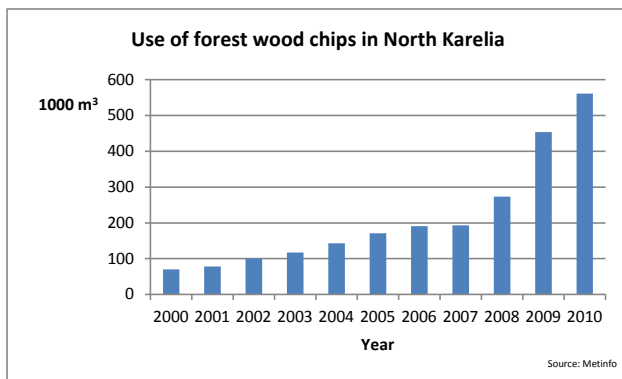


Bio-energy case study in North Karelia, Finland

North Karelia is a region in eastern Finland where the use of bio-energy has risen dramatically during the two last decades. Current targets aim at increasing production even more through the use of forest wood chips and other bio-energy materials.

In the North Karelian case study the Tool for Sustainability Impact Assessment (ToSIA) was applied to assess impacts of increasing production and use of forest wood chips.



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North Karelia Case study

ToSIA –tool

The decision support tool ToSIA (**T**ool for **S**ustainability **I**mpact **A**ssessment) analyses environmental, economic and social impacts of changes in forest value chains.

Northern ToSIA case studies

The project included four regional case studies and these aimed to explore two types of ToSIA applications:

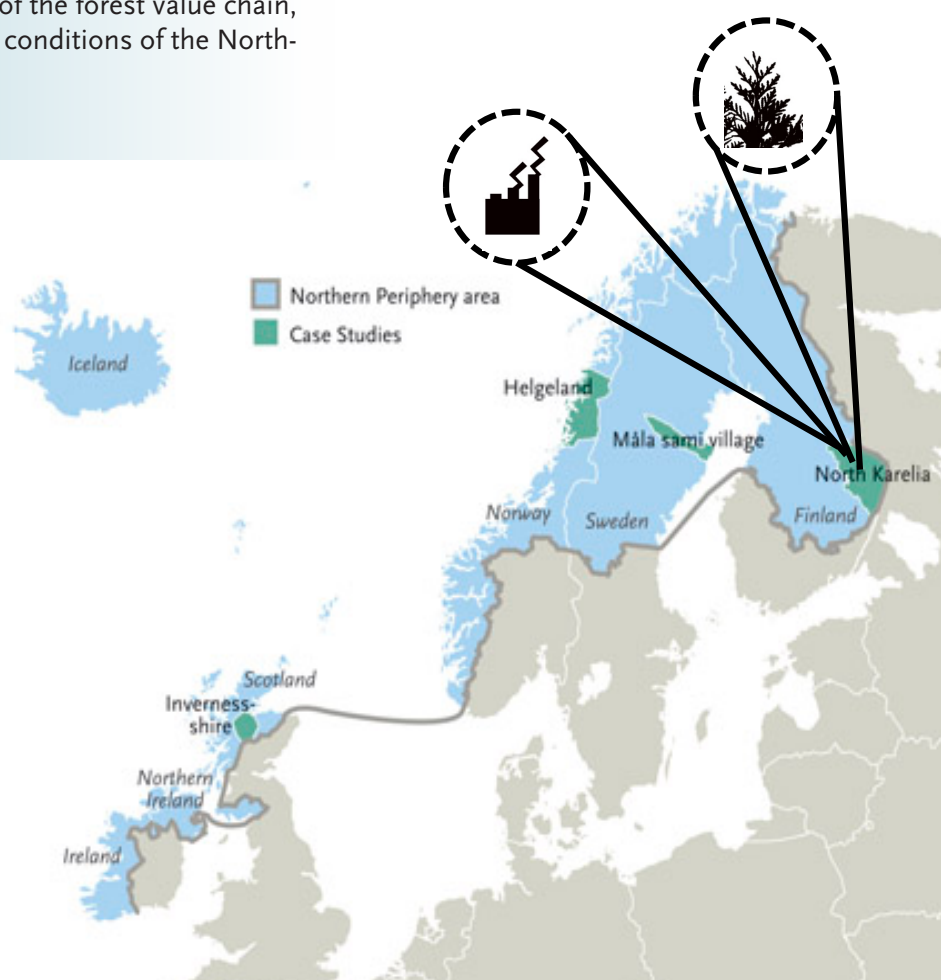
1. Public bodies engaged in regional development strategies can employ the tool in a multi-stakeholder setting to explore options for the most suitable sustainable development scenarios in the region.
2. Companies using forest resources can adapt the tool to their sustainability assessment routines. This enables them to improve corporate social responsibility, as a part of the forest value chain, operating in the remote conditions of the Northern Periphery region.

Important questions in North Karelia

- What impacts does increasing production and use of forest wood chips have on regional sustainable development?
- Do the impacts vary between centralized and distributed heat production?

Case study characterization

Forestry is significant in North Karelia; nearly 90 % of the land area is forested land and wood is the main energy source in the region. Use of forest resources is sustainable, because forest annual growth is about 8.3 Mm³ and annual felling between 4.2 – 5.4 Mm³. Current wood energy use is about 0.5 Mm³. ToSIA has been applied to support decision makers in the preparation processes of the Regional Forestry Programme and the new Climate and Energy Programme. The tool was used to demonstrate sustainability impacts of alternative forest resource use scenarios.



Regional Development

North Karelia Climate and Energy Programme 2020

Strong support through regional stakeholders including research and education bodies and a wide range of companies in the renewable energy sector

General objective for the energy sector in 2020

North Karelia aims to be a fossil oil free region in heating and power generation.

Target of forest wood chips use is 1 Mm³ by 2020

ToSIA analysis

Base line year 2005

- Use of forest wood chips 171 000 m³
- Use of heating oil; light 356 GWh and heavy 707 GWh

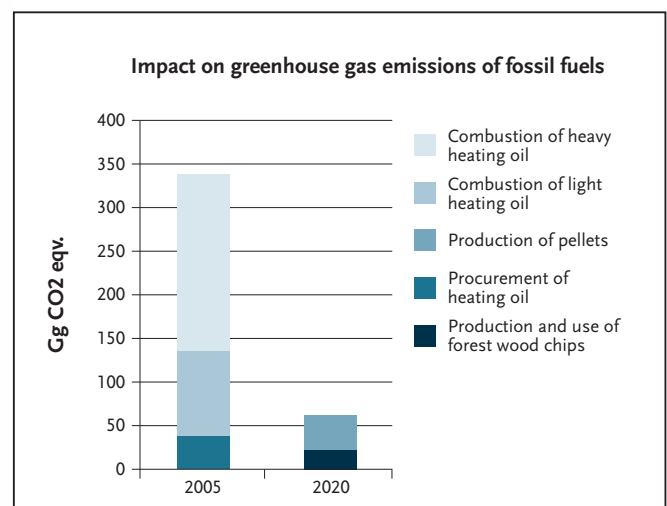
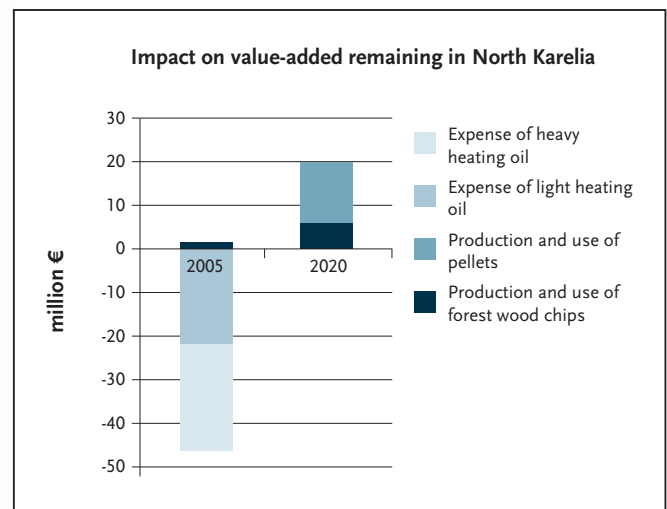
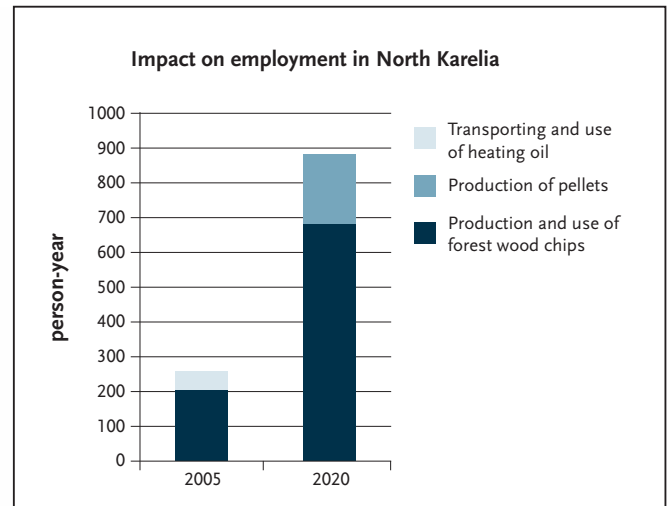
Scenario: Fossil Oil Free Region in heating generation 2020

- Heavy heating oil and half of light heating oil are replaced with forest wood chips (403 000 m³)
- A further half of light heating oil is replaced with pellets (about 37 000 ton)

Conclusions

Replacement of fossil oil to regional wood energy:

- Improves regional employment and economy
- Significantly decreases greenhouse gas emissions of production and combustion of fossil fuel





Heat production in small and medium scales

Tuupovaara Energy Co-operative

- Small scale district heating plant in the village of Tuupovaara
- Two separate boilers 0.5 MW and 0.6 MW
- Uses mainly forest chips as fuel
- Co-operative is responsible of fuel procurement and operating the district heating plant
- Annual heat production ca. 3300 MWh

Forest Wood Chain characteristics

- Light harvesting equipment
 - Chainsaws
 - Forwarding with tractor and trailer
- Roadside chipping with small size disc chipper
- Transport with tractor and trailer
 - Avg. transport distance 14 km

Outokumpu Energy Inc.

- Medium scale district heating plant in the town of Outokumpu
- 10 MW and 7 MW boilers for solid fuels
- Main fuels forest chips and sawmilling by-products
- Provides heat for over 200 customers in the area
- Energy sales in 2008: 53 000 MWh

Forest Wood Chain characteristics

- Heavier harvesting equipment
 - Small size energy wood harvesters and forwarders
 - Heavy harvesters and forwarders
- Roadside chipping done with powerful and big drum chippers
- Long distance transport with conventional rear unloading trucks
 - Avg. transport distance 50 km

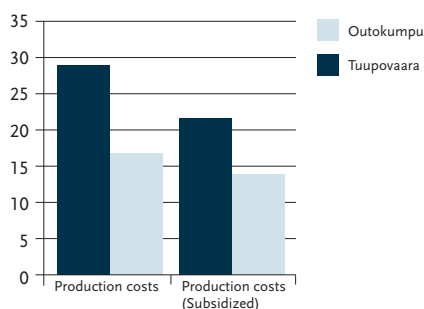


Conclusions

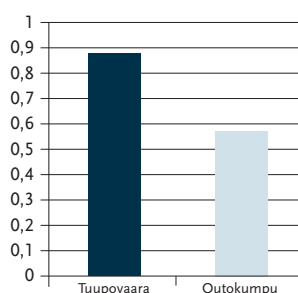
More employment and less greenhouse gas emissions in small scale heating, but higher production costs.

How these differences are evaluated depends on stakeholder's preferences.

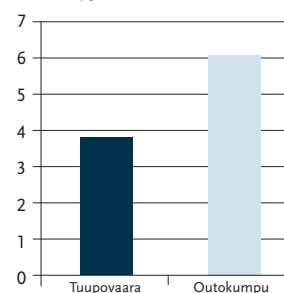
Production costs, €/MWh



Employment, person a/1000 MWh



GHG emissions from machinery, kg CO2 eq./MWh



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