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Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record

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Citation (APA):
Hendriksen, K. (2016). Greenland island infrastructures – energy challenges to the fishing industry. Paper presented at Arctic Circle Conference 2016, Reykjavik, Iceland.

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Greenland island infrastructures – energy challenges to the fishing industry

The most important export industry in Greenland are fisheries - they contribute 90% of the total export value. The local trading and processing is challenged by the fact that Greenland largely depends on island operation, which complicates and limits the infrastructure. For the fishing industry, power and water supply pose a considerable challenge, where the prize determination is a contributing reason for the reduced local processing and thereby the reduced occupation. A development, which challenges the livelihood of several local communities. (See insert for the Greenlandic context)

The island operation challenges

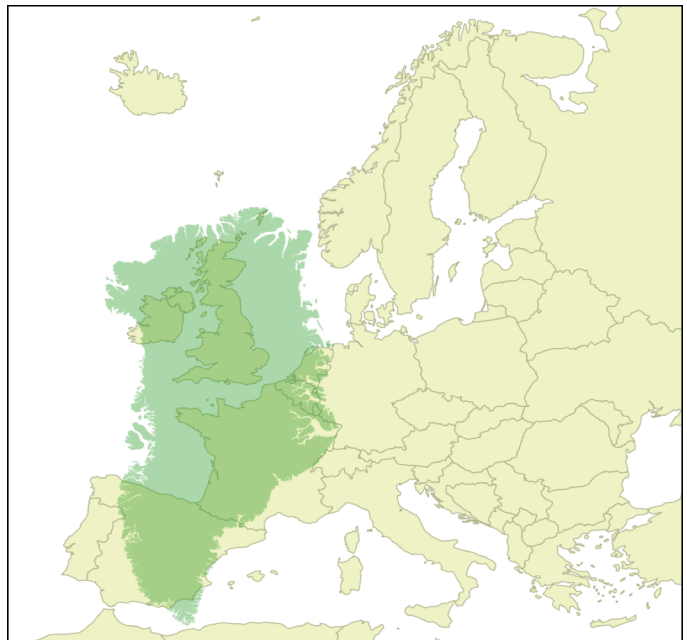
Even though Greenland is the world's largest island, when it comes to population it is a microstate. One of the largest challenges is the island operation.

In practice, Greenland does not work as one, but as 75 independent islands. With a few exceptions, there are no settlements that has roads or any other overland transportations connections with other settlements. All person- and goods transportation between the different settlements are by plane, helicopter, ships, dinghies or dogsleds. That involves that there are no places where it is possible to commute on a daily basis.

As other microstates, Greenland has a largely mono economic dependence, where fish and shellfish accounts for 90% of the export value. At the same time, Greenland has a large import and an increasing trade deficit, because the market is too small to secure marked conditions for competition and thereby a base for a market that is self-

The Greenlandic context

With its 2,146,000 km² and a length of 2.670 km, Greenland is the largest island in the world. The length of Greenland is the same as the distance from central Norway to Gibraltar, and in area, Greenland would cover most of central Europe.



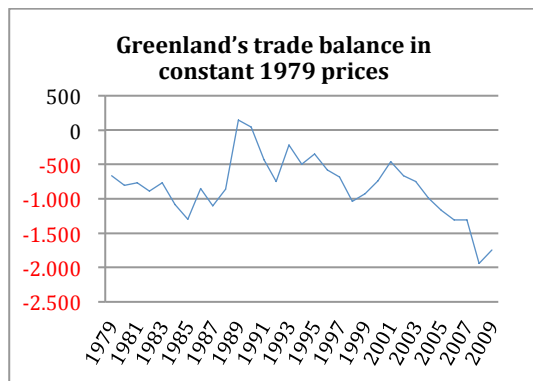
To illustrate the dimensions of Greenland on top of Europe. (Henrik Forsberg, Equivalent Projection map based on data from OpenStreetMap.org)

The Greenlandic ice cap and smaller glaciers covers 88% of the island, and by far the largest amount of the ice-free area along the coasts, are alpine mountains. Generally it is estimated that less than 3% of the island is fit for human habitation.

The Polar Stream which runs south along the east coast, transports enormous amount of sea ice from the North Pole as well as Greenlandic icebergs along the east coast and around the most southern point of Greenland, Cape Farewell. That means that it is only possible to sail along the east coast in shorter periods, in the late summer and fall, and that South Greenland periodic is closed in behind the sea ice.

Along the southern part of the west coast, the sea

sufficient on several vital areas from production to services.



Based on Statistic Greenland

The island-infrastructure also implies that there almost is no commerce between the settlements. For example, only 15% of sea freight is between the settlements; the rest 85% is directly between Denmark and the individual settlement.

The limited and cost-intensive transport infrastructure means that all settlements needs to have large storage capacity for fuel, foods, cloth and other retail goods as well as building materials, fishing gear, etc. Especially in the parts of the country, which is not reachable all year because of the sea ice, it is necessary to have large tank installations, packing, and freezing stores. The period with winter sea ice means that fish factories several places in Greenland has to have massive freezer capacity, so the fish and shellfish which is caught during the winter, can be stored until the first ship arrive.

The combination of island operation, mono economic dependence of the living resources from the sea, microstate characteristics and tiny settlements means that each settlement is challenged for its employment and existence. The threat to the small settlements can be from their resource base disappearing or not utilized because the processing closes and moves to other places. (Hendriksen 2013)

Power supply with island-infrastructure

The public power and water utility company Nukissiorfiit is obligated to supply all settlements in Greenland. Nukissiorfiit is forced to sustain independent power supply for all settlements because of the lack of a national grid due to island operations caused by geography, climate and the long distances. Even though 60% of the total electricity consumption today is produced by hydropower, the island-infrastructure means that the power supply of 70 out of the islands 75 societies is based on diesel generators. (Nukissiorfiit 2016)

is ice-free the entire year, but further north the sea is closed for sailing during the winter, because of the sea ice. The most northern region, Qaanaaq can only be navigated in July and August.

On this enormous island, there only lives 56,000 people and thereby Greenland is one of the most sparsely populated areas in the world. The majority of the population (approximately 48,000) are descendants from the Inuit's, that through the last millennium gradually immigrated from Canada crossing the sea ice, while the last approximately 8,000 people primarily comes from Denmark and are often working in Greenland for a shorter period.

The population has always been dependent on the living resources from the sea and therefor primarily are spread along the west coast.

Today there are 75 different settlements in Greenland, all reaching from 20 inhabitants to 17,000 inhabitants in the capital Nuuk.

Greenland is a part of the Danish Realm (The Kingdom of Denmark) with extended self-government.

The combination of poor infrastructure and the dependence on continuous power supply, for the heat cables on the water- and sewer lines, freezing stores and heating of homes demands on a certainty that the power supply are not cut off.

If it happens, only for a few hours, during the winter, water pipes will begin freezing and bursting and entire settlements will have to be evacuated, until the damages has been fixed. Therefore, all societies have a backup and often two backups for their power plants.

The economic consequences

All in all the climatic conditions and the island operation makes Greenland a very expensive and complicated country, something that to a high extent challenges the Greenlandic economy. As a base, every production for the domestic market or export has some basic costs associated with the climatic conditions or the island operation, which makes it difficult for Greenland to compete with multiple other countries and geographic areas. Besides that, the wage level, because of the close association with Denmark, is compatible with Western Europe, which to a further extent challenges the competitive conditions.

The fishery and fish refinement

Fish and shellfish accounts for 90% of the total Greenlandic export income. The most important species are shrimps, which accounts for 42% of the total value and Greenlandic halibut, which accounts for 29% of the total value (Statistics Greenland 2014). Among other important species are mackerel, cod and redfish.

Roughly speaking the Greenlandic fishery can be divided into two groups; fishery in the deep oceans and coastal fishery. The coastal fishery is in particular dependent on the local landing factories, therefore today there are trading post and/or fish factories in more than 50% of the 75 settlements in Greenland, where almost 50% of them, trade Greenlandic halibut as the only species or as the primary species (Statistic Greenland2014).

For the shrimp part, almost half is caught by large factory trawlers in the seas around Greenland. For those trawlers it is more profitable to trade their catch in the country where it are consumed or in a country nearby the consumer market, for which reason they only trade the amount of their catch in Greenland, which is by regulation required to secure employment. On the contrary almost all of the shrimp fishermen, who fish along the coastline, trade their catch in one of the four remaining shrimp factories in Greenland. In 1995, Greenland had 16 shrimp factories, but due to improved production technology, outsourcing of the processing to low-paid countries and a change in the demand, 60% of the shrimps are being exported as cooked shrimps with shells.

Concerning the Greenlandic halibut, the coastal fishing in North Greenland's deep fjords, nearby the ice cap, accounts for 60% of the yearly catch. Up there a large part of the catch is caught with trotline by small dinghies or from the sea ice in the winter – a hard and dangerous job.

The structure of the coastal fishery of Greenlandic halibut with dinghies in the summer and trotline from the sea ice in the winter, with use of dogsleds or snowmobile, has maintained a decentralized fishery where the population is settled along the coast in small settlements nearby the fishing places. It is in these places that the occupation still is closely related to the utilization of the living resources

from the sea. It is also these small settlements, which per capita contributes the most to Greenland's export income (Hendriksen 2013; Hendriksen and Jørgensen 2015). The paradox in this case is that these districts are also seriously challenged in terms of the social infrastructure; an example of this is the power supply.

The electricity prices and their effect

In 2005 the power and water prizes in the public utility company Nukissiorfiit were partly liberalized based on "cost real" prizes. Earlier on, Greenland had had the same prize across the entire country, based on a considerable domestic cross-subsidy combined with public subsidy.

For a normal household this differential pricing means that the citizens of the Greenlandic capital Nuuk, pays half of what the citizens in almost all the other settlement pays per kWh.

The power supply for the fishing industry is directly subsidized by the public, at the same time private users all over the country, contributes with a considerable cross-subsidization, so that all fishing factories maximal pays 41.5% of the production cost for power (Nukissiorfiit 2016). Despite of this, there are significant differences in the power prizes for the fishing industry around the country. Factories in some of the most important trading areas for Greenlandic halibut, cod and other important species, pays as much as five times more per kWh, than some of the cheaper settlements which are far less dependent on fishery for employment.

The same goes for water; factories in some of the most important fishing settlements pays as much as three times more for water than in the larger settlements. One of the many paradoxes in Greenland is that there are not a close link between the production costs for power and water and prizes for the individual settlement.

The settlements with the most expensive power and water are often the ones that have the highest infrastructure-related costs on other vital areas. Often those settlements are the ones that are only reachable a few months a year, which means that they have to have large freezer- and storage-capacity. At the same time, these small settlements often neither have the local expertise to repair freezers, production machinery, etc., which is another extra cost when such expertise has to be brought in.

In total, this means that the factories have to lower their trading prizes towards the local fishermen, to level their overall economy. At the same time, the local processing is reduced because of the high production costs, which among other things are due to the high power and water prizes, service costs, etc. Therefore the Greenlandic halibut is exported complete; with skin, head and tail or with just the head and tail cut off. This means that the local employment, which the factories created earlier, is significantly reduced.

This development with falling trading prizes and outsourced jobs in particular hits the small settlements, where the population at the same time has high living costs due to increasing prizes on power, water and retail goods. Thereby a prize determination on power and water is stimulating a centralization of the population in the larger settlements, where the prizes are lower and the material living standards are higher.

However, one of the Greenlandic challenges is that the development where the population is centralized in the larger settlements, does not consider that there is no employment for the new

citizens in the cities, meanwhile the smaller settlements which still accounts for the largest part of the export income, are slowly being depopulated and their living standards reduced. These challenges must be addressed by the Greenlandic government in the nearby future.

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