ROADMAP

TOWARDS OIL-FREE AND LOW-CARBON NORTH KARELIA BY 2040

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SECURE project contributes to Oil-free North Karelia powered by the Regional Council of North Karelia.

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Karelia
UNIVERSITY OF APPLIED SCIENCES

Northern Periphery and Arctic Programme
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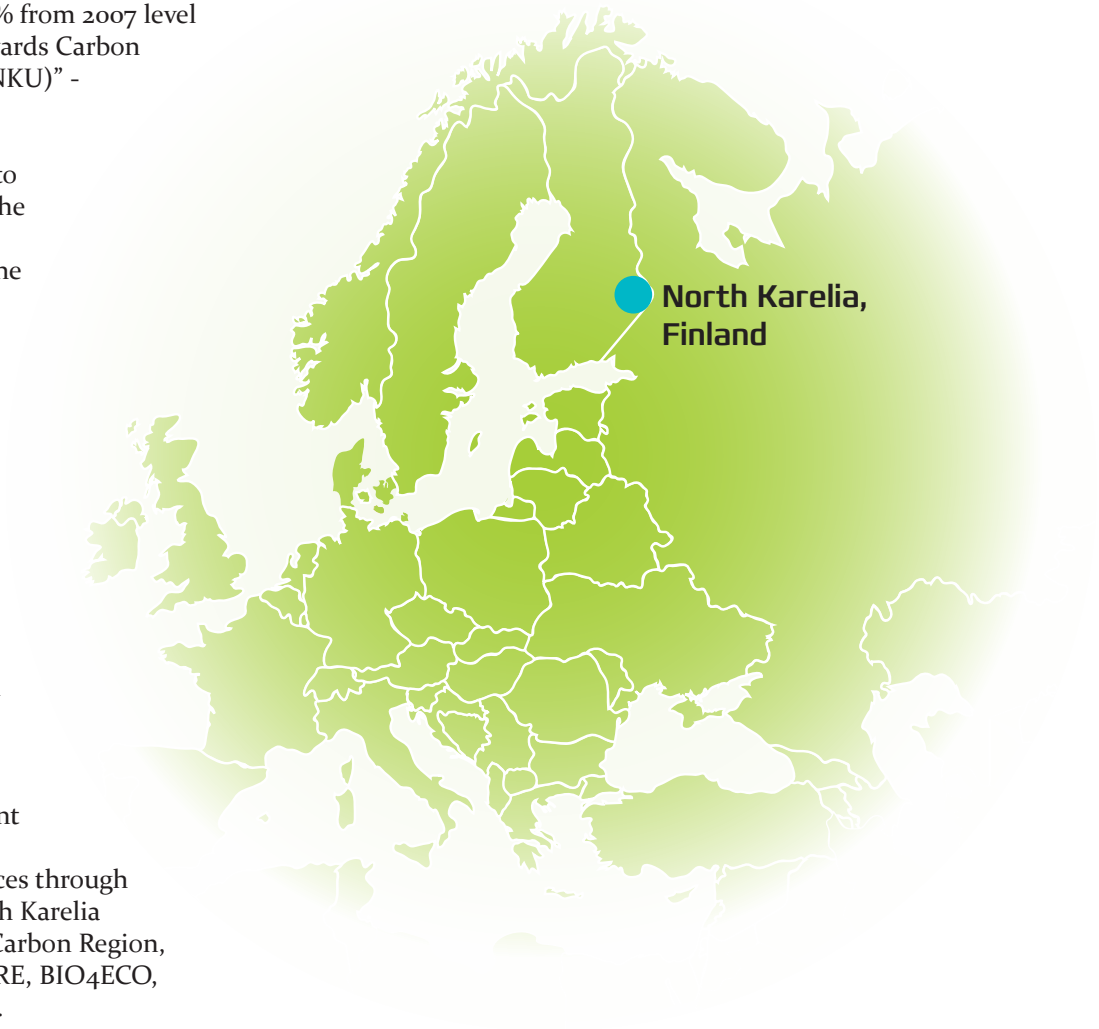
INTRODUCTION

Climate and Energy Programme of North Karelia 2020, launched in 2011, has served as a groundwork for the Roadmap Towards Oil-Free and Low-Carbon North Karelia by 2040. North Karelia has set ambitious goals for its regional climate and energy sector. It has decided to abandon fossil oil used for energy production by 2020 and in traffic by 2030, and the share of renewable energy is expected to rise from 66% (year 2014) to 100%. In addition, the region aims to reduce greenhouse gas (GHG) emissions by 80% from 2007 level to 2030 as an action of "Towards Carbon Neutral Municipalities (HINKU)" - Network.



The aim of this roadmap is to define the steps to achieve the above mentioned regional goals. The main sectors of the roadmap are:
1) energy & climate,
2) transportation,
3) land-use & housing,
4) circular economy,
5) natural resources & bioeconomy and
6) innovations & know-how.

Representatives of over 50 organizations and several private persons participated in the roadmap work. The roadmap team included the Regional Council of North Karelia, Finnish Environment Institute SYKE and Karelia University of Applied Sciences through the following projects: North Karelia Towards Oil Free and Low Carbon Region, Power from biomass, SECURE, BIO4ECO, TENTacle and CIRCWASTE.

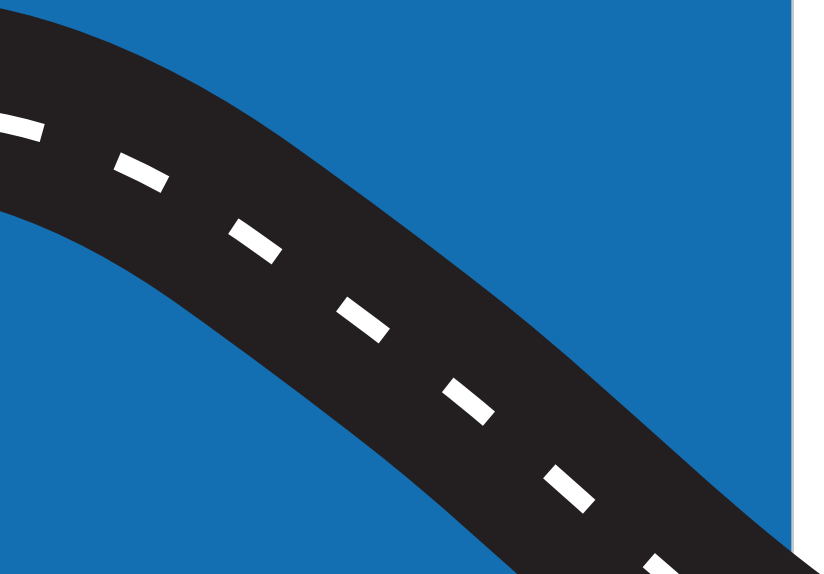
ENERGY AND CLIMATE

SITUATION NOW:

- Climate change and the Paris Agreement
- Ambitious regional energy and climate targets
- Oil-free and low-carbon North Karelia as a target – HINKU-region
- Share of energy production and consumption (incl. transportation) of Finland's GHG emissions is 80%
- Share of energy production and consumption (incl. transportation) of North Karelia's GHG emissions is 71%

AIMS BY 2040:

- Fossil fuels are not utilized
- Total energy consumption in the region decreases
- Energy system is energy-, resource- and cost-efficient
- Energy storages and demand-side responses
- Energy security and flexibility



ENERGY PRODUCTION AND SELF-SUFFICIENCY

–2020: Decentralized energy production pilots and reference subjects together with novel financing and operational models

–2030: Hybrid energy systems; no investments in fossil fuels

–2040: Bio-based oil and other renewable energy sources will replace fossil oil; solar energy solutions; electricity storage systems

DISTRIBUTION OF ENERGY AND SECURITY OF SUPPLY

–2020: Influencing on legislation and support systems (two-way electricity sales, island systems, cost-effectiveness); pilots for energy supply from household to household; demand-side response

–2030: Development and more efficient utilization of the energy production and distribution infrastructure

–2040: Modern and energy-efficient energy distribution network together with smart and flexible energy markets

END USE AND ENERGY EFFICIENCY

–2020: Improving energy efficiency; raising energy awareness; utilizing waste heat

–2030: Procurements' life cycle costs and environmental impacts; abandoning fossil oil heating in public buildings

–2040: Electrification of industrial processes; smart energy systems; regulation of energy markets

TRANSPORTATION

SITUATION NOW:

- Long distances
- Transportation of goods and passengers is carried mainly through road transport
- Vehicle fleet's average age is high
- Few alternative fuel vehicles
- Joensuu has favorable conditions for cycling, sub-regions face challenges
- Transportation accounts for 28% of the GHG emissions in the whole region

AIMS BY 2040:

- Renewable and alternative transportation fuels
- Low emission vehicle fleet
- Circular and bioeconomy interfaces
- Interlinked transportation modes and uninterrupted transport chains
- Cycling and walking conditions are top class
- Sharing economy/joint use and autonomous vehicles

OPERATIONAL ENVIRONMENT

–2020: Novel financing models

–2030: Electric vehicle charging and gas refueling station networks

–2040: Digitalization; autonomous vehicles

TRANSPORTATION SYSTEM

–2020: Opening of the logistics sector's interfaces; developing conditions for walking and cycling

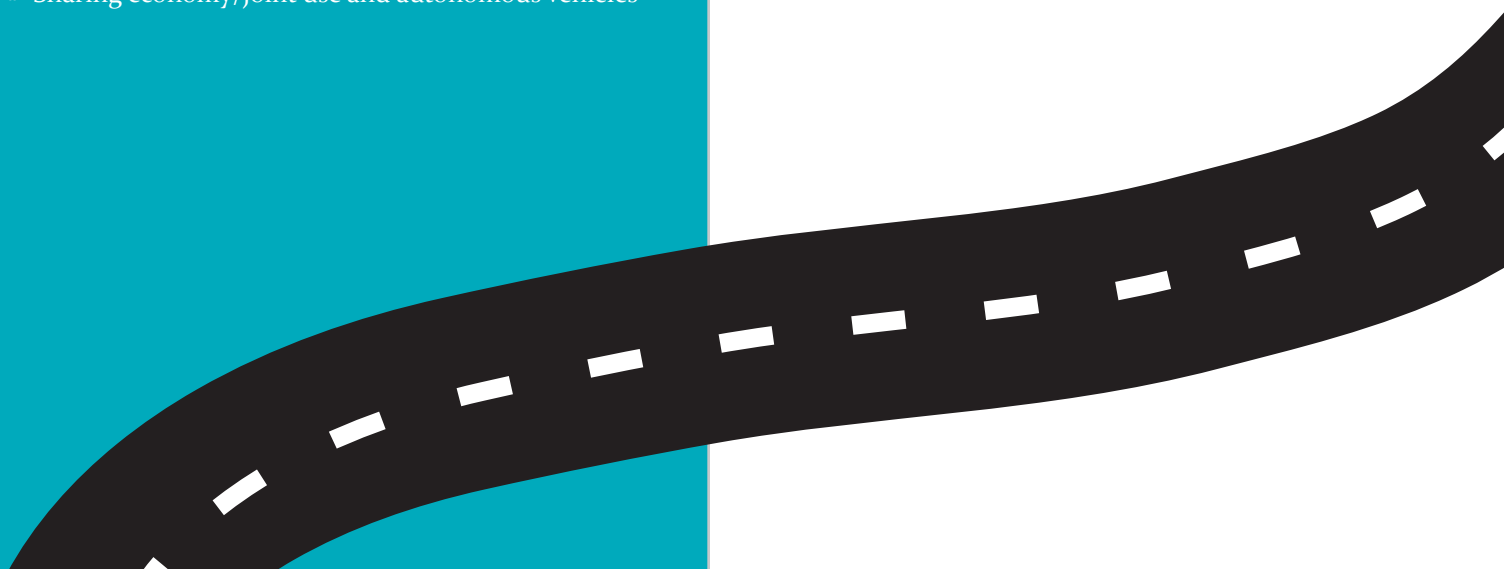
–2030: Flexible transportation combinations; sharing economy/joint use

TECHNOLOGIES AND SOLUTIONS

–2020: Vehicle conversion kits; modernization of the car fleet

–2030: Enhanced low emission public transport

–2040: Hydrogen vehicles and autonomous systems



LAND-USE AND HOUSING

SITUATION NOW:

- Land use is directed by the Land Use and Building Act and the national land use guidelines
- Planning solutions and their implementation have long-term effects on GHG emissions
- Energy production solutions in the residential areas together with mobility needs and options affect the GHG emissions
- North Karelia is challenged by the vast land area, population fragmentation and the need for mobility (165 000 inhabitants, 8 people per sq. km of land area)

AIMS BY 2040:

- Vital living environment
- Multiple operators act both energy producers and sellers – decentralized energy production
- Sharing economy
- Cost-effective and sustainable community structure
- Healthy, comfortable and energy-efficient building stock
- Wood construction

PLANNING AND CONSTRUCTION

–2020: Reducing the need for mobility; developing bicycle and pedestrian traffic; energy and material efficiency in new and repair construction

–2030: Versatile use of wood; abandoning the use of fossil fuels in buildings' separate heating systems; digitalization

–2040: Flexible modifiability of premises; real estate life cycle management; products with positive carbon handprints

HOUSING, SERVICES AND EMPLOYMENT

–2020: Functioning communications network

–2030: Jobs created by circular and bioeconomy; vitality throughout the region

–2040: Public transport is a digitized service entity; smart housing technology

COMMUNITY STRUCTURE AND LIVING ENVIRONMENT

–2020: Sustainable use of natural resources; recreational and wellness services provided by the nearby nature; novel financing models for the rehabilitation and protection of habitats

–2030: National and international cooperation forums and projects (e.g. for preventing the negative effects of climate change); GHG emissions reduction methods in agriculture and forestry sector

–2040: Achieving and maintaining good water system status

CIRCULAR ECONOMY

SITUATION NOW:

- Circular society as a long-term goal
- Finland's total amount of waste has not reduced, share of municipal waste is only 3%
- Annual value potential of circular economy in Finland is 2–3 billion euros
- Via the Life IP "CIRCWASTE - Towards Circular Economy" -project, the nationwide waste management plan is implemented regionally and different experiments/pilots are carried out
- Intensity of raw material usage in North Karelia is above the average in Finland

AIMS BY 2040:

- Efficient utilization of the side streams of forestry, extractive and refining/processing industries
- Pioneering in nutrient and raw material recycling
- Active RD&I in circular and bioeconomy
- Partnership and cooperation networks --> novel business models
- Amount of disposable waste is minimized
- Utilization of recycled materials
- Circular economy's technological solutions for export
- Circular and bioeconomy are significant employers
- Nutrition neutrality as a goal

CONSUMPTION AND RECYCLING

–2020: Increasing the recycling rate; reducing life cycle impacts

–2030: Novel applications for textile waste and fibers; experiment and development platforms for circular economy's products and solutions

–2040: Sharing economy's service platforms

MATERIAL EFFICIENCY AND LIFE CYCLE APPROACH

–2020: Ecodesign; life cycle impact assessment (LCIA); cost-efficient utilization of waste and side streams

–2030: Developing and utilizing recycled materials

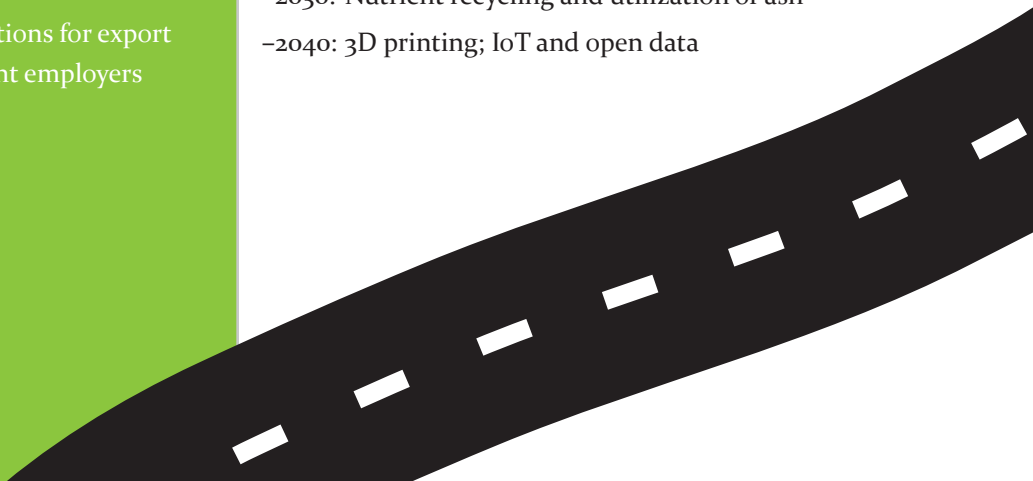
–2040: Material flows are utilized efficiently; sustainability is incorporated into material handling and production processes

INDUSTRIAL SYMBIOSES AND NUTRIENT CYCLE

–2020: Partnership and cooperation network; circular economy ecosystems

–2030: Nutrient recycling and utilization of ash

–2040: 3D printing; IoT and open data



NATURAL RESOURCES AND BIOECONOMY

SITUATION NOW:

- Renewable natural resources and ecosystem services
- No wasting of natural resources
- Circular and bioeconomy, renewable energy production and cleantech solutions are vital in the fight against climate change
- Bioeconomy has a significant role in replacing the fossil energy sources and materials with renewable ones
- North Karelia has strong bioeconomy operators and expertise
- Half of North Karelia's bioeconomy sector is forest-based and its annual turnover is almost 2 billion euros (2.7 billion euros by 2025 as a goal)
- Forest bioeconomy employs roughly 6 000 people and about 500 companies operate in the sector

AIMS BY 2040:

- Oil-free, low-carbon and resource-efficient region
- Fossil fuels and materials have been replaced with renewable ones
- Forerunner in wood construction
- Wide range of high value-added bioproducts and highly refined natural products for domestic and export markets
- Service sector plays an important part in region's circular and bioeconomy
- Jobs for the whole bioeconomy value chain have been created
- Sufficiency of ecosystem services and natural resources is taken into account
- Efficient utilization of side streams and reduction of negative environmental impacts

USE OF NATURAL RESOURCES

–2020: Sufficiency and sustainable use of natural resources; ensuring the competitiveness of wood; good forest management practices; versatile wood construction; carbon storages

–2030: Novel production methods and biomasses; digitalization of microenterprises and SMEs

–2040: Developing circular and bioeconomy sectors as an entity (circular bioeconomy); minimizing losses in material flows

NEW BIOPRODUCTS AND INNOVATIONS

–2020: RD&I; commercializing innovations; attracting investments; forest-based products; utilizing different sectors' interfaces (photonics, nature tourism)

–2030: Bioeconomy becomes more consumer and market oriented; innovation platforms enable testing, experimenting and novel development

–2040: Novel materials (e.g. 3D printing), technologies and services; intangible values

REGIONAL ECONOMIC IMPACTS

–2020: Versatile entrepreneurship in the rural areas; increasing added value in bioeconomy

–2030: Enabling biorefineries' operating and expansion conditions; developing infrastructure; meeting the needs of logistics; creating jobs for the whole bioeconomy value chain

–2040: Replacement of imported energy and goods with local alternatives; bioeconomy products and solutions also for export

INNOVATIONS AND KNOW-HOW

SITUATION NOW:

- Encouraging companies to make innovations, renew themselves and go international
- Strong cooperation between companies, public administration and third sector in RD&I
- Testing, developing and sharing new ideas through different platforms
- Enhancing the interaction between education and working life, improving the quality and effectiveness of research and innovation activities, increasing the internationalization of research and education
- Competence and its continuous improvement are key factors in regional success
- North Karelia has strong expertise in education sector
- Expertise strengthening and innovation work is supported by the EU funding

AIMS BY 2040:

- North Karelia utilizes novel innovations effectively
- Educational curricula are in line with the needs of working life; novel and flexible skills development models
- Lifelong learning and continuous self-development
- Teleworking
- Sustainable development operations models
- Active involvement of residents
- Active entrepreneurship education
- Sustainable business models
- Financial instruments that encourage experimentation and social innovations
- Active and transparent cooperation of regional RD&I actors

SUSTAINABLE DEVELOPMENT AND PUBLIC PARTICIPATION

–2020: Sustainable development incorporated into educational and training communities; local actors' participation in regional climate and energy activities; local level decision-making and influencing; culture of experimentation

–2030: Supporting the transformation of larger systems of society; sustainability; corporate responsibility; green economic growth

–2040: Sustainable business models

FROM KNOW-HOW TO NEW BUSINESS IDEAS

–2020: Closer cooperation between educational and research institutions and companies; novel expertise for businesses and for commercializing innovations; pilot-to-business development phase through demonstrations; business incubators and cooperation networks promoting the growth path of new business ideas and start-up companies

–2030: Innovative financing models e.g. in renewable energy investments; social entrepreneurship; service solutions provided by the third sector; supporting RD&I activities through networks and experiments

–2040: Moving towards the culture of experimentation

LIFELONG LEARNING

–2020: Grass-root level learning opportunities; low level influencing; digitalization

–2030: Multi-talented people; flexible solutions for re-education and competence advancement