CHARTER Working Paper 1

Knowledge and Arctic Perspectives to Support Climate and Environmental Legislation development

CHARTER

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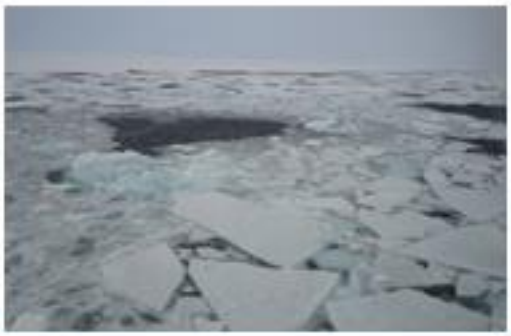
30. 9. 2020



Changing climate and land use cause pressures on biodiversity, traditional livelihoods and the local communities throughout Northern Fennoscandia.

Reviewing recent research and reports, we outline seven key points that should be taken into consideration in Finland's climate and environmental legislation and land-use related decision making. Our perspective is on Northern Fennoscandia with a particular focus on Northern Finland. Our investigation extends a few decades back in time as well as into the future. Our views represent the CHARTER project (*Drivers and Feedbacks of Changes in Arctic Terrestrial Biodiversity; 2020-2024*) funded by the EU HORIZON2020 research and innovation programme.

1. Rising temperature, melting of ice covers and permafrost and changes in snow conditions shape terrestrial and marine ecosystems at an unprecedented pace.
2. Biodiversity refers to the variability of living organisms and habitats, and to the variety of interaction types between these on Earth. Northern biodiversity is changing and becoming impoverished.
3. In the North, separation of ecosystems and activity of human communities is an artificial construct.
4. Grazing by reindeer shapes the landscape and has an impact on the regional climate.
5. Practitioners of the Northern livelihoods adapt to the changing climate through coping with the changing weather conditions. In practice, adapting to change is an integral part of everyday work.
6. Local rights and responsibilities constitute a significant aspect of adaptation to and mitigation of change.
7. We are moving towards co-governance of complex networks of issues.

Point 1. Climate change

Climate change is predicted to change the Arctic more profoundly than any other area in the world. The Arctic has been warming twice as fast as the global average. Over the period from 1998 to 2012, temperature has been rising as much as six times as fast. Even if the current climate targets were achieved, the winter temperatures over the Arctic Ocean will keep increasing. The Arctic Ocean could be largely free of sea ice in two decades.

There will be changes in the frequency and intensity of extreme weather phenomena. Snow cover surface area will decrease, snow season will shorten, and the areal extent of permafrost will decrease. Changes caused by the warming that has already been triggered will continue at least until mid-century. Global emission reductions can stabilize the impacts after mid-century, but it is unlikely that the Arctic can recover to its previous condition during this century.

If greenhouse gas emissions continue to increase at their current rate, the average summer temperature in Finland will increase by 2 to 3 degrees and the average winter temperature by 4 to 5 degrees by mid-century compared to the period from 1981 to 2010. In Northern Finland, this will lead to changes in weather in all seasons: e.g. summers will continue to become warmer and the growing season will become longer. Autumn rainfall will increase, the frost season and onset of snow and ice cover will be delayed. Winters will become warmer, ground frost depth will decrease, and rainfall will become more common. In spring, snow and ice cover of water bodies will melt earlier and the growing season will start earlier.

Rising temperature, melting of ice covers, and changes in snow conditions will shape terrestrial and marine ecosystems at a high rate. Northern habitats and species have been and are changing.

Species are receding northwards. The growth of trees and dwarf shrubs is increasing and shrubification is threatening tundra and open fell areas. Damage caused by moth outbreaks in mountain birch forests becomes more severe and occurs more frequently. Finding a suitable habitat will be a challenge for some species. For example, the lemming is dependent on snowbeds, and the habitat pressures experienced by it are reflected e.g. in many predator species.

According to estimates, nearly half of the habitat types and more than one-tenth of the species of Finland are threatened. Of the fell habitat types, e.g. *Empetrum* mountain birch forests, wind-exposed mountain heaths, and snowbeds are threatened.

The North is sensitive to disturbances. Prediction of changes is complicated by the fact that we do not know exactly how various organisms will adapt to habitat changes, how stable the food web structures are, and what is happening to the key species of the ecosystems.

Additional information:

AMAP 2017: Snow, Water, Ice and Permafrost in the Arctic (SWIPA). AMAP.
CCIVE 2017: Climate Change Impacts and Vulnerability report. EEA.
Huang, J. et al. 2017: Recently amplified Arctic warming has contributed to a continual global warming trend. Nature Climate Change, doi:10.1038/s41558-017-0009-5
Kontula & Raunio (eds.) 2018: Suomen luontotyyppien uhanalaisuus 2018. Luontotyyppien punainen kirja.
Schoolmeester et al. 2019: Global Linkages – A graphic look at the changing Arctic. UN Environment / GRID.
Meredith et al. 2019: Polar Regions. In the report: IPCC Special Report on the Ocean and Cryosphere.

Point 2. Biodiversity

Biodiversity refers to the variability of living organisms on Earth. It also refers to the variety of interaction types between habitats and species. Conservation and restoration of all these is challenging – and not least due to their complex interdependence relationships. For example, in the long term, a minor change in the annual average temperature will cause changes in several ecosystems.

Species diversity and genetic diversity are important for the survival of species and the stability of food webs. This can also be referred to as structural and processual diversity of habitats. Functional diversity governs biogeochemical feedbacks and has an impact on both natural systems and human communities. From the perspective of climate, functional diversity links species to important functions of the ecosystem such as carbon storage and, for example, prey and predator relationships.

There has been a decrease in biodiversity in the North. The warming climate is considered to constitute the most severe threat in the future. In addition, long-range environmental transportation of pollution and land-use changes pose a threat to some species and ecosystems. Also, increasing human activity contributes to the spreading of alien species.

Decrease and change in diversity are two different things. In the warming and globalizing North, increase in diversity can have a detrimental impact if, for example, new diseases, parasites or invasive alien species spread in an area. In Northern Finland, these may include pathogens impacting e.g. forests and reindeer, pest insect outbreaks, or northward movement of the deer ked and the tick.

In order to be able to assess change better, it is essential to examine the environmental conservation operations in the entire Fennoscandia comprehensively and systematically, taking into consideration the complex interrelationships and feedbacks between species, ecosystems and human activity.

Additional information:

Díaz et al. (eds.) 2019: Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Summary for policymakers. IPBES.
Conservation of Arctic Flora and Fauna 2013: Arctic Biodiversity Assessment: Report for policy makers. CAFF
Marquet et al. 2019: Navigating transformation of biodiversity and climate. Science Advances 5(11): eaba0969.

Point 3. Northern environment

The functioning of Northern ecosystems and activities of human communities should not be examined separately. We study the Northern environment as a Social-ecological system (SES) in which human activity and livelihoods are intricately linked with the natural environment, climate and biodiversity. For this reason, we conduct multi- and transdisciplinary research, engaging local communities in the process.

The Northern landscape is not pristine nature and it is not wilderness. It is a cultural landscape shaped by many livelihoods. Traditional livelihoods of the North include reindeer herding, hunting, fishing, gathering as well as small-scale farming and forestry. These livelihoods are characteristically seasonal and nature-dependent. Work is part of the culture and the social relationships of the community are unified by traditional knowledge and different generations working together. Income flows are often low and livelihood is pieced together from a variety of sources like a mosaic. The livelihoods enable living in the area and safeguard local economies and food self-sufficiency. Many of the traditional livelihoods are positively intertwined with multiple use of forests, nature conservation and nature-based tourism.

The reindeer is a key species of Northern ecosystems and it has a central role in Northern nature, local communities and livelihoods. This is also the case in Northern Finland – in particular in Sápmi. Semi-domesticated reindeer and their herders have been shaping the dynamics of the tundra and taiga ecosystems for at least 2000 years. The Northern environment is a cultural biotope. This complicates the definition of concepts such as "[to be in a] natural state", "ecological state" or "overgrazing" and highlights their value-ladenness. The target state of the Northern environment depends on the perspective adopted towards it.

The traditional livelihoods need vast areas of land in order to be able to function. While the Northern landscape may convey an impression of emptiness, it is for example pastureland that is used according to the seasonal cycle of reindeer life and reindeer herding. Nature enables wandering, hunting, fishing and gathering. Nature promotes health and well-being and is an integral part of the social identity and expertise of the practitioners of the Northern livelihoods.

Biodiversity also ensures the continuity of ecosystem services. Natural diversity and well-functioning ecosystem services ensure the diversity and resilience of the operational environments of various livelihoods, whereby the impact of natural disasters and diseases is less strong. Thus, it is possible to cope with adverse weather conditions and adapt to the changing climate. Biodiversity also enables us farming and forestry, production of bioenergy and other renewable energies, and multiple use of forests, including nature-based tourism. In particular, it safeguards traditional livelihoods such as reindeer herding, hunting, fishing, and gathering.

Additional information:

AMAP 2017: Adaptation Actions for a Changing Arctic: Perspectives from the Barents Area. AMAP.
Carson & Peterson (eds.) (2016). Arctic Resilience Report. Arctic Council, Stockholm Environment Institute and Stockholm Resilience Centre, Stockholm.

Item 4. Grazing by reindeer

Grazing by reindeer shapes the landscape. The impacts of grazing by reindeer on ecosystems have been studied for decades and it is clear that grazing and trampling have affected the vegetation of the area and the nutrient resources of the soil. In the boreal forest zone, grazing is targeted to lichen-rich habitats and its impacts are comparable to lichen regeneration after forest fire. In the fell zone, the impacts vary according to the vegetation type. Heavy grazing pressure increases diversity in nutrition-rich areas but decreases it in barren and lichen-rich areas. Vegetation cover degradation can lead to local erosion. Regeneration of mountain birch forests after autumnal or winter moth outbreaks can be complicated, which also has an impact on insects, birds and rodents.

We may ask whether the grazing pressure caused by reindeer husbandry can be characterized as "natural". Grazing by wild reindeer, prior to grazing by semi-domesticated reindeer populations, was more periodic and the population size varied greatly from year to year. If we want to restore the lichen areas of Northern Finland to their former state, it would require adjusting the grazing pressure by reindeer in such a way that the grazing periods would resemble natural migration routes and large variation in population size. If the target is to increase diversity by decreasing grazing pressure, emphasis should be placed on habitat types with the highest number of threatened plant species.

An important consequence of the shrub expansion on fells and tundra is change in albedo and the related change in net radiation. The lower the albedo, the more energy from the sun is absorbed, which contributes to the warming our climate. The change is the most visible in winter and in spring. The albedo of an intact snow cover is much higher than that of snow cover through which shrubs, bushes and trees are growing. The intact snow cover also melts later. Changes in albedo influence regional climate. Grazing prevents shrubification and has an impact on soil temperature as well: in areas used as winter pastures, the soil temperature remains lower. On the other hand, high grazing pressure on lichen-covered land decreases the proportion of light-colored lichen in the landscape and decreases albedo during the snow-free season.

It is only recently that research has begun to develop an in-depth understanding of the role of the traditional livelihoods in shaping the landscape and climate. **In practice, controlled grazing by reindeer is a long-term biological climate engineering experiment.** The possibilities of this experiment should be better known in order to be able to know the requirements for the role of reindeer herding in the context of mitigation of climate change in the Arctic. New scholarly knowledge and climate modelling enable gaining genuine insight into the impacts of this system. The necessary actions can be included in livelihood action plans. Thus, through policies, it will be possible to achieve direct and measurable climate impacts.

Additional information:

CHARTER project work plan 2020-2024 (http://www.charter-arctic.org/)
Stark et al. 2020: Porolaidunten ekologinen tila ja hiilitase. In: Kumpula & Siitari (eds.): Kestävä biotalous porolaitumilla. Luonnonvara- ja biotalouden tutkimus 29/2020 / LUKE.

Point 5. Adaptation

Practitioners of Northern livelihoods adapt to the changing climate through coping with the changing weather conditions. In practice, adapting to change is an integral part of everyday work. The weather and snow conditions of the Reindeer Management Area in Finland have already changed. Winters have become milder, in some areas summer heatwaves have become more common, spring is arriving earlier, and autumns have become warmer. Winter weather is variable, and warm and rainy conditions has frequently caused freezing of vegetation and snow layers. The developments described are likely to continue in the future.

The reindeer as a species and reindeer herding as a livelihood have the ability to adapt to various conditions. However, certain weather conditions are challenging for the reindeer and can prevent them from finding natural nutrition. Such conditions also increase the workload and expenses of reindeer herders. Some of the coping strategies (e.g. increased use of motor vehicles, supplementary feeding on barren sites) are not desirable from the perspective of mitigation of climate change or environment. However, not many alternatives are available.

The governance of reindeer management needs to enter into proper dialogue with land-use governance. Formerly, as land use in the North was less intensive, it was possible to move reindeer herds during difficult conditions if necessary. The borders of reindeer herding cooperatives, or even states, were not particularly meaningful. In contemporary reindeer herding, it is not always possible to find suitable pastures in all weather conditions. Old-growth forests rich with arboreal lichen are particularly valuable from this perspective. They can be used when terrestrial lichen pastures are covered with ice. Otherwise, reindeer must be provided with supplementary forage, i.e. hay or pellets, either in enclosures or in the forest.

The traditional livelihoods need to plan their adaptation. Development of preparedness and long-term adaptation strategies as well as support through legislation are needed. However, we do not know yet what exactly constitutes effective adaptation strategies and what the limitations to their implementation are, or, how research-based knowledge can best be translated into concrete management actions. Preparedness to adapt may exist, but there may still be obstacles to practical implementation. Identifying these is essential.

Global actors are increasingly interested in the North. The use of the Northern environment is increasing and diversifying. This means growth of urban areas, more roads, electrical grids, transmission towers, mines, wind farms, accommodation areas and other infrastructures for the purposes of tourism. The use of forest is intensifying and mining claims are being filed.

Development projects decrease the adaptation possibilities of the traditional livelihoods. Almost every new land-use project has detrimental impacts on reindeer herding. **A decision not to implement an infrastructure project or forestry measures is often the best solution for reindeer herding.** Similarly, in Sápmi, non-implementation of development projects is often the best solution from the perspective of the Sámi culture and traditional way of life.

The need for mitigation of climate change confronts us with an ethical challenge. The Northern landscape is valuable: it is a source of bioenergy and hydropower, there is plenty of space to build wind farms, and the mines produce raw materials sorely needed by the battery industry. Who should have the right to decide what the North will look like in the future?

Additional information:
AMAP 2017: Adaptation Actions for a Changing Arctic: Perspectives from the Barents Area.

Point 6. Local communities

Local knowledge refers to knowledge of local inhabitants and practitioners of local livelihoods. Local knowledge is inextricably intertwined with a particular area, or place, and a certain way of life. It is related to embodied experience, social relations and traditions.

In the Reindeer Management Area, knowledge of reindeer herding must be taken into consideration. Such knowledge may be local knowledge or indigenous knowledge, i.e. the knowledge of the Sámi. The actors involved who possess the knowledge in question are reindeer herders and their families, reindeer herding cooperatives and the official or self-organized groups operating within them (*siida* communities, village or family groups, working communities and their social networks), the Reindeer Herders' Association, and the Sámi Reindeer Herders' Association. There are several reindeer herding traditions in the Reindeer Management Area of Finland. When using indigenous knowledge, it is essential to discuss the nature of the knowledge and its use and role in decision making with the Sámi and their representative bodies. Defining these things is not the task of the researcher.

Reindeer herding and other local traditional livelihoods may be part of the solution when seeking ways to support the biodiversity of Northern nature and to mitigate climate change. Policies should lead to practical actions implemented by the local communities in particular. In order to ensure that the actions to be implemented are based on the best knowledge that is available, and that the actions will be socially acceptable, the focus of planning and decision making should be placed on the perspectives of local communities and livelihoods.

Local knowledge is underused or poorly understood in the context of planning and decision making related to use of the environment. It is time to shift focus from consultation to co-production of knowledge and embrace the challenging task of learning co-governance. It is also necessary to acknowledge the existence of knowledge gaps and the lack of understanding. In novel Arctic strategies, the agency of local communities and livelihoods is taken into consideration. This is essential particularly in Sápmi, as the areas inhabited by indigenous peoples are essential to protection of biodiversity and mitigation of climate change internationally as well.

Local communities play a central role in particular with regard to adaptation to change. Adaptation is a social process which is realized in the life of individuals and their local communities and through their livelihoods. What is needed is a forum for dialogue on the targets of adaptation and the ways in which adaptation at one level, or in one sector, could be part of the planning and decision making at other levels, or in other sectors.

Additional information:

CHARTER project work plan 2020-2024 (http://www.charter-arctic.org/)

Wheeler et al. 2020: The need for transformative changes in the use of Indigenous knowledge along with science for environmental decision-making in the Arctic. People and Nature: 10.1002/pan3.10131.

Point 7. Co-governance

We are moving towards co-governance of complex networks of issues. It is possible – and essential – to take protection of biodiversity and practices of adaptation to and mitigation of climate change into consideration.

Protection of natural environments of certain areas also helps stabilize the climate system. There are already several protected areas in Northern Finland. These combined with less managed areas support globally significant goals: conservation of continuous natural environments and ecological corridors. The significance of the environment external to nature conservation areas is increasing. This sets requirements not only for environmental legislation but also for legislation governing land-use planning.

The decision making concerning Northern Finland is shaped by several political facts. The EU plans to reduce its greenhouse gas emissions by 55% by 2030, (compared to 1990 levels). Thus, energy from renewable sources would account for at least 27% of the energy production. Finland aims to be carbon-neutral by 2035. Finland's government implements the EU's and its own climate policy for example by taking the climate impacts of land use into consideration and by strengthening carbon sinks. In our view, the actions set out in the government programme are suitable. From the perspective of Northern Finland, the reduction targets for emissions caused by the energy and transport sector are particularly important. Land use in the North is well positioned to influence the emissions and carbon sinks of the entire country.

The targets set, of course, place pressures on Northern nature and society. Transition to climate-friendly circular economy is often framed through possibilities and advantages. However, it will require various sacrifices to be made in rural areas and in the North, and the issue must be discussed locally.

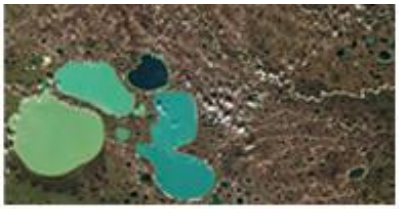
According to EU policy, sustainable use of natural resources and sustainable economic activity is promoted together with the inhabitants of the Arctic. Dialogue with indigenous peoples should promote international collaboration. In its Arctic Strategy, Finland has expressed desire to ensure participation of indigenous peoples in particular in matters "regarding their status as an indigenous people."

Synergies must be sought and compromises must be made in order to be able to mitigate climate change and adapt to it. Simultaneously, efforts should be made to maintain biodiversity and the resilience of the local communities and their livelihoods. Key points include multiscale and multilevel co-governance, participatory approach to land-use planning and development, and social learning.

When creating pathways to the future of the North, it should be done in collaboration with local communities and practitioners of locally significant livelihoods. Whatever the options for pursuing Arctic policy and decision-making, the knowledge, needs and capabilities of local communities and livelihoods belong where decisions are made.

Additional information:

EC 2020: A European Green deal. European Commission.
EC 2016/2019: EU's Joint Communication on An Integrated Policy for the Arctic. European Commission.
EU 2020: EU Climate news 16.9.2020, EURACTIV.com
Hallitusohjelma 2019: Osallistava ja osaava Suomi. Neuvottelutulos hallitusohjelmasta 3.6.2019.
Suomen Arktinen Strategia 2013. Valtioneuvoston kanslian julkaisusarja 14/2013.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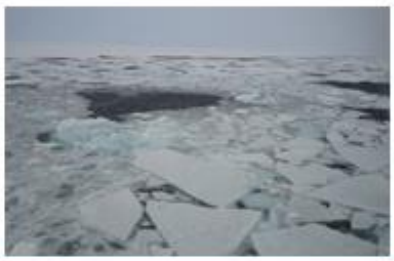


How to cite: Eronen J., Rasmus S., Landauer M., Forbes, B. 2020. Knowledge and Arctic Perspectives to Support Climate and Environmental Legislation development. CHARTER Working Paper # 1.

Available here: bit.ly/3mQiiCB and www.Charter-Arctic.org

CHARTER is coordinated by the Arctic Centre, University of Lapland. The project leader is Research Professor Bruce Forbes. CHARTER involves 21 research institutions across 9 countries as well as collaboration partners from Russia, USA, Canada, China and Japan. CHARTER works and collects new research material in Northern Fennoscandia and in Northwest Russia. In addition, existing data from North American Arctic, Greenland and European mountain regions are used. The project will run from 2020 through 2024.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 869471

Cover photos - clockwise from left: Jeff Kirby, bgeos/Copernicus, Jeff Kirby, Jeff Kirby, Julienne Stroeve