

Wood Energy and a 'Networked Periphery' in Eastern Finland

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Abstract

This article reports on research set in North Karelia and its surrounding areas in the eastern part of Finland. This region with an economy based mainly on its forest resources has faced problems of marginalisation and out-migration and has been consciously coming up with strategies to solve them. Different challenges and opportunities posed by global transformations (internationalisation of the forest industry, rising energy prices, climate change, the urgency of energy transition, and different technological innovations) have stimulated action here to promote energy production based on domestic woody biomass resources, mobilising the interests of larger and smaller, public and private actors alike. They engage in various types of partnerships in order to advance and market their professional expertise and applications in the field. This study analyses information from interviews with representatives of different types of actors as well as from project reports, organisations' websites and newspaper articles. The starting assumption drawn from regional development and other social-scientific theories, i.e. that a 'networked periphery' is emerging, is justified by the diverse set of partnerships found and the presence of a conscious regional strategy aiming in that direction.

Introduction

This contribution is an outcome of a research project investigating the regional development implications of renewable energy production based on a local natural resource, wood, and set in the context of a rural periphery. After having developed a conceptual background and initial questions of the research (Németh 2009a), I carried out a series of interviews in 2010 with key actors in North Karelia about their roles and cooperation linkages in the region's wood energy sector. In this article, I give a structured summary of the information they shared with me, and then link the findings to the notion of 'networked periphery'.

The assumption of a networked periphery

Various theoretical approaches in socio-economic geography and regional development¹ serve as a starting point towards the conceptualisation and analysis of an as yet hypothetical, 'networked periphery' phenomenon. According to Hyttinen et al. (2002, 12):

A variety of new factors in regional development emerged in the 1990s. Local problems are interpreted in a global, multifaceted context [Amin & Thrift 1994], culturally-bound reasons have increased in importance as factors in explaining regional development, (...) Enterprise networks and industrial clusters are the keywords in interpreting the success of economic development (...) The recent approach is (...) based on enterprises networking, and on the attributes of social capital (i.e. for instance, people enhancing their know-how by interaction) (...)

Keeping in mind these 'keywords', and applying them in the rural-peripheral context, I propose the following chain of thoughts for consideration:

The objectives of regional development are rooted on the one hand, in the existence of territorial differences in social and economic development (territorial inequalities, divergence), and on the other hand, in the presence of spatial entities, open sub-systems on different scales which are a product of physical proximity (or distance, remoteness) and of distinguishable sets of natural, cultural-historical conditions and assets. Not only the global, but also the sub-national economic core-periphery relations (i.e. agglomeration economics; Baldwin et al. 2003; Krugman 1991) are manifest at various spatial levels. What is more, they are not absolute but relational and relative (since, for instance, there can be comparative growth centres included within the boundaries of peripheral regions.)

It is also important that the centre-periphery dialectic is a dynamic one. Taking a more cultural-social constructivist approach (Saarts 2007) to the enquiry, besides 'real' economic courses, there are processes not only of peripherisation but also, 'de-peripherisation' which can occur first at the level of consciousness and discourse (in the minds and in representations); and in the latter case, these may consequently help reverse the processes that had caused the marginalisation of a particular region. The existence of a (positive) regional identity or vision can help maintain favourable

bonding and bridging connections instead of increasing the relative isolation and dependency of a peripheral area. A greater density of functioning links takes us to networks: when these bonding and bridging linkages and activities are numerous and inclusive (i.e. involve the often spatially dispersed actors from diverse fields of activities and sectors, and incorporate for instance, business, policy, research and civil society), they may form a network which despite being changeable and constantly developing, is nonetheless durable since it is continuously reproducing itself as also the social (and human, knowledge, etc.) capital generated within it (Bourdieu 1983; Coleman 1998; Putnam 2000).

Major actors, interests and their connections

In this section, some of the most important actors in promoting wood energy in Eastern Finland are presented. The information about their activities and cooperation comes mostly from seven personal interviews carried out from March to July 2010, mainly in North Karelia. Figure 1 shows a simplified diagram of key actors and their linkages, which in most of the cases indicate concrete co-operation in the field of bioenergy. (WE stands for 'wood energy related', E. F. for 'Eastern Finland', and the names of the 5 regions are abbreviated, too.)

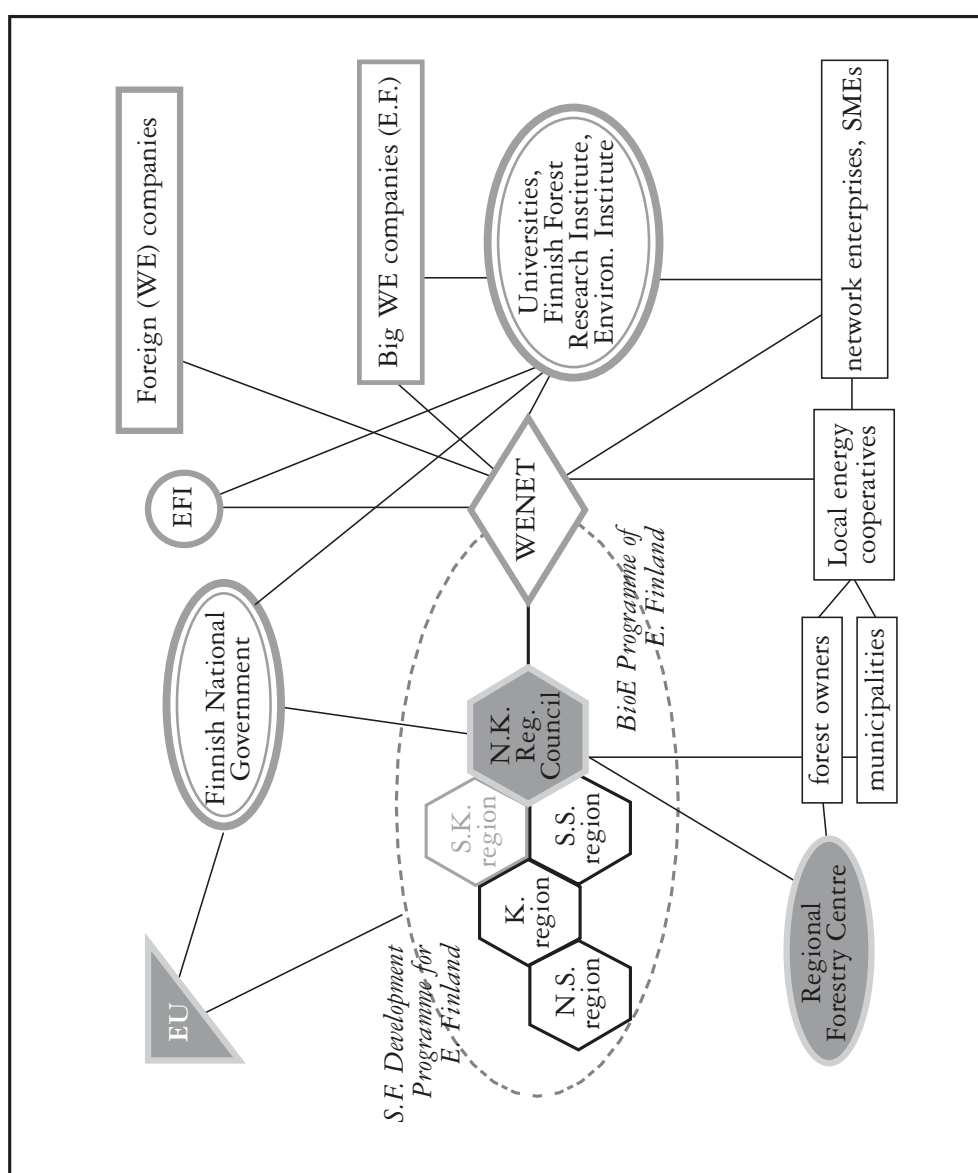
The national framework

External and internal pressures – political solutions

Finland's energy production is shared between oil (24 %), wood fuel (21 %), nuclear power (16 %), coal (14 %), natural gas (11 %), peat and a negligible amount of hydropower and wind power (2008; Statistics Finland). This means that about half of the energy is still produced from fossil fuels. There has been much pressure on the Government from two directions: the energy intensive Finnish industries want to see their energy supply secured and electricity imports reduced, while the EU climate targets demand greenhouse emissions reduction, as well as a 38 % renewable energy share in the energy mix by 2020. The Finnish Government thus aims to

substitute much of the fossil fuel used in energy production (in particular, coal and oil) by building two new nuclear power stations, and is committed to increase investments in renewable energy production

Figure 1. Key actors in promoting the wood energy sector in E. Finland and their co-operation links



Regional development policy

It is now understood that to cope with the current and foreseeable socio-economic (e.g. demographic) and environmental challenges, national level regional policy has to work against the obvious tendency of investments and human capital concentrating in just a few (5) major growth poles (found mostly in Southern Finland). The current Minister of Economic Affairs (*Mauri Pekkanen*) believes that it is possible to achieve this by focussing attention and investments on the particular strengths of individual regions, which the regions themselves should identify, since this is something 'they know best' (Hynynen 2010). The areas lagging behind are the ones richest in natural resources, and it is argued that a more efficient and innovative use of those will be the means to strengthen their economies, especially by raising entrepreneurship and creating new jobs. Related to these external and internal pressures, the wood energy sector has particular relevance to the strengthening of peripheries and further growth centres in Finland.

Intervention – subsidy systems

Several of the interviewees expressed the significance of certain state decisions due by the end of 2010. These concern in particular the smaller-scale businesses at two crucial points of the biomass-energy supply chain. One is the new support package composed of special feed-in tariffs that guarantee good prices to the producers of electricity based on renewable resources. The question is whether this will include biomass besides wind and biogas fuel types. This form of state intervention can make electricity production profitable enough to encourage the smaller-scale heat enterprises to invest in the installation of combined heat and power (CHP) plants; otherwise this will be a 'luxury' of only a few large companies. A favourable decision is thus crucial to the development of more decentralised production and supply systems, which importantly, have the most immediate impact on local development. The other cause for some anxiety is the reform of the *Kemera* support system, which serves as a subsidy to the use of small-sized thinning wood for energy production, making wood energy a more attractive side-business for forest owners, and consequently generating more employment, for instance, in chipping and transport.

Network of forestry centres with long traditions

An important public actor taking on an increasing role in promoting wood energy production is the nationwide network of regional Forestry Centres (*Metsäkeskukset*). The following extract from their website indicates their central and much respected role in Finland:

Forests are an integral part of Finnish culture and play an important role in every-day life acting as a source of inspiration for both the prosperity as well as basic survival of the Finns. The forest means more than just biodiversity; it embodies the will to survive and the spirit to change. In the minds of the Finns, the forest is still very much a sanctuary. (...) Each Metsäkeskus office offers the service of drafting a comprehensive, as well as individual, forest management plan. Great care is taken to correctly emphasise or combine different aspects of forest productivity, recreational use or landscaping needs, to create a plan that represents the state of the forest today. Each plan outlines recommendations and best practise for long term care and management for the future and includes information about expenses, yield estimations, lot map and forest biodiversity data.

(Source: www.metsakeskus.fi)

Their work falls into two different types of activities. They perform public services by supervising national forestry acts and executing other 'official' tasks. They provide general counsel to forest owners about the management and use of their forests – also concerning energy wood production – free of charge (funded by the state). On the other hand, there are some more specialised expert services which forestry centres may sell, for example, to companies engaged in heat production based on the use of wood chips. Forestry centres develop and own forest resource inventories, which is crucial information especially when planning the establishment of biomass based energy plants. One of their greatest advantages is that they have the most immediate and frequent contact with the forest owners of their regions, which gives them up-to-date and deep knowledge of their situation and needs (as well as much trust). At the same time, this closeness makes them potentially useful as 'agents' for other stakeholders linking and mediating towards these forest owners. In this way, forestry centres support local action and regional development and are regularly invited to join as partners in research and development projects related to forest energy by other organisations.

Regional councils (Regional Council of North Karelia)

Challenges to meet

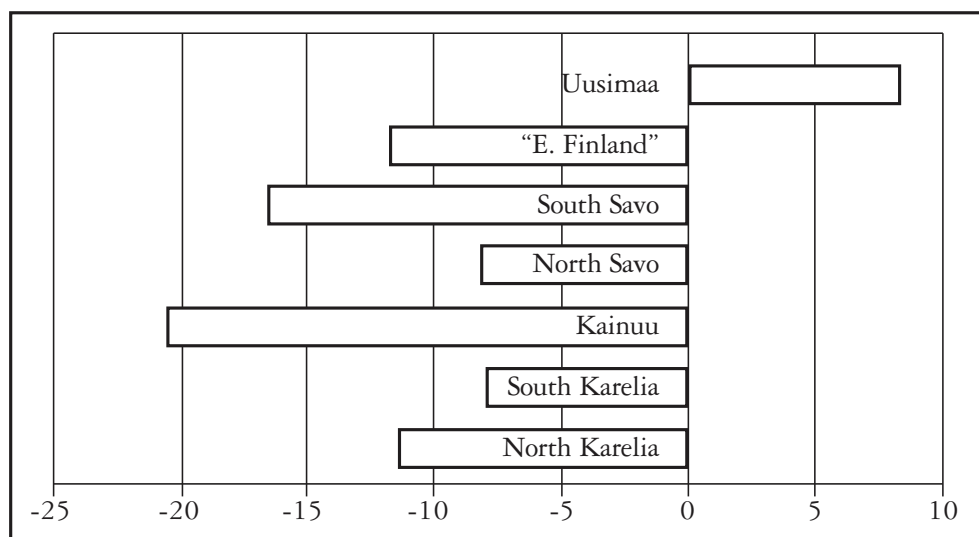
North Karelia and its wider region, Eastern Finland,² represent an economic (and to some extent, geographical) periphery of the country (see Table 1, Figures 2 and 3). Nevertheless, this area does have centres of growth (their regional capitals) with important concentrations of public and private R&D and educational functions, which are able to keep some of the out-migration from their rural hinterlands within the region.

**Table 1. Basic indicators of peripheral situation:
the regions in the eastern part of Finland (and the region of
Uusimaa including Helsinki, for comparison)**

	Area (1000 km ²)	Population (1000)	Pop. density (inh./km ²)	Major urban centre (reg. capital), its population (1000)	Share of centre in the regional population (%)	Distance on road from reg. capital to Helsinki	Unempl. rate (2010/I)
N. Karelia	21.6	167	7.7	Joensuu, 72.8	43.7	5 h 19 min (440 km)	14.8
S. Karelia	7.2	135	18.7	Lappeenranta, 71.9	53.3	2 h 45 min (225 km)	10.9
Kainuu	24.5	83	3.4	Kajaani, 38.2	45.8	6 h 32 min (561 km)	11.1
N. Savo	20.4	249	12.2	Kuopio, 92.7	37.2	4 h 32 min (392 km)	11.1
S. Savo	18.8	158	8.4	Mikkeli, 48.8	30.8	2 h 34 min (231 km)	10.7
E. Finland	92.4	792	8.6	5 centres: 324.4	40.9	–	–
Uusimaa	6.8	1,425	209.4	Helsinki, 584.42	41	0	6.5

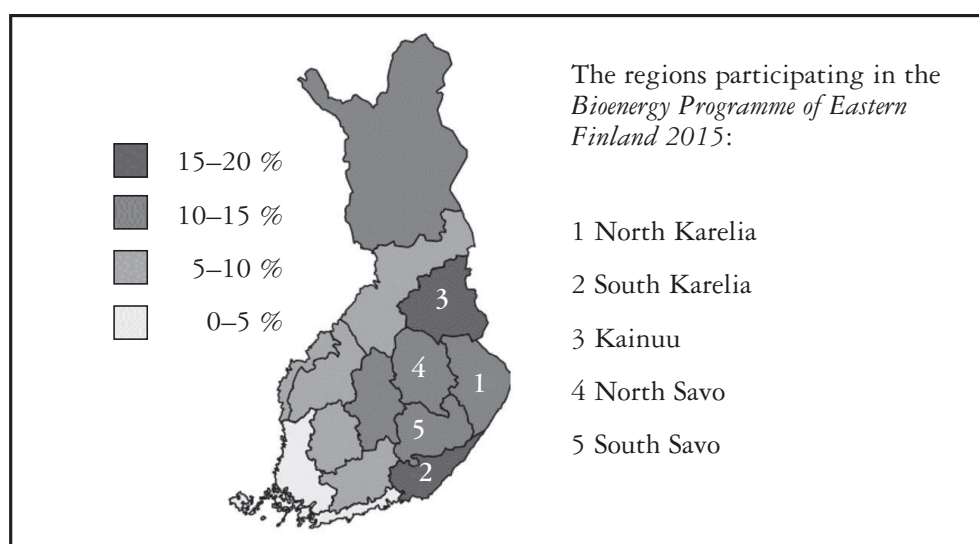
Source: Statistics Finland.

Figure 2. Total net migration of regions in the eastern part of Finland between 2001 and 2009 of the 20–39 age groups (% of population aged 20–39 in 2000).



Source of data: Statistics Finland

Figure 3. Forest sector share in regional GDP in 2006



Source: Statistics Finland (edited)

Creating a competitive and state-of-the-art image

In the case of North Karelia, the Regional Council has been consciously shaping the region's image as a centre of expertise in the forest sector ('The Region of Forests in Europe'; NK website), and more recently, of bioenergy solutions. In this region, 70 percent of total energy consumption is from renewable resources, and the long-term goal is to become totally oil independent (Gibson 2010). In the last five years or so, bioenergy seems to have defined the second strategic identity of North Karelia after claiming the title of a pioneer in developing a people-oriented information society in the late 1990s (Németh 2009b). Bioenergy is a key area and is mentioned as one of the most promising future clusters in the latest Development Programme of North Karelia. All this means clear communication of the objectives and action frameworks to the actors in the region, a positive marketing effect to the outside, as well as a message of an optimistic vision and a sense of pride.

Cooperation with similar regions focusing on strengths

Despite the obvious difficulties indicated above, the regions in the eastern periphery of Finland (see map in Figure 3) have teamed up to develop a joint programme for the promotion of bioenergy, and most recently, of other renewable energy resources, such as biogas and wind. They aim to become a 'model region nationally and in Europe' (Pirkanen 2010). They have done so not only to maintain energy independence in an era of rocketing oil prices, to strengthen their bases of sustainable development, to achieve low greenhouse emissions and favourable CO₂ trading positions but also to make profits as exporters of related knowledge and technology, and to increase employment. The region's assets include abundant forest resources³ and (at certain locations, mainly in the regional centres) much forestry and related know-how as well as some innovation capacity (BPEF 2008). Their strategy is to build on these foundations in order to achieve a stronger position within Finland, and to establish cycles of success where, as stated on the website of North Karelia: 'the region's enterprises create today's jobs, the development of technology and innovations create tomorrow's jobs and training and education are creating jobs for the day after tomorrow' (NK website).

Ensuring a two-way connection between local actors and the national/European level

Eastern Finland, a former Objective 1 area of the EU Structural Funds (SF), is still receiving support (except for South Karelia) due to its low population density, accounting for 32 % of all the SF money allocated to Finland. The ERDF (European Regional Development Fund) Programme for Eastern Finland 2007–2013 receives € 731 million (including 50 % national co-funding). This support is directed especially at ‘the establishment of enterprises, young entrepreneurs, internationalisation, the productisation of knowledge into innovative activity, and the growth of strong clusters’ (Ministry of Employment 2008). The Wood Energy Net project (Wenet, see details below) was initiated by the NK Regional Council and has received ERDF funding for three subsequent periods. This shows that a regional council can provide representation of regional interests and public co-financing and is thus a good potential partner in projects.

Furthermore, the interview at the Regional Council of North Karelia (Pitkanen 2010) revealed another essential role such councils have in promoting forest energy in their area. Continuous consultation is maintained with some of the stakeholders in the region (the so called ‘Regional Forest and Energy Group’ coordinated by the Council) including representatives of the major energy companies, local energy cooperatives, the regional Forestry Centre, universities, the Finnish Forest Research Institute (Metla, the centre of which is also located in Joensuu) and other organisations. This enables them to obtain feedback about planned regional strategies and to represent their interests in Helsinki, in forums where the Regional Council can ‘lobby’ and influence important decisions by the national government (for instance, those about the feed-in tariffs in 2010). In this way they can also advise national decision-makers on ways to achieve the EU 2020 goals. Although it would be beneficial if smaller-scale enterprises were activated in a similar way (along the entire supply chain, and also in manufacturing branches supporting wood energy production), only few of them have so far been involved by making suggestions on regional strategies as well as their own practical needs – most probably because they do not easily see the significant connection between these two.

The Wood Energy Net (Wenet)

Multisectoral stakeholdership

Wenet started out as an EU project established in N. Karelia in 2004, was subsequently extended to cover all of Eastern Finland, and has since been co-financed (besides ERDF) by the regional councils and regional development companies of Eastern Finland, the town of Varkaus (N. Savo) and the Wenet member companies through their annual membership fees. It has become more like an organisation than simply a project by 2010 with its office based in Joensuu Science Park, and the plan is to make it self-sustaining after EU funding runs out. It is managed by Josek Ltd. (Joensuu Regional Development Company) in cooperation with the Universities of Applied Sciences of North Karelia, Savonia and Mikkeli, as well as the Kajaani University Consortium. On its website Wenet defines itself as 'a network of leading experts, organisations, manufacturing companies and suppliers offering tailored sustainable energy solutions which cover e.g. the entire wood energy value chain as well as modern district heating systems' (Wenet website), and clearly states that it operates in 'Eastern Finland'.⁴ In 2010, Wenet had 34 member companies, among them multinational giants and internationally known Finnish manufacturers of forestry and forest industry machinery, heat retaining ovens, etc. with headquarters in the region (e.g. Andritz in Varkaus, N. Savo; John Deere and Kesla in Joensuu, Tulikivi in Juuka, N. Karelia), whose regional economic importance can also be seen in subcontracting to smaller local companies.

Internationalisation of business and knowledge exchange

The interview with *Jouko Parviainen* at Josek Ltd. confirmed the initial impression from the Wenet website: its main purpose is to present its member companies and the business potentials in Eastern Finland, especially internationally, and to promote knowledge transfer in and out of the region. This is done by offering so-called 'one-stop shopping', 'show-hows' about best practices, business models that have been developed and tested in Finland, and 'turn-key solutions for efficient and sustainable use of local fuel resources' (Wenet website). There has been much interest from elsewhere in Finland and even abroad. Parviainen explained that usually, when representatives of a

foreign company (e.g., from Canada, Scotland, and Russia) come for a visit with a specific business interest in mind (a product, application), Wenet invites several local/regional businesses with relevant profiles to the meetings and involves them in 'show-hows'. Sometimes these members also arrange the accommodation, lunch and social programmes for the visitors to create further opportunities for exchange. This may lead to further cooperation possibilities besides the originally targeted business partnership, so that more than just one company can benefit from this connection. Furthermore, Wenet offers its members 'cost effective marketing tools', e.g., exhibition space in international bioenergy expos at their shared Wenet stand, allowing also smaller companies to be present at those expensive events.

Intensifying networking within the region

Although less emphasised, the other original function of Wenet is to help the wood energy businesses develop within the region: to support them with information, tools and applications, advice, mutual cooperation and business-making possibilities, and to promote entrepreneurship among potential owners of start-ups. This has been partly accomplished, and partly not. The show-hows are used in training courses and study tours, which is valuable in terms of strengthening education and attracting future entrepreneurs. Wenet has been active working in R&D projects together with their Eastern Finnish partners and members (e.g., to develop solutions for competitive pellet production and innovative energy solutions for SMEs; and a Baltic Sea Region bioenergy project).

The website and the regular Wenet newsletter provide general knowledge about the supply chain, up-to-date information about exhibitions, conferences, innovations, etc.; yet some criticise it for being less interactive than it could be. Wenet so far has failed to attract many of the smaller or medium-sized enterprises into its membership, although it includes almost all the bigger ones. In addition, in order to promote new bioenergy entrepreneurship in the region, 'some sort of mentorship could be useful for young professionals who have a dream', a product or service idea but not enough self-confidence, experience and information to actually start their own private business (Kärkkäinen 2010). Wenet could be a suitable organisation to fill this gap relying on its partners and membership.

European Forest Institute

The European Forest Institute (EFI) is an international organisation with its headquarters in Joensuu and the mission to strengthen and mobilise 'European forest research and expertise to address policy-relevant needs' (EFI website). Since its establishment in 1993, it has been known in North Karelia mainly for its international staff and orientation, and less for its work in the very region it is based in. Until quite recently, it has been perceived as being 'far' from the local/regional affairs (which was confirmed by several of the interviewees). As a consequence of Europe's aspirations to combat climate change, EFI has also put more emphasis on developing and using its expertise in relevant themes, such as CO₂ balance and sustainability of different uses of forests and the impact of climate change on forests. Although EFI has always worked together with the Universities in Joensuu and Metla, it has only been in the last few years, and in the field of bioenergy in particular, that this international organisation has become involved in more diverse and extensive cooperation within the region.

Two of EFI's international projects in 2010 serve as examples. One aims at sharing and delivering good practices among the partners about sustainable forest management providing renewable energy (RoK-FOR). It is coordinated by the Regional Environmental Centre of North Karelia, involving the University of Eastern Finland, Joensuu Science Park, EFI and the NK Regional Council. The other project is Northern ToSIA within the EU's Northern Periphery Programme, where EFI is helping to improve and apply a tool across European rural case-study regions (which it had started to develop in a previous European project) to carry out sustainable impact assessments of different types of multiple uses of forests. This project is coordinated by EFI and involves, among other partners, the Finnish Forest Research Institute (headquartered in Joensuu). EFI has also organised workshops – jointly with some of the regional organisations – to involve representatives of municipalities and different other stakeholders in developing the indicators for the impact assessment tool. Besides, they started to market the newly developed tool in North Karelia, for instance, where they recommended it for use to the Regional Council in their bioenergy related strategy and policy

making. Not surprisingly, the recently updated Wenet website also includes EFI among its regional partner institutions.

Local energy cooperatives and network companies

One of the most popular Eastern Finnish ‘show-hows’ in the field of heat entrepreneurship is a cooperative in Eno, in the municipality of Joensuu. It is one of the largest of the many district heating cooperatives in Finland⁵ and has received the greatest attention (which is indicated by several newspaper articles and 500 foreign visitors in 2009 alone). Eno Energy Cooperative was launched in 1999 and the three plants were built between 2000 and 2004 (with some public financial support): they produce district heating fuelled by wood chips coming from the forests owned by the cooperative members in the Eno area. The combined output is 4.8 thermal MW; an over 7 km long network of underground piping delivers the heat to Eno (pop. 7,000): to terraced houses, old people’s homes, schools, church, service centres, etc. which are physically close enough to be feasibly connected. As a result, heating costs have dropped by € 15/MWh, and about 1.6 million litres of oil have been saved each year. What is more, the local economy has saved already € 1 million, their CO₂ emissions dropped by 4,400 metric tons annually and employment opportunities have increased. Only those detached houses that are located too far from the pipes still depend on electricity or oil (Gibson 2010; Hassinen 2010a, 2010b; Lievonen 2010; Suomi 2010).

At the start forest owners needed to be convinced that the system can generate added revenue for them; and later it was important that there were no major conflicts of interest, or arguments within the cooperative. This was relatively easy to achieve, probably for many reasons. Firstly, the cooperative form means shared responsibilities and little risk for the individual member. The administrative manager of the cooperative also works at the North Karelian *Metsäkeskus*, which has been helpful due to its proximity to forest owners, and its expertise and information about the regional resources. Finally, ‘team work’ appears to dovetail well with the mentality and culture of this part of Finland as opposed to the more urbanised and socially more ‘individualised’ south-western

areas (where private limited liability companies and faster profit seem to be more popular). Consequently, the membership of the cooperative has grown rapidly from 12 to 51.

From the viewpoint of local development, the main advantage of these cooperatives is that they are decentralised and locally embedded. The raw material, the members, the contracted harvesting, chipping and transporting enterprises are from the same relatively small area where the heating is produced and supplied, and in many cases, ash is transported back to the forests. In Eno, 80 to 90 % of the raw material comes from thinnings, which is an activity crucial to achieving high-quality and valuable logs in the long run (which is, of course, the ultimate aim and source of income for forest owners). The use of thinnings for energy production can thus be well integrated into general forest management; the only issue is the high costs of collecting and transporting this material from the forests (see *Kemera* subsidies in section 'The national framework').

Without a favourable subsidy system, and especially with a view to the EU Emission Trading Scheme starting from 2013 (when large energy companies will be forced to shift from fossil fuels by higher taxes and will be ready to pay more for energy wood to forest owners), these small cooperatives will no longer be able to function and compete with economies of scale. To prepare for the foreseeable difficulties, the Eno cooperative is considering the option of collaborating with three similar but smaller energy cooperatives in its neighbourhood, and to join forces with them at least via the forest resource end of their supply chain.

In addition, some smaller-sized wood energy businesses have started to emerge in formations mostly referred to as network enterprises. An analysis of examples from North Karelia (Pulkkinen & Pykäläinen 2010) and a longer interview at *Itä-Savon Lähienergia* (July 2010) in South Savo show that these businesses work together for the same reasons as the energy cooperatives – despite the fact that they are often in competition with each other (i.e. offering the same services). They market their products (e.g. wood chips, machinery, special expertise, applications of automation, etc.) together in a group not only to share and decrease the costs of advertisement, but to attract clients and customers with an increased

reliability of their deliveries and quality. These businesses decrease risk by providing each other with some 'backup', for instance, by stepping in for the other company in the group in case of emergent shortage of products or manpower. The cooperation between the individual enterprises develops gradually, based on trust relationships and joint experience. Furthermore, they have a better chance together to become partners of research and development institutions and recipients of public support for innovation (e.g. to implement pilot CHP projects, test new technologies). Finally, it should be noted that, as in the case of the bioenergy cooperatives described above, the local-regional embeddedness of these networking small and medium-sized enterprises means an important advantage in terms of securing their businesses and the socio-economic development of their regions.

Conclusions

From the above analysis it can be concluded that in the case of North Karelia and its wider region in the eastern periphery of Finland, regional development strategies, the decisions made and directions taken by the actors on different spatial levels have started to adapt to the new political, economic and technological realities brought about by climate change *by utilising the opportunities arising from the same transformations*. Surely, a lot of this development is visible (only or partly) on a more symbolic level, in the form of political discourse and rhetoric, suggestive names of institutions and documents and conscious image marketing. And of course, there are a few holes this research could detect in the 'fabric of the net', or at least some linkages that need reinforcement: the weak motivation of SMEs to participate in higher-level forums, or the insufficient support to innovative ideas to become start-up enterprises in the bioenergy sector. However, there is also much genuine action taking place (proactive legislation and financial support, cooperation projects, research and new business models) in the course of this adaptation process, in combating CO₂ emissions, creating local green jobs and promoting both social and technological innovation in renewable energy production. The case presented

also shows that traditional values and trust relationships – which are important cultural assets of rural peripheries – are revalorised resources in this new era of 'networks'.

What is also interesting to see is the configuration of partnerships, the connectedness, interdependencies and references across a multitude of stakeholders from the level of a small local enterprise or community to the globalised action field of transnational companies and international climate agreements. This is visible even when focussing on a single peripheral region of a country. The extent to which different actors and scales rely on each other, and the importance of their communication and learning processes and information flows in realising their – sometimes conflicting – goals and aspirations is pointing towards the emergence of a 'networked periphery'. Innovative adaptation to a new 'climate regime' requires and results in a lot of experimentation, temporariness and flexibilities across several spatial scales, and the network arrangement seems to fit this phase of development perfectly.

Acknowledgements

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Notes

- ¹ For instance, the technology and innovation approach, the local and regional implications of the innovative milieu theory, cultural institutionalism, governance theories, and to some extent, regulationism can also be applied, as also suggested by Hyttinen et al. (2002, 20–30) in their study about the regional development perspectives of the forest sector.

- ² I use the name Eastern Finland with the important condition that it does not stand for an existing administrative region (the Province of Eastern Finland existed from 1997 to 2010, and included only 3 regions: North Savo, South Savo and North Karelia). In my research, it is taken to include the regions of North and South Karelia, Kainuu, as well as South and North Savo, for the reason that these make up the area for which the *Bioenergy Programme of Eastern Finland 2015* is drafted.
- ³ Forests cover 86 percent of Finland's land area, which makes Finland the most extensively forested country in Europe (Gibson 2010). According to the Finnish Forest Research Institute (Metla) and several of the interviewed actors, about three times more biomass can be sustainably extracted for the purpose of energy production than is currently used.
- ⁴ The borders of the region, again, are not entirely clear: in terms of funding organisations, it corresponds to the four regions covered by the Structural Funds Programme, while the Wenet membership and cluster of research and expertise are drawn from a much more extended 'Eastern Finland'. South Karelia is a relative newcomer to the regional bioenergy cooperation; the earlier Bioenergy Programme (drafted around 2006) included only the four other regions.
- ⁵ Heat entrepreneurship has been rapidly increasing in Finland: there are 430 wood-fuelled district heating systems in Finland (2010) with an average capacity of around 0.5 MW; half of them are owned by cooperatives or limited liability companies (Gibson 2010).

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