



GREBE

Generating Renewable Energy
Business Enterprise



Northern Periphery and
Arctic Programme
2014-2020



Report on Innovations from local technology and business solutions

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As the Arctic changes, so does the world.

(IACE Institute of Arctic and Environment Research, JAMSTEC)

***As the Europe Northern Periphery regions
changes, so does the society in Northern
Europe.***

(GREBE Norway)



Aughris Head (Steve Rodgers Photography)

Narvik Science Park would like to take this opportunity to thank the other GREBE Project partners and SMEs, and everyone who has assisted and contributed towards this report.

The GREBE Project

What is GREBE?

GREBE (Generating Renewable Energy Business Enterprise) is a €1.77m, 3-year (2015-2018) transnational project to support the renewable energy sector. It is co-funded by the EU's Northern Periphery & Arctic (NPA) Programme. It focuses on the challenges of peripheral and arctic regions as places for doing business, and helps develop renewable energy business opportunities in areas with extreme conditions.

The project partnership includes the eight partners from six countries, Western Development Commission (Ireland), Action Renewables (Northern Ireland), Fermanagh & Omagh District Council (Northern Ireland), Environmental Research Institute (Scotland), LUKE (Finland), Karelia University of Applied Sciences (Finland), Narvik Science Park (Norway) and Innovation Iceland (Iceland).

Why is GREBE happening?

Renewable Energy entrepreneurs working in the NPA area face challenges including a lack of critical mass, dispersed settlements, poor accessibility, vulnerability to climate change effects and limited networking opportunities.

GREBE will equip SMEs and start-ups with the skills and confidence to overcome these challenges and use place based natural assets for RE to best sustainable effect. The renewable energy sector contributes to sustainable regional and rural development and has potential for growth.

What does GREBE do?

GREBE supports renewable energy start-ups and SMEs:

- To grow their business, to provide local jobs, and meet energy demands of local communities.
- By supporting diversification of the technological capacity of SMEs and start-ups so that they can exploit the natural conditions of their locations.
- By providing RE tailored, expert guidance and mentoring to give SMEs and start-ups the knowledge and expertise to grow and expand their businesses.
- By providing a platform for transnational sharing of knowledge to demonstrate the full potential of the RE sector by showcasing innovations on RE technology and strengthening accessibility to expertise and business support available locally and in other NPA regions.
- To connect with other renewable energy businesses to develop new opportunities locally, regionally and transnationally through the Virtual Energy Ideas Hub.
- By conducting research on the processes operating in the sector to improve understanding of the sector's needs and make the case for public policy to support the sector.

For more information, visit our website:

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1. The influence of environmental conditions in NPA region

Global climate change impacts Europe in many ways, including: changes in average and extreme temperature and precipitation, warmer oceans, rising sea level and shrinking snow and ice cover on land and at sea. These weather phenomenon have led to a range of impacts on ecosystems, socio-economic sectors and human health and safety. There is no doubt that the changes in climate will have a strong impact in our daily life, whether we accept extreme weather conditions as a new phenomenon or not. Adaptation to past historical data, present observations and future predicted impacts will in the coming decades be needed to analyse, as well as be complementary to global climate mitigation actions.

Narvik Science Park published a report on this in the GREBE Project. This can be downloaded from the GREBE Project website [here](#)



Figure 1. There have always been severe weather phenomenon, however, a change in the system pattern is changing the climate in Northern Europe regions. (Source: Avis Nordland/an.no)

1.1 Background

The rural business in the energy sector as well as other sectors provide an important livelihood source in the northern peripheral areas of Europe. The harsh climatic conditions experienced in many NPA regions, particularly high north and arctic regions, present significant challenges to SMEs and start-ups that can seriously impact on the viability of their businesses. Winter storms regularly occurring in the high north, known as polar lows or arctic weather fronts, can bring about sudden and extreme drops in temperatures, with debilitating ice and snow conditions developing quickly.

In North West Europe the influence from the North Atlantic Oscillation give rise to storms, resulting in high winds and precipitations. These conditions frequently give rise to unsafe working conditions and suspension of business operations, particular in the case of technology installations. Operational environments in these areas are often vulnerable irrespective of climatic conditions, given their isolated, remote locations, far away from

technical maintenance staff, and which are often difficult to access by road, air or sea. Businesses located in these areas must compensate for fragile and less robust parameters, in order to cope with unforeseen sudden disturbances (for instance, climate change effects).

There are significant climate challenges in the partner regions with different types of harsh weather. Low temperature, hard winds, and rain / snow conditions can be extreme in the NPA regions. The question is - how to find the best process conditions for business in remote NPA communities, where knowledge transfer is an important aspect? A harsh local / regional climate, sparsely populated areas together with rural geographic related issues and poor infrastructure have a tendency to bias the company's business models.

1.2 Definition of extreme weather conditions

An extreme weather occurrence can be defined in different ways and the metrological institutes in each GREBE partner region have their definition made to optimize the specific conditions in each region. A broad institutional indication is often presented when life and values may be lost caused by the extreme weather condition. However, in this paper we follow the direction of [Source: Impacts of extreme weather events on infrastructure in Norway – InfraRisk, NGI Report 20091808-01-R] where:

“Extreme weather conditions are weather that most likely provide problems for people, business and infrastructure”.

As the climate changes then we may expect to get more extreme weather conditions. The correlation between the two parameters are related in the sense that when climate change give rise to an altered weather phenomenon in the North Atlantic Ocean of fluctuations in the difference of atmospheric pressure at sea level between the Icelandic low and the Azores high. This is known as the North Atlantic Oscillation (NAO). The result can be shown in a change of e.g. precipitation or temperature that will give rise to different types of weather challenges.

1.3 Climate change

The change in climate will affect us all, whether we are located in east or west of northern Europe (or elsewhere on the globe). In for example, Norway the climate has become warmer over the last 100 years and precipitation has increased by about 20%. These trends are expected to continue. It is also indicated that these intense precipitation events will increase the risk of certain types of flooding, landslides and avalanches. Similar trends of projections may also be indicated in the GREBE coastal regions. The adaption of the climate change are affecting the infrastructure that is sensitive to variability and therefore vulnerable of roads, airports, railways, ports, electricity grid, water supply and sewerage systems, waste management services and buildings.

All businesses will be directly or indirectly affected by climate change through the vulnerability of services on which they depend. This applies among other things to infrastructure, personal / operational safety or energy / communication failure.

However, climate change may also provide excellent renewable opportunities for business activities and value operations. For example, as a consequence of more precipitation it could increase profitability in the electricity sector and especially the hydropower production.

[Source: Climate change adaption in Norway, Meld. St.33]

1.4 Climate change adaption

The challenge of managing these climate affects that will affect us is to increase the knowledge and learn from history about climate change and their regional impact. The study of long-term weather adaption is a relatively new field. However, the data collected and gained knowledge has produced a database and better prediction of severe weather. There are a readiness within responsible government institutions and organizations to learn, analyse and increase the experience from each harsh weather update.

The experience from the weather is analysed and valuable lessons are learned. The knowledge is updated and usually disseminated, e.g. in risk reduction strategies and natural hazard management for each region or country.

Extreme weather events will often induce costs to restore the damage that have been incurred in the society. The learnings from an extreme weather event will also be taken into account. The active response phases as described as a present mode and a future preventive mode is also valid for infrastructure and human safety as well as for vulnerable businesses often located in rural and low populated areas.

1.5 Effects on GREBE partner regions in Northern Europe

Findings from the work of Narvik Science Park (NSP) indicate that in the north-eastern part of Europe there is a high societal disturbance caused by wind, rain and in some manner also freezing rain. Since the occurrences of harsh weather conditions are not frequent, the effect will be more palpable. In comparison, the northern part of Europe, e.g. Iceland has a frequent presence of high wind conditions that in this case will be more of a “normal” continuous state in daily weather. In the northeast coastal regions of Europe, the weather is more unpredictable with sudden storms (e.g. polar lows), delivering both rain or snow and windy conditions. In the mainland northeast regions there are precipitation and in conjunction with this often cold climate.

“Local extreme weather” is the weather impact on societal infrastructure in the different NPA regions is considered to be affecting the business activities. The phenomenon of “local extreme weather” is serious for the single business when it occurs and may have serious consequences for a business competing in an open market. The ongoing climate change is affecting the weather conditions in a way where we will expect more extreme weather and the aftermath thereof. The trend is toward more local extreme weather as indicated by the considerable diversity of the weather conditions in northern Europe:

Ireland/Northern-Ireland – Wind & Storms

Scotland – Rain & Wind

Iceland – Wind & Cold

Norway – Snow & Cold

Finland – Ice & Snow

As mentioned, the general factors that affects the conditions and have impact in northern Europe is precipitation and wind. The economic outcome is then vulnerability in these NPA regions and gives a negative bias for local business and a non-favourable competitive disadvantage compared to similar businesses in other EU regions.

1.6 The Regional Readiness

The readiness from the society to handle harsh weather and local “extreme” conditions varies from country to country in northern Europe. The regional readiness in local “extreme weather conditions” should be an important measure when establishing new enterprises and a serious risk analysis should be made before each activity starts, by taken in account the possibility for weather disturbance. Based upon the description below from each GREBE partner region, an indicative regional or even local perception has to be defined. The overall measure that indicates some connection between local “extreme weather frequency” and a corresponding indication of society readiness can be of great value. This opens a discussion and action plans or even a business strategy plan, concerning suddenly weather extremes that are changing quickly, for example in frequency and behaviour.

This will also reflect the current climate change in coherence with business activities that we are experiencing and specifically when it is expected to make the biggest noticeable effect on the environment in the Arctic and sub-arctic regions. The regional readiness in society is of great importance when considering the time loss of energy, restriction in transportations or not operational production.

However, the impact of “local extreme weather” is considered manageable and moderate in most of the northern EU regions. The frequency of these weather phenomenon’s can be severe when an indirect impact occurs, e.g. avalanches, coldness, strong winds and flooding. These will also in the future cause disturbances in the society.

These occurrences mainly affect the accessibility to production plants and the mobility of staff. Nevertheless, there is always a high risk that the safety aspect will in each situation not be fully understood. The “local extreme weather” is always important to relate to for both personnel and business operations.

1.7 Conclusions - climate effects on society business

- I. **Regional cooperation** - The diverse geographical areas of northern Europe, are experiencing a number of joint challenges in relation to location, but also possible opportunities that can be overcome and realized by regional cooperation. The experience from each region may be introduced to other Northern European areas and innovations from different parts in society can be used to create specific growth initiatives and common efficient business opportunities of the European Northern and Arctic regions in a climate efficient way. One major impact of challenges and initiatives in business operations is the influence of weather conditions on society and in the extension of SME business operations and productivity located in these areas.
- II. **Strategic handling** - Today, many operators in society refer to weather as a restriction in budget and argue that it is a phenomenon that has an actuable impact on business. However, the weather can be a strong benefit for the business when an updated insight into the specific local conditions is available and by using a strategic handling document based upon regional knowledge and experience from other businesses. Even national weather organizations are today providing companies this service.
- III. **Variety of weather** - The final implication is that a change in weather pattern will result in a variety of weather phenomenon that can affect the NPA regions in a different matter. There are different effects on the society, depending upon the specific region, i.e. flooding, wind, and disturbance on roads by fallen trees or avalanche.

2. How society adapt to the new climate situation

The methods for analysing risks and vulnerable processes are one of the most important issues to rely on when mitigating the weather effects both before under and after an impact from severe weather systems. This analysis can be the basis for more detailed analysis in specific operations.

The importance of societal activities, were risk and vulnerability analysis are the foundation for strategic plans where government bodies, institutions, public organisations and large companies should carry out risk and vulnerability analysis related to extraordinary circumstances. The analysis shall identify risk and vulnerability at all functions, systems and initiatives of importance to meet the requirements of the regulation and be reviewed at least annually and updated if needed. [Veiledning til forskrift om forebyggende sikkerhet og beredskap i energiforsyningen, ISSN 1501-0678].

As an example of the vulnerability in a Northern Europe region with a low population and exposed to rough weather conditions is shown in the statistics from the The Norwegian Water Resources and Energy Directorate NVE, which provides energy data.

Year	Not delivered energy. Volume (GWh) ‰ of total energy consumption	Number of interruptions per end user	Duration of disruption (minutes)
2011	33,2 (0,31 ‰)	2,4	342
2012	8,0 (0,07 ‰)	1,4	127
2013	24,9 (0,22 ‰)	2,0	239
2014	12,3 (0,12 ‰)	2,2	192

Table 1: Non-delivered energy, average number and duration of interruptions per end user in the period 2011-14. [Report 89/2015, Vil klimaendringene ta fra oss lyset i lampen? NVE report ISBN 978-82-410-1140-5]

The data for 2011 is higher mainly due to a severe weather system, Storm “Dagmar” which hit Norway, is the storm with the greatest impact on energy supply over the past 20 years. The data for “not delivered energy” for 2011, according to Table 1, statistically corresponds to about 7 million interruptions in the energy net / grid and the volume is equivalent to the annual energy consumption of about 1650 homes.

The average annual duration of interruptions per end-user associated with the distribution, as shown in Table 1, located roughly in the middle of the spread in a European context.

It should however take into account that the Norwegian geographic location and its extent makes is similar to the regions in Northern Europe. The location of the GREBE partner regions makes them particularly exposed to intense weather systems that adversely affect energy reliability. Upcoming climate change is expected to increase this exposure.

An existing tool that support the adaption and planning of expected climate change in Europe is the “The European Climate Adaptation Platform” (CLIMATE-ADAPT). It is also useful to evaluate current and future vulnerability of regions and sectors that is of interest.

(<http://climate-adapt.eea.europa.eu/about>)

2.1 The different spectrum of severe weather in Northern Europe.

The figures below show the complexity of severe weather conditions in the northern parts of Europe. The results are often devastating and the infrastructure hit by these impacts the society in different ways. However, the negative impact in SMEs dealing with daily operations in often rural areas, whether it is inland or coastal locations are affected of these natural phenomenon.

The results from these severe weather systems affecting the local business will in many cases, have a negative impact for days or even weeks after the weather event. The spread of specific event will vary with the type of infrastructural impact that happens, e.g. flooding snow, wind etc.

Below is an assembled image series of natural events that are common in the Northern Europe and Grebe regions.

2.1.1 Blocked roads



Figure 2a (left). A closure of the road close to the city of Harstad in Norway. A boat temporarily replaces transportation between the city districts. (Source: Nordlys avisa 17. juli 2016, Foto: Ruben Andre Lund Hanssen)

Figure 2b (right). The road located many metres below the sign due to an avalanche in Troms Norway. (Source: Nordlys avisa Foto: Statens Vegvesen)

2.1.2 Wind



Figure 3a (left). Two trailers are blown over by the wind. (Source: Nordlys avisa, 09. December 2016)

Figure 3b (right). Storm closes the roads on Iceland. 24 February, 2017 (Source: foto: IceNewsBy K. Jóhannsson)

2.1.3 Flooding

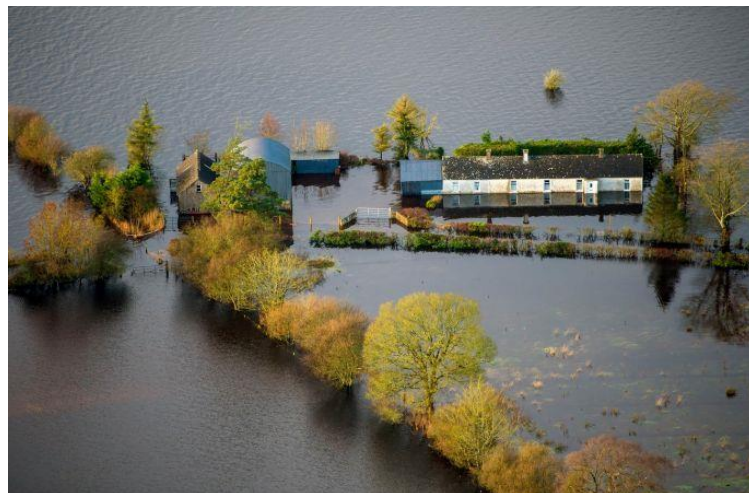


Figure 4. The flooding results often in severe infrastructural challenge and the recovery takes a long time. This will have major impact on the local business. Image shows flooding along the banks of the river Shannon near Athlone. (Source: photograph: Brenda Fitzsimons/The Irish Times Sat 12 Dec 2015.)

2.1.4 Icing



Figure 5. Icing is a severe challenge mostly on infrastructure. (Source: Westfjord Power Company.)

3. A SME survey in the GREBE project partner regions

It is important to find a suitable level of confidence in handling critical external occurrences that will affect small energy companies (SMEs) located in, or have activities in the rural part of northern Europe (Northern Periphery). These specific conditions are in many senses handled in different ways depending on type of business, outdoor activities and remote locations. On the other hand a storm or flood may damage the performance of business with considerable negative effects on project outcome and at the end the financial results of that year.

On the other hand, there are some structural activities that can minimize the negative effects of harsh weather on small, rural energy companies. There may also be active management of strategic plans and complementary work tasks can result which can result in a positive situation despite of harsh weather conditions. This phenomenon can create an increase in activity and net income of project efforts and implementation of a work plan.

A survey was undertaken of locally based, small energy businesses in the GREBE partner countries (Ireland, Northern Ireland, Scotland Iceland, Norway and Finland). See Appendix 1 for the questionnaire used in this survey.

The aim of this survey was to investigate how challenges identified in the previous activity specifically impact on renewable energy related technologies and businesses. The responses from small energy business will seek to identify existing deficiencies in renewable energy technologies and businesses that have arisen as a direct result of the climatic and physical challenges identified in the [Report on the Influence of Environmental Conditions in the NPA Arctic Regions](#).

The survey also aimed to determine how these assets could be more effectively utilised in order to support the delivery of smart business and technology solutions. In doing so, it reviewed the appropriateness of existing technologies and business models and their capacity to adapt to local conditions. It explored specific technology solutions and business models that can best address arctic challenges and conditions. There was a

focus on identifying how technology solutions and business models can successfully adapt and take advantage of the unique physical and climatic conditions of the NPA partner regions.

23 SMEs located in the GREBE partner regions competed or partly completed this survey. The aim was to establish a trend in how renewable energy related SMEs in Northern Europe experience the impact of weather in their business.

Survey participants were asked questions about their business and how the weather and climatic conditions adversely affect their operations. Their responses to the question if **‘Experiencing weather constraints is also a constraint in RE business operations’** are summarised per region below. Full details of their responses are outlined in Appendix B.

In **Ireland**, five SMEs responded mostly ‘Yes’ to this question and one Irish respondent said that that experiencing weather constraints results in ‘Employees are unable to carry out external work and delayed installations and there may be delays in delivery of materials.’

In **Northern Ireland**, three SMEs responded ‘Yes’ to this question and one respondent stated that ‘Weather constraints can affect business operations when strong winds and rain make it unsafe for work to be completed on a roof. If an assessment of risk shows that during extreme weather, scaffolds are in danger of collapse, the scaffolds will be removed as soon as it is safe to do so.’

In **Scotland**, seven SMEs responded to this question and the results were mixed, with four respondents answering ‘Yes’ and three respondents answering ‘No’. One ‘Yes’ respondent stated that ‘The business develops run-of river hydro power stations. Rainfall patterns and future trends are important for the business.’ One ‘No’ respondent stated that they ‘are in no way affected by the weather in what we do.’

In **Iceland**, three SMEs responded to this questions, with two answering ‘Yes’ to the question and one answering ‘No’. The ‘Yes’ respondent stated that they ‘Take into account in their reports on projects’ weather constraints, while the ‘No’ respondent stated that they ‘Are manufacturing windmills for harsh weather, and the repair costs are low.’

In **Norway**, two SMEs responded to this question, and both answered ‘Yes’, with one respondent stating that ‘The ferry company are dependent on weather to run the ferries. Alternative route and longer distance on mainland is used when the ferry is closed.’

In **Finland**, three SMEs responded to this question, all answering ‘Yes’. One respondent gave the answer that ‘The business was established to ensure the secure and lower price of energy for a local farm and co-located business enterprise. Energy demand fluctuates during the year and according to weather conditions. Weather conditions effect on the wood fuel harvesting (road conditions), fuel quality (moisture) and thus compensating investments were needed for a wood fuel dryer and storage.’

4. Result from the GREBE region survey

Some other questions asked of the participants are outlined below:

Q. Are weather constraints affecting the business budget?

A. In the survey 63% answered Yes (37% answered No) to the question if weather constraints are affecting the business budget.

Q. Do weather constraints require for the need for specific skills and competence in business operation?

A. In the survey 63% answered Yes (37% answered No) to the question if weather constraints needs specific skills and competence in business operation.

Q. Does the business need specific external skills (consultants) in projects, because of weather constraints?

A. In the survey 40% answered Yes (60% answered No) to the question if there are need for specific external skills in projects.

Q. Is there an internal strategic document / knowledge in the business operation in relation to weather constraints?

A. In the survey 38% answered Yes (62% answered No, including one answered "Limited) to the question if they need for specific external skills (consultants) because of weather constraints.

5. Some conclusions from the survey

The results from the 23 SMEs located in the GREBE regions show a broad diversity which was expected. There are active energy companies and business more or less related to the energy sector that exhibit diversity in weather dependent operating activities. Some businesses can handle severe weather by task reassignment operations, that is implement weather factors into work practices and move staff from external to internal work during adverse weather. The main impact is however, that in a majority of businesses the impact of severe weather is affecting the budget directly or indirectly by increasing costs for specific needed skills in the company itself or as external consultants.

The estimated costs for energy based businesses in the GREBE region are in this survey described by themselves to lie between 3 and 25% per year. This is also expected since some of these SMEs are located in different weather exposed areas, i.e. located on islands or in coastal mainland with different impact. The weather conditions vary from year to year but a general estimate is that budget increase between 10-20 % if the energy business is located in rural areas with severe weather affects. This includes also indirect costs as infrastructure impact.

Below are some reflections and comments from the SMEs:

"The overall cost is several tens of thousands of euros. This is mainly additional energy consumption, and operational costs. Percentage could be about 3%."

"€10,000 - 15,000 per year at least estimated (total affects) incl. snow blowing, planning, software, etc. based on estimate, it has not really been calculated."

"€5,000 for the snow blowing alone for one biomass supplier."

"Have higher costs than on the mainland and are disadvantaged due to remote location. These are difficult to estimate, this could be between 10%-20% for housing projects."

"Weather can have a small impact especially during the winter months but additional costs are taken into account in regards to possible delays in planned activity."

"In development of a project, it accounts for about 25% of the development costs to get to financial close. For an operational project, we can see inter-year weather disturbances impact output by +/-25%."

The feedback from the SMEs in the survey in proposing how to compensate for the weather constraints is for some significant answers. These are detailed below. This illustrates what parameters the local business

experience as important measures to identify and work with in order to minimize the weather effects. The good examples from the survey are presented as input to a wider discussion.

SMEs compensate for weather constraints and disruptions by:

- Timing, operational planning and using experienced contractors
- Compensating investments in fertiliser storage capacities
- Avoiding challenging times in transportations (thaws)
- Planning in construction phase (needed insulations) for arctic conditions
- In Process by preventing freezing (heating, antifreezes)

When asked about this, SMEs responses included:

“Programme weather factors into work and move staff from external to internal work during adverse weather. This is priced into the work where possible.”

“Task reassignment.”

“Better modelling based on future scenarios.”

“You just have to accept that it goes with the territory. It just makes the running costs slightly higher for high ground developments. Some factors can be over-come by better design of course. Heaters were retrospectively fitted to our turbines when the moisture problem materialised but if we were installing new turbines, we would build this requirement into the design.”

In the discussions provided in the report “The influence of environmental conditions in NPA and arctic regions” and continuing in this report on “Innovations from local technology and business solutions” will be followed up and investigated further where the recommendations will be discussed and consider the evaluation of possible actions, organization and awareness regarding the optimization of preparedness in SME business located in rural areas of northern peripheral region in Europe.

The trend we experienced in this research provides a clear indication that a strategic plan and a vulnerability analysis for all business working in rural regions is needed, which most certain will limit the consequences by severe weather conditions.

There are different business approaches in the literature. A direct problem analyses and prevention to “normal” weather phenomenon has to be considered in business planning for specific incidences which happens on a 5-10 year basis or even 50-100 years basis whether storms, flooding, snow, ice, dry periods etc.

6. The new climate economy

The response given from the survey and other discussion with SMEs in the rural coastal and inland regions of Northern Europe have a substantial risk of being affected in a negative way by severe weather conditions. The climate has an unforeseen risk of affecting local or even regional business and in many cases are local or regional basis affected while neighbouring business are not affected.

These circumstances have a negative effect on the concurrent situation in vulnerable areas. However, the survey indicates that in many cases the management of SMEs experience financial loss in business due to weather conditions. The climate affected economy in these regions will have a negative effect on the financial outcome for a business even if the management, as viewed in the survey state that it has a limited effect on the total budget.

The article [Impacts of extreme weather events on transport infrastructure in Norway, Geophysical Research Abstracts, vol. 18EGU2016-15407-3, 2016] estimated weather related cost is 100 mil NOK (c. €11 million) in Norway. As the other partner regions are not as densely populated as Northern Norway and have a similar

regional infrastructure then a rough estimate is that the six NPA partner regions included in the GREBE project will exhibit a weather dependent cost for the SMEs in the rural areas of the Northern Peripheral and Arctic region of Europe of six times the Norwegian estimate.

In the GREBE partner regions there is a weather dependent cost of approximately €60-€80 million each year. This is often not calculated as costs for SMEs that will affect the small business budget each year. The impact for business opportunities and growing abilities located in rural northern Europe may have a negative consequence in managing successful companies with competitive commercial products or services are strictly limited. The indirect influence that weather has to be managed in a strategic manner, in order to minimize the internal costs of interruptions in the business.

As seen from the survey and internal discussions with SME:s in the GREBE regions the managements often calculate for the financial weather dependent costs in the business. The businesses have a pragmatic relation to harsh operations, but without any company policy, plan or strategy.

7. Business strategy

A minimal planning strategy for weather related disturbance in business are generally lacking both in long and in short seasonal terms. The absence of business strategies tends to characterise SMEs in rural GREBE regions both in limited financial contingency as well as in maintaining physical systems and services.

There are some cost related economic factors that will affect the small business in a rural areas of Northern Europe and it may be time to consider a new weather and climate economy that compensates the businesses that are fighting against the nature and experience higher costs in their energy operations. These companies are strategically located in rural areas which require entrepreneurs, employments opportunities and an innovative environment.

APPENDIX 1: Questionnaire sent to SMEs in the GREBE Partner regions

Your organisation:		
Region:		
Country:		
Key area	Significant impact Yes/No	Reasons / Further details etc.
Is experiencing weather constraints also a constraint in your renewable energy business operations?		
Are weather constraints affecting your business budgets?		
Does weather constraints have need for specific skills and competence in business operations?		
Do weather constraints need specific external skills (consultants) in projects?		
Do weather constraints relate to an internal strategic document / knowledge in the business operation?		
Can you estimate the added costs (percent of total project costs/ or yearly in the business budget) related to weather disturbance?		
How does your business compensate for the weather constraints?		

APPENDIX 2: Responses to Question 1 in the survey sent to SMEs in the GREBE Partner regions

Ireland

1. Yes. Weather conditions can sometimes interrupt the install of our geothermal collectors due to adverse conditions to work in.
2. Yes and No. As a fuel / biofuel processor, this company is highly dependent on weather conditions, so in cold weather, their business performs well. However, they need structures in place to meet consumer demands.
3. Yes. The weather greatly affects boat and airplane services which then affect arrival and departure of workers and cargo.
4. Yes. Employees are unable to carry out external work and delayed installations and there may be delays in delivery of materials.
5. Yes. External insulation requires good weather for installation. This is delayed in poor weather conditions

Northern Ireland

1. Yes. Harsh weather can impact on installations on roofing project – solar. Flooding can impact on small hydro installations.
2. Yes. Harsh weather can have an impact on installations on roofing project – solar. It can also have an impact when carrying out pipe insulation outside.
3. Yes. Weather constraints can affect business operations when strong winds and rain make it unsafe for work to be completed on a roof. If an assessment of risk shows that during extreme weather, scaffolds are in danger of collapse, the scaffolds will be removed as soon as it is safe to do so.

Scotland

1. Yes. Installation work stops when weather is too wild.
2. No. Onshore not often for us.
 - a. Yes. Offshore at times.
3. Yes. The business develops run-of river hydro power stations. Rainfall patterns and future trends are important for the business.
4. Yes. We are not working on any RE projects at present but have been involved with Marine Tidal trials in the past. The limited weather window to carry out work placed significant constraints on the business to meet the client's timescale.
5. No. We are in no way affected by the weather in what we do.
6. No.
7. Yes. Wind turbines and micro hydro projects on high ground become difficult to access in winter conditions and health and safety rules require that technicians do not go up there if an ambulance could not access them in event of emergency. Either access tracks must be kept cleared of snow and ice or a suitable vehicle such as tracked snow cat must be made available. This adds considerably to costs. Turbines have to shut down to protect themselves in extreme wind conditions ice formation on blades can cause damage to turbines and a hazard to people. During periods of down time, moisture build up can arise in turbines which then causes electrical damage to equipment when it re-starts. Heating needs to be fitted to combat this and re-starting turbines delayed until moisture is dried out.

Iceland

1. Yes. Are aware of weather constraints, but no plans
2. Yes. Take into account in their reports on projects.
3. No. Are manufacturing windmills for harsh weather, and the repair costs are low.

Norway

1. Yes. The SME is weather dependent to be able to route with a boat on the sea outside the island of Senja.
2. Yes. The ferry company are dependent on weather to run the ferries. Alternative route and longer distance on mainland is used when the ferry is closed.

Finland

1. Yes. In anaerobic digestion process freezing of the bio waste and liquid fertilisers causes challenges. Raw material needs to be heated up to 70 degrees Celsius, which effects on the energy consumption of the process. Freezing of the bio waste in containers is also a challenge. Weather conditions also effect on transportations (snow removal, slipper roads) and increase thus operational costs. Spreading of the fertiliser's is made during some weeks in springtime; due to weather challenges, additional storage capacities are needed close to the fields.
2. Yes. The business was established to ensure the secure and lower price of energy for a local farm and co-located business enterprise. Energy demand fluctuates during the year and according to weather conditions. Weather conditions effect on the wood fuel harvesting (road conditions), fuel quality (moisture) and thus compensating investments were needed for a wood fuel dryer and storage.
 - a. Investment in biomass-based chp, was motivated also by the security of energy supply and avoiding storm disturbances
3. Yes.
 - there are limits, important to plan operations carefully
 - i. two main reasons: snow & ice and wet soil in autumn (to get material out of the forest and to make impurities to the chip material)
 - ii. damages to soil
 - iii. snow is bad for heating system (boiler), use of cover paper to avoid snow and ice in chips; impurities, snow and ice are not good for combustion



Northern Periphery and
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2014–2020



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Project Partners

GREBE will be operated by eight partner organisations across six regions:



About GREBE

GREBE is a €1.77m, 3-year (2015–2018) transnational project to support the renewable energy sector. It is co-funded by the EU's Northern Periphery & Arctic (NPA) Programme. It will focus on the challenges of peripheral and arctic regions as places for doing business, and help develop renewable energy business opportunities provided by extreme conditions.

