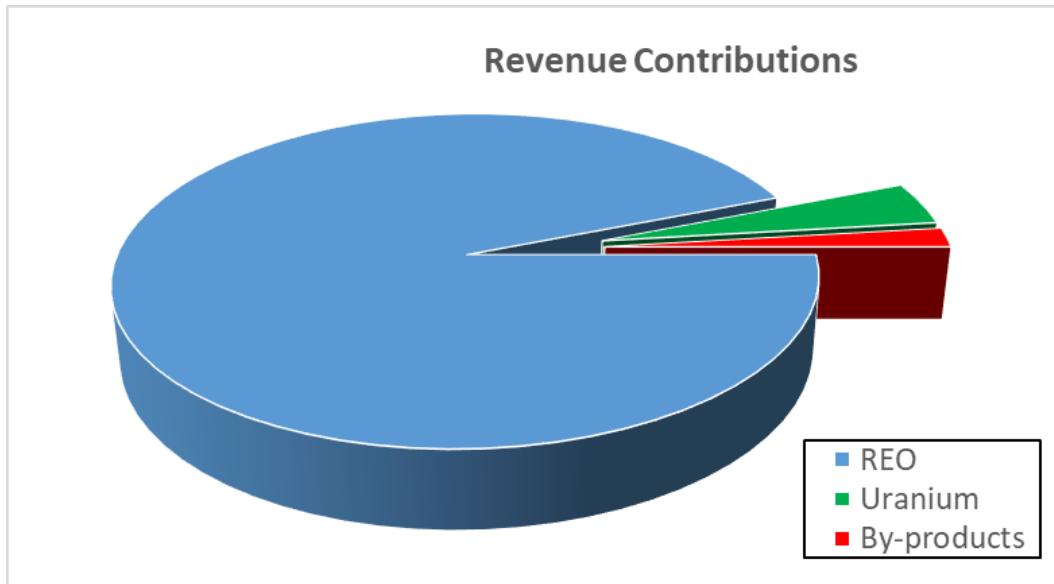
**Figure 8.1:** Local Greenlandic Children will benefit from the Project

## **7. Conclusion**

World class mining projects have significantly different economic impacts by their very nature. Fewer than 20% of the world's mineral assets generate over 80% of the economic value across the mining industry. Discovering a mineral deposit within the top 20% is a potential economic and development windfall for a developing economy. Greenland has such a deposit with Kvanefjeld and with it the potential to create long term economic prosperity.

Following significant exploration, metallurgical test-work and market research the Company has dramatically changed the Project from that originally envisaged by the Danish government authority Risø in the 1970's.

Fundamental research was performed to understand the orebody and the mineralogy. This led to a completely different flowsheet being developed from first principles. The product mix establishes REs as the main source of project revenue. An understanding of the global RE industry has led to the ability to capture the value from these products.



**Figure 7.1:** Proportional Revenue Contribution from the Kvanefjeld Project at current prices (2020).

The current configuration of the project has been created to satisfy a range of stakeholders and strategic investors. Final uranium product will be produced in Greenland which allows for simpler uranium export permitting for Danish/Greenlandic authorities. The Company will establish a refinery which produces a value-added rare earth intermediate product. This will bring additional jobs and fiscal revenue to the Government of Greenland. The Company's strategic partner (Shenghe Resources) has co-operated to optimise this study to integrate its efficiency with the global rare earth supply.

Development plans have considered the impact on the local community and environment. The Update configuration includes a range of measures designed to benefit the local community and reduce the impact on the environment. Conservative tailings design to world's best practice and water recycling contribute to these efforts.

Development of the Project is a watershed moment for Greenland as it will dramatically increase the potential of Greenland as a mining economy. Permitting of this project will show to the rest of the world that Greenland is open for sustainable mining business. This will reflect positively for further foreign investment and positive international attention. The fiscal revenue raised by the project for the Government of Greenland is a substantial portion of the country GDP which will provide a higher standard of living for everyone in Greenland for many decades.

The benefits of a world class mining operation can be shared with shareholders, local communities and governments. There is adequate commitment from all stakeholders to make the Kvanefjeld project a success for everyone involved.

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