SNS NK Nordic Energy Research

Sustainable biomass

and its role in the transition to a green economy

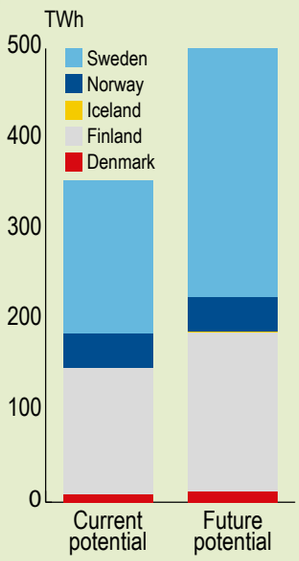
Meeting the carbon neutrality targets in the Nordic countries will require rapid and concerted actions, and likely depends on strong growth in biomass use.

FORESTRY

Potential

The potential for increased production of biomass in some Nordic forests ranges from 50–100%.

Source: Nordic Forest Research, Skogforsk, Nordic Energy Research



To do-list for increased biomass outtake from Nordic forests:

- Increase the current harvest of woodlands
- Increase growth rate through a change of species, fertilization and introducing new management methods
- Afforestation, which can increase the forest area by 2–3% (1.6–2 million ha)

Regulations

In the EU, forest biomass is required to comply with the principles of sustainable forest management:

- Productivity
- Biodiversity
- Regeneration capacity
- Vitality
- Potential to fulfill relevant future functions

Criteria for the two main international certifications for sustainable forestry, FSC and PEFC, are decided nationally. The chart below shows the most popular certifications in the Nordic countries.

National regulations in the Nordic countries include criteria to ensure sustainable forest management in the region.

Source: European Commission, Nordic PEFC standards
Neither PEFC nor FSC have published any data on certification in Iceland.

Critical issues

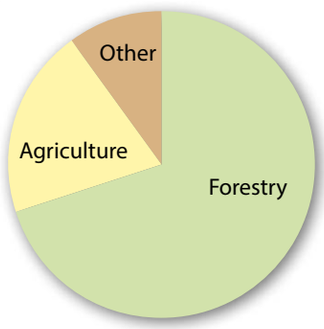
- Joint Nordic efforts play an important role in increasing the use of sustainable bioenergy
- Sustainability is included in existing legislation encompassing Nordic biomass providers
- The sustainability of Nordic biomass for heating and transport can be further improved
- Measures are needed to support the development of sustainable bioenergy in the Nordic region
- To mitigate climate change, Nordic efforts should inspire similar actions elsewhere the world

Biomass is important

The use and demand for biomass are likely to increase in the future. Simulations show that carbon neutrality requires increased biomass use in the energy sector. Meanwhile, other sectors are also forecasted to increase their need for biomass. For example, a process to use biomass to produce bio-oil (with properties similar to fossil oil) is currently being developed in the Nordic region. This is expected to enable the production of higher-value products from residues.

Total potential is great

Of the current potential Nordic biomass supply, forest biomass accounts for 70%, and agricultural biomass accounts for 20%. The remaining potential is in waste biomass.



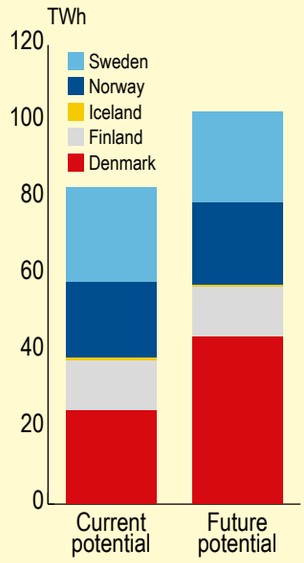
Source: Nordic Energy Research

AGRICULTURE

Potential

Production of straw, husks, energy crops and grass constitutes the main potential for increased biomass production in the Nordic countries, together with manure.

Source: Nordic Energy Research



The main barriers to increased outtake are:

- Regulatory obstacles
- Missing synergies
- Economical obstacles

A low price for straw makes it an under-used biomass source.

Regulations

The EU standards for good agricultural and environmental conditions (GAEC) aim to achieve sustainable agriculture and are related to:

- A minimum level of maintenance
- Protection and management of water
- Soil erosion
- Soil organic matter
- Soil structure

The new CAP (Common Agricultural Policy) framework for 2021–2027 will increase its focus on environmental and climate action through eco-schemes and requirements.

The international standard ISO 13065:2015 sustainability criteria for bioenergy include criteria for the production of biomass from agriculture and forestry.

Several tools and sustainability frameworks are currently available, but their practical use is limited due to high costs of evaluations and limited data availability.

Source: European Commission, ISO, Slätmo et al.

Several sustainability frameworks in use

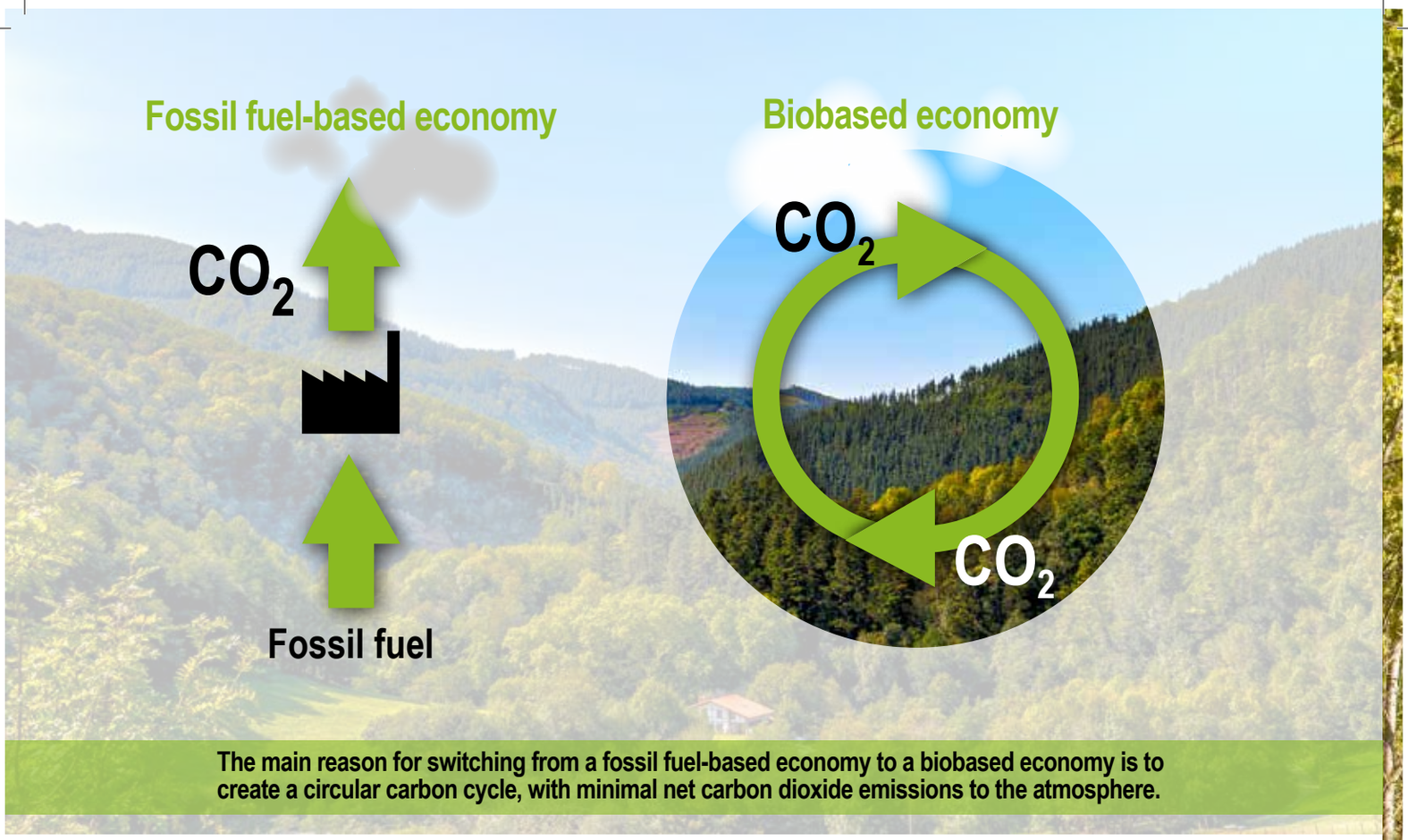
Currently, several frameworks and certifications aim to define what production and use of biomass can be considered sustainable. They often focus on a product type or a certain application. Hence, none of the current certifications has enough coverage to be adopted for a general biomass certification.

Global sustainability goals provide a comprehensive framework

The United Nations Sustainable Development Goals 7, 9, 13 and 15 are relevant to sustainable biomass production. Goal 15 includes all terrestrial ecosystems, but as forests have a significant role in reducing the risk of natural disasters and mitigating climate change, forests are especially important for goal 15.

The Convention on Biological Diversity is another international framework relevant to assessing the sustainability of biomass production in both forestry (as forests are one of the biologically richest terrestrial systems on the planet) and agriculture (where international initiatives include pollinators, soil biodiversity and biodiversity for food and nutrition).

Source: Skogsstyrelsen, United Nations



The main reason for switching from a fossil fuel-based economy to a biobased economy is to create a circular carbon cycle, with minimal net carbon dioxide emissions to the atmosphere.

Complex issues around sustainable biomass

● Goal conflicts

Forests and agriculture currently produce biomass and other services, so an increase of biomass production might reduce the other values currently produced in the areas. These include food production, ecosystems, water and soil quality.

● The speed of carbon benefits

Some biomass sources have a long carbon cycle: released carbon will be reabsorbed over a longer timeframe. This effect should be regarded and compared to the set timeframes of GHG neutrality goals, when the climate benefits of different sources of biomass are assessed.

● Technology development

Future development in carbon capture and storage technology and the potential of digital twins technology (advanced digital modeling) might decrease while maintaining or increasing productivity.

Nordic cooperation provides benefits

The Nordic countries are well placed to be global leaders in the production and use of bio-resources enhancing both competitiveness and sustainability.

The environmental skill and knowledge base in the Baltic Sea region can, together with a large stock of bio-based resources, make important contributions to the Sustainable Development Goals, mitigating climate change through developing the bioeconomy.

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