

TRIBORN

Triple Bottom Line Outcomes for Bioenergy Development and Innovation

NORDREGIO POLICY BRIEF 2017:3 • PUBLISHED MAY 2017



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Bioenergy and rural development in Europe: Policy recommendations from the TRIBORN research and stakeholder consultations, 2014-17¹

1. INTRODUCTION

Local renewable energy initiatives assume a prominent role in Europe's developing distributed energy networks in the proposed EU Renewable Energy Directive for the 2020-30 period (RED2030)². The IEA, OECD, the EU Commission and national governments are increasingly aware of this role and of the importance of reducing the barriers to their - often innovative - development. The OECD (2012) has stressed the need to ensure positive outcomes for local people in the expansion of renewable energy, and the importance of bioenergy in this regard.

The Nordic countries have been fore-runners with their municipality and region led bioenergy initiatives, and both these and the wider bioeconomy have taken off vigorously in Finland and

Sweden, where there are regions with diverse value-chains and exciting innovations. The 3,5 year inter-disciplinary TRIBORN project has studied this local and regional community action and the very often positive economic, social and environmental impacts in Norway, Sweden, Finland and Italy, and the regional, national and EU framework conditions it evolves in.

The point of departure in this Policy Brief is our research on the Nordic experience, and this explains our focus on forest-based bioenergy. Bioenergy 'communities' are common in all the Nordic countries, even in Norway where bioenergy development lags behind its neighbours. It is important to remember that in all three Nordic countries studied, municipalities - and in some cases, jointly with regions - have been delegated the responsibility for - and

have encouraged and even led - bioenergy communities. While this bottom-up governance has worked well in the Nordics, it should be seen in a context of relatively powerful municipalities, with strong underlying citizen trust compared to some other European countries. It should also be seen against a historical background of municipal responsibility for oil fuelled district heating, for example in Sweden and Finland. The proposed RED2020-30 highlights the importance of strengthening renewable energy communities and empowering consumers and communities. However, for the most part the national governments in the Nordics have generally provided framework conditions that support this, and this will remain important. The same cannot be said of all EU countries as the OECD report in 2012 makes clear.

2. GUIDING PRINCIPLES

Several guiding principles for ensuring a prosperous and sustainable bioenergy development in rural and remote communities were reflected in our research approach and method. They can be summarised as:

■ **Bottom-Up:** Look first at what is done, and what can be done, at local levels, by local people and institutions.

■ **Multilevel Governance:** The frameworks within which such local action emerges, thrives, and produces 'sustainable' outcomes involve multi-level governance in the countries concerned – we need to examine the powers and actions of all levels from local municipalities, through

regional and national levels, to the European Union.

■ **Triple Bottom Line criteria (TBL):** We should assess local action by examining the Economic, Social and Environmental outcomes, and especially the scope for positive outcomes concerning sustainable rural development in the regions from which biomass is drawn from.

■ **Multi-disciplinarity:** In order to assess the environmental (e.g. ecological, climate emissions) as well as the social (e.g. effects on quality of life) and the economic (e.g. incomes, employment, local enterprise and value added) impacts and outcomes, it is necessary to involve different academic disciplines. Our research team therefore included natural scientists

(ecologists, foresters, physical geographers), as well as social scientists (economists, sociologists, political scientists and human geographers).

■ **Participatory:** It is necessary to work closely with the members of local energy communities, the stakeholder groups, and with a range of policy makers at all levels with relevant responsibilities.

The perspective in this brief, is therefore from the "bottom-up", since it looks first at what is - and can be - done at local and regional levels, and second at the enabling or constraining factors resulting from national or transnational structures, such as national policies, EU regulations or the Paris Climate agreement.

3. BIOENERGY IN NORDIC COUNTRIES

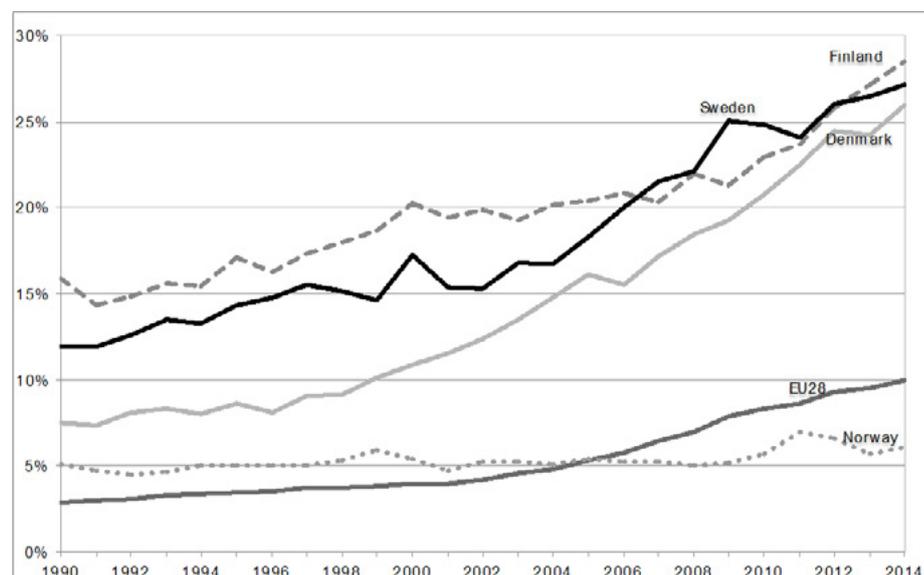
The 20th century afforestation in Nordic countries now begins to offer an abundance of mature industrial round-wood. Moreover, due to steady improvements in forest management, the yield trend is steadily upwards – more can be harvested from the same area. On the demand side, the traditional use of paper has weakened, creating good incentives for innovation of new value chains in the bioeconomy. The harvesting of round-wood generates residues and its processing generates waste. After use, wood becomes construction materials

and waste. The development of bioenergy-to-grid value chains based on all the residual sources of biomass is important for the future Nordic energy economy. It is not only carbon neutral energy in the long run, it also has the potential to reduce the load on the power grids in cold winter days where the load peaks. This frees electrical energy for transportation and export. Finally, bioenergy development has more positive impacts on local rural economies in terms of employment, entrepreneurial opportunities and incomes than any of the other energy options, whether renewable or not (OECD 2012).

All Nordic countries harvest less than their annual timber growth and have recognized capacity to increase harvesting while remaining environmentally sustainable in terms of ecosystems, carbon neutrality and climate impacts. Norway is nevertheless lagging behind its Nordic neighbours in the innovation of bioenergy value chains³ (Figure 1).

The most likely explanation for Norway's lagging position compared with neighbouring countries lies in differences in the 'framework conditions'. Comparative analysis is particularly helpful when trying to understand the significance of such differences.

Figure 1. The share of bioenergy in Gross Inland Energy Consumption in the Nordic Countries and EU-28, 1990-2014. Per cent. Source: Author's calculations on EUROSTAT data (EC 2016)



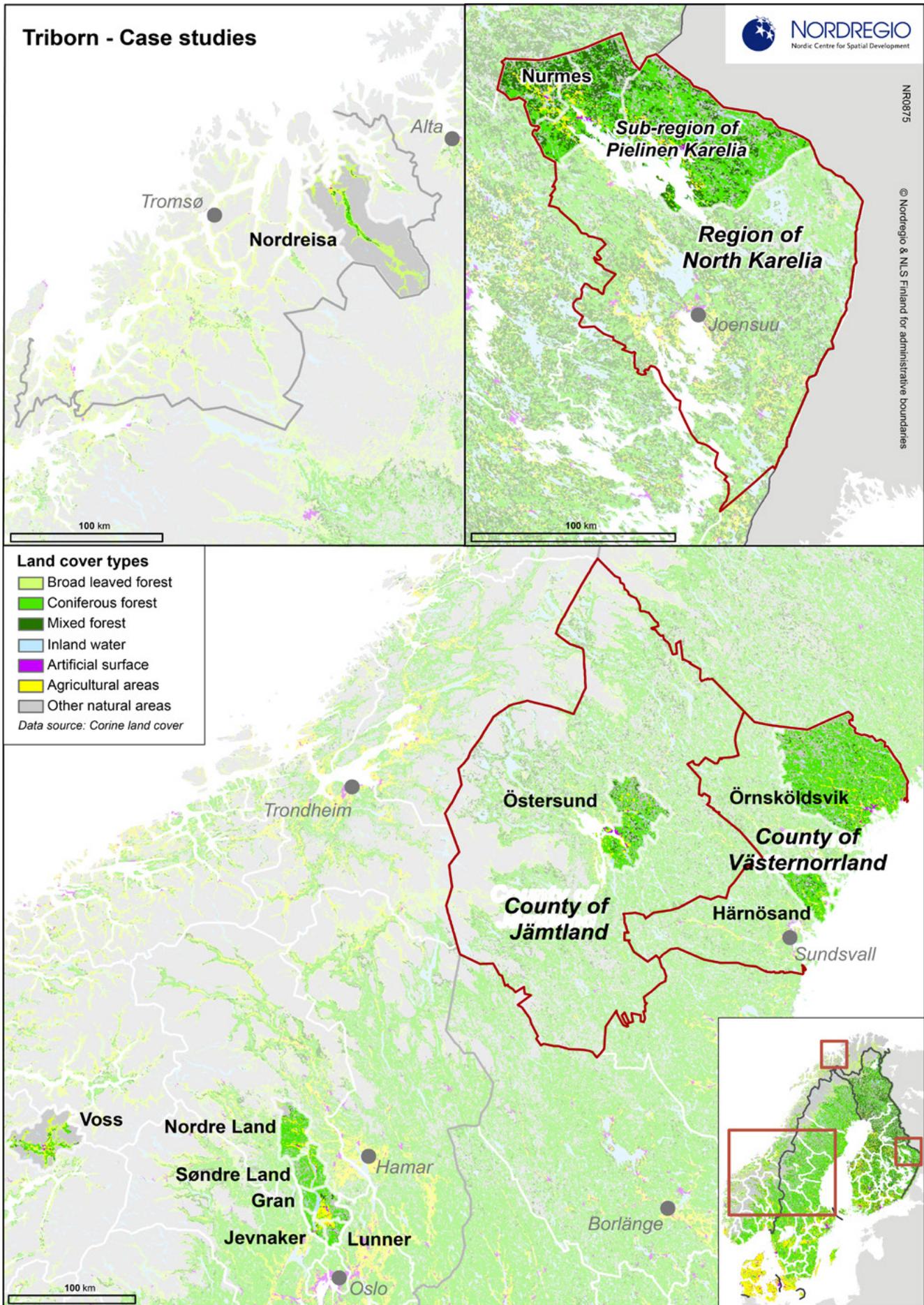


Figure 2: The case-study regions within the TRIBORN project.

4. BIOENERGY COMMUNITIES

In this section, we look at the bioenergy communities we studied in Norway, Sweden and Finland and success factors behind bioenergy development. These were in Hadeland, Nordre and Søndre Land, Voss and Nordreisa⁴ in Norway, North Karelia in Finland, and Jämtland and Västernorrland in Sweden. The cases are shown on the map (Figure 2), which also indicates the extent of the forested land in the Nordic countries, which account for about one-third of Europe's forest resources.

The typical 'good practice' model of a bioenergy community in all three Nordic countries is a public-private partnership involving biomass producers (e.g. foresters), forest transformation industries (e.g. sawmills, pulp & paper plants), entrepreneurs (forest associations, individual entrepreneurs, local commons), local and sometime regional authorities and resident groups. They are typically allied to some degree with techno-economic expertise (e.g. consultants, research institutes, colleges, NGOs etc.). They also get a contribution to their knowledge from vendors of technical plants.

We call this type of partnership a 'quintuple helix' because this best describes the main groups bringing specific knowledge and other resources into the local biomass-bioenergy chain and the coalition in bioenergy production, and innovation. They also represent different interests that are necessary for the building of long-term trust and relationships. Figure 3 below describes that model.

Most of the bioenergy communities in Finland, Sweden and Norway are led by municipalities or their district heating utility and often with strong linkages to the regional authorities, biomass and waste heat providers (sawmills, and large forest companies e.g. SCA, Norrskog) and residents contributing as customers and with bio-waste. Finland is a leading case, and within Finland, North Karelia has been a forerunner (Box 1)

In Sweden, one-third of the district heating has been outsourced to large energy corporations. Cooperative fuel and heat providers and individual entrepreneurs also play a role. Corporations are not as resilient as municipality owned utilities when meeting strong competition from low electricity prices.

In general, we find that these initiatives are more "community" orientated in small villages and more "corporation-like" in cities, and this is coherent with the inclusion of renewable energy communities in the proposed RED2030.

5. TRIPLE BOTTOM LINES – one size does not fit all

The European Commission proposal for a revised renewable energy directive recognizes the role and the rights of renewable energy communities and of "pro-sumers"⁵ in the distributed power grid, including heating and cooling. Importantly, it settles disputes on which paths of biomass and bioenergy value chains are 'sustainable', at least in environmental terms. National governments are assigned the responsibility

for defining institutional frameworks such as legislation and industry standards that minimize the risk of developing environmentally unsustainable value chains.

Within the TRIBORN project, Hansen et al. (2017a) have proposed 12 criteria observed in Sweden and Norway and instituted in legislation and industrial standards to ensure sustainability of bioenergy value chains. In general, the frameworks have ensured environmentally sustainable bioenergy in the three countries, albeit with manageable flaws.

Bioenergy will remain important in the Nordics for the foreseeable future. The countries and their foresters have been pioneers in environmentally sustainable forest management, the development of efficient converters of forest biomass to energy, including heat, and (with the main exception of Norway) in the development of district heating. They have advanced methods for forest inventories, and have developed advanced methods of Green house gas (GHG) emissions and emission-saving measurement.

However, the demands on the environmental, economic and social effectiveness of the whole value-chain are increasing, and need to be efficiently and reliably monitored. The context is now a growing bioeconomy in which there are ever more alternative uses for bio-resources (including wood and waste), and a regulatory system that gives increasing priority to GHG emissions. The notion of the *circular economy* – recycling and reuse of resources at all levels – and the *cascading principle* – that highest value uses must come first in the

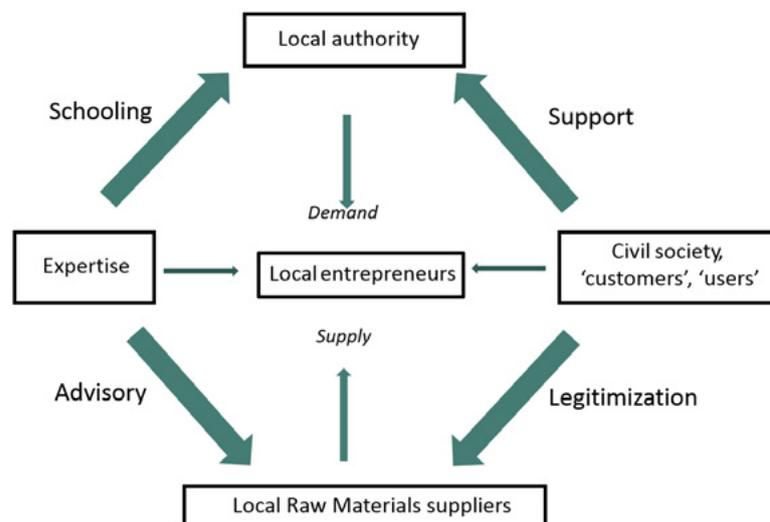


Figure 3: Typical forms of local partnerships in bioenergy cases.



» use of bio-resources, where ‘value’ is not only measured by price, but also by GHG impacts, are both important. They both reinforce the importance of the local and regional levels in terms of policies and actions to promote more balanced sustainable outcomes (Bryden et al, 2013, 2017; Clarke et al, 2015; Hegnes et al, 2016). This means that regulatory burdens and costs are increasing, and these ultimately fall mainly on governments and producers at local levels. It is important that means of reducing these costs, and finding more effective and efficient means of managing regulatory burdens, are found using new approaches and technologies.

There are claims among some NGOs and environmentalists, supported by several scientists, that sustainable forest management is not ‘carbon-neutral’. These claims have recently been given support by a Chatham House report in the UK (Chatham House, 2017). Such generalized claims are not reflected in the position of the UNFCCC Climate Panel, and have been refuted by the IEA and a large group of over 125 scientists supporting the IEA response (IEA Bioenergy, 2017). Many other reports

and articles also argue that the claim is invalid in the general case (see for example, Lundmark et al, 2014, Clarke et al, 2015, and Berndes et al, 2016). Our research does not add significant new scientific evidence to that already supplied in abundance on this question, other than to highlight the importance of context, locality, values placed on specific ecosystem services and management practices.

However, in a context of polarized opinions within the natural science and interest communities, we would strongly oppose policy measures that have the effect of limiting the exploitation of the natural, renewable, forest on at least four grounds:

The **first** is based on ethical objections to any position that leads, or could lead, to people losing their means of livelihood now and into the future, and perhaps especially those who live in sparsely populated and remoter regions where alternatives are hard to find; the **second** is based on the overarching need to utilize forests and related technology as part of the drive towards decarbonisation and re-

duction in the use of non-renewable fossil fuels, and the important role already played by Nordic countries in this process; the **third** is the European Commission’s own goal in moving to EU rather than national targets for renewable energy (RED 2030) to allow different forms of renewable energy to be produced where the relevant resources are easily available; the **fourth** is based on the competence for forestry policies that currently lies with EU (and EEA) Member States, and not with the European Commission, and where it is member states that must decide appropriate levels of harvesting.

We would further note that, following the Brundtland Report, an ethical *Triple Bottom Line* principle recognizes that sustainable development is as much about humans – their social, cultural and economic life – as it is about climate and the natural environment. All elements of the Triple Bottom Line are important for sustainability, and our key message is that local environmental, social, economic, institutional and climatic conditions and outcomes are very important in this respect: **One size does not fit all!**

BOX 1: The case of North Karelia, Finland.

North Karelia is a remote and rural region in Eastern Finland bordering Russia, with a GDP per capita of 73% of the national average. Known as Europe’s forest region, almost 90% of its total area is covered by forest. The forestry industry makes a substantial contribution to the regional economy, and the region has vast experience in commercial and intellectual engagement with forestry industry.

The Regional Council of North Karelia estimates that the regional bioeconomy cluster involves around 500 companies, has generated 6 000 jobs and about €1,7billion turnover. Between 2004 and 2010, turnover and employment in the renewable energy sector (mostly woody biomass) grew by about 130% (turnover) and 60% (employment). Because of the strength of the inter-sectoral linkages as well as the local ownership of the value-chain, the regional multiplier for employment in the forest supply chain is estimated at 2.3. (OECD 2012).

Renewable energy, 82% of which comes from wood-based sources, accounts for 63% of the regional energy mix. This has contributed to the lowering of the North Karelia’s CO₂ emissions around 21% between 2007-2012. (Regional Council of North Karelia, 2016)

The region hosts a number of multinational forestry-related industry actors. A large number of smaller actors are operating around these major actors, providing services and material across the forest industry value chain and also developing businesses stemming from the industry side streams. District heating plants – commonly owned by groups or cooperatives of foresters or mu-

nicipalities – have shifted to renewable biomass from imported oil or local peat. Local ownership together with widely spread income and employment benefits and locally fired heating systems add to the legitimacy of the sector within the local population.

North Karelia’s forest sector is thus of regional and national strategic importance. Those involved have been quick to secure adaptation of policies and regulations to local and regional needs. The long-term strategic work of the Regional Council in association with the research and teaching institutions, the foresters, the equipment manufacturers, and indeed the value-chain as a whole has both enhanced legitimacy of locally produced renewable energy, R&D and innovation activities and attracted investments. The strong regional innovation network ensures that research objectives evolve in response to specific needs within the region, which contributes directly to the competitiveness of the forestry industry. In North Karelia, the development of bioenergy is happening through formal and informal networks connecting primary producers, private enterprises in the value-chain and energy co-operatives with the public sector, regional research institutions and consumers in a quintuple-helix manner.

However, peripheral municipalities have often experienced economic problems derived from rising unemployment rates, and this underlines the importance of new investments in industries using the abundant forest resources (Lehtonen & Okkonen, 2016). Creating more value from biomass has become an increasingly salient issue in North Karelia, where biorefining is considered as a means to strengthen regional employment and economic diversification, create value-added locally and increase regional competitiveness through innovation throughout the forestry value chains.

BOX 2: The case of Jämtland and Västernorrland in mid-Sweden

The Swedish case study regions are rural forest-rich areas that demonstrate good regional practice in the development of bioenergy. In Jämtland, low value biomass from the area is converted to heat and power by a municipal utility Jämtkraft. District heating here is almost entirely biomass-fuelled, making use of forest residues, wood chips, recycled construction wood, peat and bark mainly sourced in the surrounding area. Jämtkraft utility covers more than 80% of the district heating needs in the Östersund area and about 15% of the total electricity production. The bioenergy value chains also include the production of wood pellets and vehicle gas from wastewater sludge. The local authorities have facilitated the expansion of the bioenergy sector through strong leadership and commitment to reducing GHG emissions, supporting fossil fuel free transportation (e.g. Green Highway initiative) and green public procurement practices. Östersund municipality is among 35 municipalities in Sweden that are members of Climate municipalities network (Klimatkommunerna) which demonstrates also their high ambition and leading role in local climate change initiatives.

The development of the bio-based cluster in Örnsköldsvik, Västernorrland, was triggered by structural changes in the pulp and paper industry and an economic downturn, which pushed the

establishment of a cluster company that gathered regional and local actors together in 2003 and led to the pulp mill being upgraded to a biorefinery in 2005. The cluster company SP Processum brings together large forest and paper industries, chemical industry and the municipal energy utility, as well as smaller research and technology firms and Umeå university to develop the forest biorefinery. The Örnsköldsvik cluster is a vivid example of industrial symbiosis with a closed cycle and almost no residues. For instance, the process water from the near-by chemical industries and a pulp mill is utilized for biogas production, and cellulosic ethanol is produced from pulp waste products from Domsjö Biorefinery. Today there are many agreements between the companies located here regarding the electricity supply, steam, maintenance, use of laboratories etc. The biorefinery initiative has received long-term funding from the government through a cluster programme of the Swedish Innovation Authority VINNOVA.

The synergies depend strongly on innovation of inter-relations and transfer pricing between enterprises and processes. The cluster also has strong local and regional support, and the local municipality uses surplus heat for district heating. Supporting cluster innovation platforms like this has been a key long-term strategy of innovation authorities, representing an obvious organisational response to the challenge of a sustainable expansion of forest based value chains.

6. KEY MESSAGES AND POLICY RECOMMENDATIONS

6.1 Key messages

■ **A common Nordic voice:** The Nordic countries account for about one-third of European forest resource. They have also been leaders in renewable energy, CO₂ taxation, bioenergy, and the development of a bioeconomy as a (partial) replacement for fossil fuels. They are thus important for development of European low carbon and circular bio-economy. Equally, their context, interests and concerns should have an appropriate weight in EU policy developments. It is therefore important for them to work together and make common cause in EU negotiations to ensure that the EU framework of related regulations and directives allows them to continue to lead the way in sustainable forest-based bioeconomy development in the future. Close attention must be paid to the proposed rules around 'Sustainable' Forestry and the measurement of climate gas emissions under the LULUCF.

■ **Devolve power to national authorities for harvesting:** The growing productivity of the Nordic-Finnish forests, together with the fact of under-harvesting, explains the united and clear opposition of governments and forestry interests to the EU proposals to set reference levels under the LULUCF for harvesting based on a date in time, rather than leaving such decisions to the National authorities that have forest policy competence and who can best judge the relationship between forest growth and forest harvesting.

■ **Positive role of municipalities:** The RED2020-30 recognizes that districts and municipalities have important roles to play, for example in promoting heating and related energy communities, decentral-

ized and consumer-led installations, and district heating.

This recognition is important for the Nordics, most of which have been leading actors in these or related fields. The measures that local citizens and municipalities can take on their own initiative are therefore an important element in the multilevel governance framework for the bioeconomy, and for bioenergy development within that. However, the importance of local and regional action, including citizen-led action of the type that TRIBORN studied, means that great attention must also be given to the framework conditions in which this can flourish. These framework conditions are set largely at National and EU levels, and conditioned by international agreements on climate change mitigation and adaptation, among others.

■ **Forests, and forest industries, are important for Nordic rural and regional development:** Plans for the development of the bioeconomy are set to become more important in future, including in the peripheral and sparsely populated regions. While welcoming the new provisions in the RED2020-30 dealing with the role of bioenergy in local and regional development, it is important that policies also seek to optimise – and assess – environmental, social and economic outcomes for rural areas and people. This makes it important for policy makers to develop enabling frameworks where specific regional and local conditions can be considered, local authorities are empowered, and local initiatives can flourish. Equally, the detail of the EU proposals in relation to local energy communities and consumer empowerment must be carefully examined to ensure that the successful local models developed in the Nordics and other countries can continue to thrive in the future.

6.2 Recommendations for local and regional levels

Local and regional authorities have a key role in developing the bioeconomy, and bioenergy within it, and are normally best placed to ensure that innovation in bioenergy benefits local economies, local nature and rural community residents. In TRIBORN we identified the following measures and activities at local and regional levels. In some cases, these are undertaken at regional or district level, in others by municipalities, and as municipals and regional powers differ within the Nordic countries:

- Provide incentives for good practices in relation to the development of Triple Bottom Line bioenergy and bioeconomy at local and regional levels.
- Identify human and natural resources available, including bio-waste – and set realistic objectives and targets, related evidence, and better means of access to technological and economic advice from relevant knowledge centres. This can, for example, be done through extension work; mapping of existing bioeconomy value-chains, industrial side streams and by-products in the region in order to increase utilisation of industrial waste as a substitute for raw materials by creating connections between companies in the region (industrial symbiosis). This can contribute to development of new business opportunities based on collaboration between forestry and other industries (e.g. Örnsköldsvik Industrial Symbiosis in Sweden).
- Undertake early stakeholder development, including identification of actors and interests at local/regional levels, i.e. local authorities, and animation of these actors to encourage engagement in a collective learning effort.
- Identify knowledge resources and gaps, and who and how to fill them. Local politicians, policy makers, influential stakeholders, civil society and NGOs and opinion makers should be engaged at the earliest moment to ensure that voices are listened to and legitimacy is secured. Identify knowledge brokers and expertise, and organise study visits, to fill technical, operational and economic knowledge gaps.
- Develop appropriate partnerships and stimulate cooperative and collective innovation initially and through time: How to instrument, facilitate, support, and encourage the 'quintuple helix' business or other relevant models from a policy point of view. Analyse what motivates actors, and the consequences for the institutional settings. Ensure that all parties/actors/ benefit from joint activities. Create acceptance in the community.

6.3 Recommendations for the national level

The national level provides an important overall framework for the development of a bioeconomy and bioenergy that empowers and enables local and regional action, and stimulates the transition from a fossil fuel based economy to a green economy based on bio-resources which, in the Nordics, include bio-waste and forestry. Some of the important areas of action at the national level in most of the Nordic countries are:

- The setting of a price on carbon. Fossil energy has been replaced by bioenergy with the help of Carbon taxes, which have been very effective particularly in Finland and Sweden. For various reasons, the EU ETS has not proven to be as effective in driving the transition to low-emission production.
- Act as a role model, for example through adoption of bio-energy/ bio-fuel solutions for buildings and vehicle fleets and support the creative use of industrial, municipal and other bio-waste materials; adopt green public procurement.
- Invest in infrastructure, for example in pipe reticulation for district heating.
- Frame relevant contracts to ensure that local suppliers of biomass are given a level playing field.
- Ensure enabling regulation on heating and cooling in new buildings.
- Develop a long-term commitment to bioenergy and the bioeconomy generally through:
 - o 'Green Branding' and seeking national and international recognition of the municipality based on its 'green' performance and image, which is an important attractiveness measure (e.g. Green Highway in Sweden). Participation in networks, (Klimatkommunerna, EU's Covenant of Mayors etc.) may draw international attention, attract investors and new companies. It also cultivates pride and increases acceptance of the green solutions among the residents;
 - o Monitoring and promoting knowledge, dissemination and exchange activities on the impacts of the bioeconomy activities on local people, economies, enterprises, and environment by using a Triple Bottom Line perspective and related indicators.
 - o Influencing the price ratio between 'black' and 'green' resources and consumption, so that utilisation of bio-resources and waste is maximised;
 - o Developing a strategic vision accompanied by an action plan, including a local energy plan. As there is a variegated geography, history of industry and labour, common solutions and framework do not exist and regions should develop their own bioeconomy agendas;
 - o Stimulating sustained engagement with local and regional high schools, colleges, universities and research institutes to provide support for industry links and high level of competence building. Providing a strong local knowledge base for bioenergy and special technological competence due to acquired competencies in the forest-based industries and facilitating intercompany contacts and cooperation in a quintuple-helix set-up and other new business models.
- Equally, subsidies on fossil fuels – whether direct or indirect (failure to adequately tax carbon to meet the environmental costs) – should be ended everywhere. What is important for investor and consumer behaviour is the ratio between 'green' and 'black' energy prices, and the gap needs to be widened in favour of 'green' energy. A recent study found that by scaling up 15 Nordic low-carbon solutions, global emissions could be cut by 4 Gigatonnes, or the equivalent of the entire EU emissions today, by 2030. The cost would be equivalent to only 9-days fossil fuel subsidies at global level (Nordic Council of Ministers, 2016).
- The banning of land-fill for bio-waste, as in Sweden and Norway and partly in Finland. Equally this has been a very important measure encouraging the use of all forms of bio-waste in the spheres of bioenergy and bioeconomy. »

- » ■ The flexible regulation of forest harvesting in relation to forest growth, and encouragement of improved forest management. This has enabled growth in the forest stock, and the storing of carbon within it, at the same time as it has increased harvesting in Sweden and Finland.
- The support of the skill sets needed for an advanced, sustainable (TBL) and innovative bioeconomy through all levels of education, training and apprenticeships, and at all levels of governance, as in Finland and Sweden.
- The regulation of local energy monopolies. Locally and municipally owned and operated district heating companies or cooperatives need to have a local monopoly of collective heating supply if they are to make the necessary investments in pipe reticulation and plants. However, local consumers need to be protected against exploitation of this monopoly position. This can be done by relating the costs of bio-heat supplied to that of alternative means of heating at the household level. In Norway, for example, the Energy Act allows for local energy monopolies, but regulates that the heating price should be at parity with electricity prices.

- Investment support is necessary because the bio-economy faces competition from the powerful, subsidised (implicitly and explicitly), and still dominant fossil-fuel-economy. Innovation support is necessary because many of the technologies are at early stages of development. In general, 'infant-industries' arguments apply to the bioeconomy. This can be funded by taxes on electricity, as is the case in Norway and Sweden.

- Supportive central governments ensure a positive but locally adaptive framework for bioenergy development, for example through clear objectives and long-term goals, national tax regimes, devolution of responsibilities and funding, and supportive criteria from innovation agencies, which should recognise the Quintuple Helix structure.

- Innovation policies targeted towards competitiveness, economic growth and production of know-how, but including Triple Bottom Line criteria, should also engage with the stakeholders involved. This is to ensure that local and regional policies encourage more inclusive long-term local and sustainable development in economic, social and environmental terms.

BOX 3: The case of Hadeland, Norway

Hadeland, a rural forested region, is a hub for bioenergy in Norway and has around 14,000¹ jobs/employed. The use of bioenergy in the region is three times the national average and it has one of the country's best climate accounts^{2,3}. How has this happened? Local and regional authority initiatives like Bioreg Hadeland and Green Energy Municipalities have been key strategic public initiatives and within these local top politicians, and Heads of municipal building, planning and forestry have had central implementation roles. The municipalities have constructed district heating infrastructure and bioenergy heating plants, established requirements for their use, been their customers, and made consultations for residents.

Local entrepreneurs have been motivated by the income possibilities either as an additional income in forestry or as their main business. They are diverse in their organization, being forest commons, part of forest associations or have established cooperation with actors with resources. In the phase of establishment there has been a combined emphasis on getting the right biomass, getting access to capital and good competence on technical solutions, judicial and political conditions. There have been few conflicts between actors and local communities as both industry and municipalities have emphasized information to local residents. In sum, the municipalities have acted as customers, regulators, planners and facilitators for business development.

Although Norway has ample affordable energy from hydro-power and oil, Hadeland has been able to use bioenergy to diversify the economic structure and create value-added based on local forestry biomass, reduce regional CO₂-emissions, provide more secure energy delivery in cold periods and create a coherent approach to use of local biomass⁴. For bioenergy, the production

of chips has become an important added industry for forestry, with 21m NOK output, producing 50 GWh in 2010 and with a potential of around 165 GWh with today's technology. The heating is distributed between more than 60 small heating plants and more than 15 larger ones. The diverse economic structure employs people in building and operation of plants, deliveries of equipment, plumbing, logging and transport of bioenergy, chip production and transport, sale of bio-oils and advisory and development work and was calculated to provide 23 annual jobs in 2010, mainly within the region.

Biomass waste is available from the region's sawmills and the forest industry. Bioenergy also reduces the overload of the grid in cold winters, e.g. bioenergy carried 30% of the load in January 2010 and can reduce the need for increased power, for example in tourist hubs or large industries. Finally the emphasis on bioenergy and more advanced biobased products also contributes to knowledge accumulation, regional branding in the renewable energy sector and bioeconomy generally. To sum up, Hadeland shows a good example of developing a local circular economy with job creation, a more diverse economy, reduced regional climate emissions and a local coherent support for use of bioenergy.

LINKS:

¹ <http://www.lunner.kommune.no/statistikk.312562.no.html>

² <http://regionhadeland.no/application/files/2814/5371/8114/Vedlegg-REG-160312.pdf>

³ <http://kommunal-rapport.no/energi-og-miljo/2007/06/bioenergis-ke-gran>

⁴ <https://www.hadeland.no/lokale-nyheter/bioenergi-er-blitt-naring/s/1-59-5276549?service=print>

6.4 Recommendations for the EU level: Areas of concern

The EU has an important role in relation to renewable energy and biomass, a role that has increased since the 2015 UN Climate Change Conference COP21. The EU's **Climate and Energy Framework** sets the framework for GHG emission cuts, renewable energy ambitions, and energy efficiency to 2030, leading to new targets for EU and EEA countries for several important policy areas. A Renewable Energy Package for 2020-30, including the revised **Renewable Energy Directive (RED2030)** was published on 30/11/2016. This sets targets for renewable energy, elaborates best practices in renewable energy self-consumption and support schemes, and lays down a new bioenergy sustainability policy which is crucial for the use of forests for bioen-

ergy in Nordic and Baltic countries. The proposed regulation on **Land Use, Land Use Change and Forestry (LULUCF)** will determine the accounting for activities affecting carbon sinks and CO₂-emissions from land use, land use change and forestry, and is also crucial for the Nordic countries. These proposals have been examined in the light of the TRIBORN findings, especially the need for a supportive framework for bioenergy and bioeconomy development (including at stakeholder workshops in Norway and Sweden, and meetings in Brussels and Paris). The following are the key areas of concern regarding current EU policy proposals:

The **PROPOSAL** to set reference levels for CO₂ emissions from forestry under the LULUCF are problematic for all the Nordic countries, including the forestry interests, and are opposed by them. These reference levels will be based on historical data for harvesting levels, forest composition and development, based on calculations that do not recognize the scope for increased harvesting in the Nordic countries, or the increasing forest yields that are being achieved in these countries. They will therefore freeze the development of forestry and, by extension, the bioeconomy, and bioenergy. This is a stultifying, rather than an enabling, provision that must be opposed for the following main reasons:

- It will prevent the achievement of RE goals for 2030 and beyond
 - It will further prevent the development of the low-carbon bioeconomy, and related transition from fossil fuels, thereby frustrating CO₂ emission reductions
 - It will conflict with the ambition of the RED (by removing national targets for RE) to open up comparative advantage in RE production across EU/EEA member states as part of the development of the EU energy market, since it will stop the Nordics from using their comparative advantage in forest resources and growth
 - It will stop the development of local energy communities that do, or could, depend on forest-based resources
 - It will prevent the development of a sustainable bioeconomy that is important for the future of remote and rural regions of the EU, and especially in the Nordic countries, and render many recent investments in education, training, technology and plant unviable
 - It will shift major control over forestry policy from the member states, where the competence lies at present, to the European Commission
 - The proposal is made even worse by the provision that the Commission may over-rule and replace the reference levels set by member states
 - It is unnecessary, and reflects lack of trust between the Commission and member States.
- **Our recommendation would be to leave decisions on harvesting levels to be decided at national levels based on sustainable forest management, and according to forest growth and national GHG emissions targets.**

SUSTAINABILITY RULES are laid down in **Article 26** of RED 2030. This at least provides some guidelines, but the Article also allows review and probable revision in 2023, very soon after the implementation date of 1/1/2021. This is far too soon after implementation, and creates uncertainty, and considerable risk, for investors and planners.

- **We recommend that sustainability rules remain in place for the period of the RED, with a mid-term assessment to be considered by all stakeholders prior to further revision.**



THE ROLE OF COMMUNITIES in the energy transition is covered mainly by **Articles 21 and 22** of RED 2030, but **Article 24** allows for 'opt-out' rights of consumers that could hamper the local monopolies needed for the development of bio-based district heating. In general, the provisions for renewable energy communities are too rigid and inflexible, for example concerning ownership (which seems to counter the Nordic model of heavy municipal involvement). For example, municipalities often own the local energy companies, and the 51% private ownership requirement does not work for them.

■ **We recommend that the provisions should be more supportive of the role of local energy communities, and more flexible as to their composition.**

REGULATORY COMPLEXITY will increase because of the RED and LULUCF. The costs of this regulatory complexity will fall largely on local foresters and forest companies.

■ **New ways of simplifying the regulations and of monitoring compliance must be found.**

OTHER CONCERNS of the TRIBORN team and related stakeholders can be found in the TRIBORN Policy Background Note.

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NIBIO is to contribute to food security and safety, sustainable resource management, innovation and value creation through research and knowledge production within food, forestry and other biobased industries.

Further information

Read more about the TRIBORN project here: <http://www.nibio.no/prosjekter/triborn>

Endnotes:

¹ This Policy Brief is based on the work of the TRIBORN research team with local bioenergy communities, as well as four consultations workshops with stakeholders in Norway, Brussels, Finland, Paris, and Sweden including discussions with the European Commission, OECD, IEA, AEBIOM, ENRD. The output of the research team in terms of published and working papers is also substantial, and many of these can be found at the end of this paper and on the TRIBORN website. TRIBORN was led by the NIBIO research team, with NORDREGIO, Norsk institutt for naturforskning, University of Santiago de Compostela (Spain), Sveriges lantbruksuniversitet, Energigården, CISA (Italy) and Hansen Economics. It is funded by the Norwegian Research Council under the Bionær Programme.

² In particular, such local initiatives are enshrined in the notion of 'local energy communities', which are proposed as new actors in the EU Renewable Energy Directive for the 2020-30 period (RED2020).

³ This is not however true of every District in Norway – the growth of bioenergy in Hadeland since 2000 has been roughly comparable with that in the neighbouring countries.

⁴ Nordreisa is a contrasting case with lack of success factors. They had to close down the plant in Nordreisa in the end of 2016 due to weak economy.

⁵ Pro-sumers are those who both produce and consume energy (e.g using solar panels, connected through to the grid)



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