

# Integrating Green Growth in Regional Development Strategies

Lise Smed Olsen (Ed.)

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takes place among the countries of Denmark, Finland, Iceland, Norway and Sweden, as well as the autonomous territories of the Faroe Islands, Greenland and Åland.

### **The Nordic Council**

is a forum for co-operation between the Nordic parliaments and governments. The Council consists of 87 parliamentarians from the Nordic countries. The Nordic Council takes policy initiatives and monitors Nordic co-operation. Founded in 1952.

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Stockholm, Sweden, 2012

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# Preface

This is the final publication of the project Regional Strategies for Green Growth and Innovation, commissioned by the Nordic Working Group for Third-Generation Regional Policy. The intention of the “third-generation regional policy” is to use the potential of each region in the best possible way and to integrate all Nordic regions and local communities into the global economy. The working group is composed of representatives from the national ministries responsible for regional policy. It was established by the Nordic Committee of Senior Officials for Regional Policy. One of the working group’s priorities is to explore the potential of green growth for regional development, for which purpose this project was initiated in July 2011. Its main objective is to provide policymakers with a useful reference on regional challenges and opportunities to achieve green growth and innovation.

This report synthesises the work carried out within the framework of the project which comprise

the working papers “Scoping Green Growth and Innovation in Nordic regions”,<sup>1</sup> and “Green Growth and Innovation in Nordic Regions: Case Studies”.<sup>2</sup> The report concludes with an introduction to policy implications identified within the project in preparation for post-2013 regional development strategies, and suggestions for further research on the topic of green growth in a regional perspective.

The authors would like to thank the representatives of the Nordic Working Group for Third-Generation Regional Policy who have commented and provided valuable input on draft versions of this working paper. We also thank Maria Lindqvist and Lisa Hörnström for their comments and advice during the working process.

Ole Damsgaard  
Director

Stockholm, November 2012

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1 Olsen and Weber (Eds), 2012

2 Olsen et al., 2012



# Summary

This is the final publication of the project Regional Strategies for Green Growth and Innovation commissioned by the Nordic Working Group for Third-Generation Regional Policy. It comprises an identification of key concepts; a quantitative mapping exercise of green growth performance in Nordic regions; two case studies of respectively an urban and rural region which have both targeted public development initiatives within the area of green growth; and finally policy implications for green growth in post-2013 regional development strategies and suggestions for further research.

Perspectives on green growth have developed in the discourse of international institutions such as the Organisation for Economic Co-operation and Development (OECD) and the European Union (EU). The EU has integrated the concept of green growth into the strategy “Europe 2020”, which echoes the common understanding that the economic and financial crisis is a point of departure for the tripartite priority of “smart, sustainable and inclusive growth”. The Nordic Council of Ministers through the Nordic Prime Ministers’ Working Group for Green Growth has set the objective to make cooperation a key priority through a unified vision, titled “The Nordics – leading in green growth”. Three key concepts are especially significant: green growth, eco-innovation, and environmental technologies. The aim of green growth is principally the same as that of sustainable development, that is, to achieve balanced, resource-efficient growth that does not degrade the environment. Yet green growth extends a more direct focus on the conceptual, policy and monitoring tools necessary for innovation and investment that can give rise to competitive sources of economic growth. Environmental technologies involve all technologies whose use is less environmentally harmful than relevant alternatives and involves measures to support eco-innovation. The concept of eco-innovation recognises that technological innovation alone is not sufficient to enable the transition of Europe into a resource-efficient economy, and the role of procedural and organisational eco-innovation is now being further emphasised as a means to reduce environmental impacts while maintaining economic performance as a priority.

The quantitative mapping exercise follows work by the OECD and the EU initiative “Eco-innovation Scoreboard”. Indicators have been gathered from an assessment of the availability and relevance of each

indicator in the Nordic context. Using the OECD indicators to measure green growth was challenging, because in several cases they were not applicable to a Nordic context or did not possess regional dimensions that would distinguish between Nordic regions. The chosen indicators were grouped into three themes: socio-economic conditions, innovation capacity and performance, and natural assets. Quantitative analysis suggests that challenges for regional development are related to the issue of population change, especially in terms of the flow of people to urban regions at the expense of population loss and ageing in rural areas. Urban regions are noted for population growth, comparatively low unemployment and high GDP per capita. Because knowledge and innovation institutions, as well as economic production, are largely concentrated in these areas, they are also the recipients of the majority of R&D funding in the Nordic context. Many green production activities are located in rural areas whereas a vast majority of resource consumption takes place in urban settings. This is an increasingly important consideration in the Nordic countries as growth of just a few large urban centres continues to take place at the expense of the vast rural areas. The urban-rural dimension as a territorial context to some extent frames the conditions of green growth and eco-innovation, and has been the point of departure in the selection of case studies.

The case studies concern the urban region of Skåne in southern Sweden, with a focus on activities in cleantech, and the rural region of South Savo in eastern Finland and its activities in bioenergy. Main drivers of a public policy focus on cleantech during the early 2000s were the initiation of cooperation between the environmental division and the business development department which had not previously cooperated at Region Skåne; an analysis to identify which area had the most potential for environmental business development; the commitment of the Regional Council to fund cleantech development through a cluster organisation; and the development which had been initiated by Malmö City in the 1990s on sustainable urban construction. Main drivers of a public policy focus on bioenergy during the 1990s in South Savo included: the vast supply of natural resources which meant that forestry has always been an important sector in the region; the consequent use of forests in bioenergy production; establishment of a carbon dioxide tax system favouring the use of

wood, wind energy and waste fuel on a national level in Finland in 1990; the role of two municipally-owned energy companies in the shift towards systematically coordinated bioenergy development; and finally the establishment of an energy foundation by one of the energy companies and its owner municipalities, which has since then been a significant funding body for almost all bioenergy development projects in the region.

In both case study regions cluster development has been used as a public policy tool to support cleantech and bioenergy development respectively. In Skåne the cluster organisation Sustainable Business Hub (SBH) was established in 2001, and in 2011 the bioenergy cluster organisation Biosaimaa was initiated in South Savo in order to support the continued development of the national Centre of Expertise Programme. Within the project-based activities of SBH structures have been developed to support networking, business development and an approach to provide “sustainable solutions” in export missions. In South Savo most of the projects within the Biosaimaa cluster organisation are in their early stages. The focus is on projects dealing with bioenergy logistics solutions, including starting up a bio-logistics centre in 2013 and an associated biocoal plant that will be fully operational by 2015.

Policy implications were discussed in the light of quantitative and qualitative analyses. It was found that regional analysis of regional context and potential for green growth is important, and it was suggested that a starting-point for identifying green growth potential would be to study the three areas of socio-economic characteristics, innovation capacity and performance, and natural assets. The role of higher education institutions is another significant element: e.g. it was found in both case studies that there was a need for development of certain competences in the cleantech and bioenergy sectors. Challenges related to education

as well as research and development needs can be discussed and coordinated through different forms of regional partnerships. Cluster initiatives may facilitate networking, business development, export, etc., but it is stressed that cluster organisations should have an outward-looking perspective in order to identify potential for interregional and international collaboration. The policy implications of entrepreneurship, product development and export in the case of environmental technologies are also important. The role of eco-innovation in public procurement is relevant in this regard as it may provide an opportunity for firms to carry out demonstration projects. Furthermore, a focus on eco-innovation in public procurement is an opportunity for public authorities to act as demanding customers and be a driving force for green growth.

Four main points were emphasised as important in the development of green-growth strategies in addition to traditional regional development strategies: (1) the need to ensure the integration of the concept of green growth in all regional development strategies; (2) the need for an increasing focus on the proper utilisation of natural resources; (3) the need to ensure cross-sectoral collaboration in the development of strategies, e.g. between environmental and business development departments of public authorities, and to include third-sector parties such as environmental and nature protection NGOs; and (4) the need to meet demands for new ways of identifying potential for green growth in existing economic sectors in a given region. Finally, suggestions for further research were given in terms of further development of quantitative indicators to identify performance and potential for green growth at the regional level, as well as studies of industries which contribute the most to environmental pressures and can thereby also potentially contribute most toward greening the economy through eco-innovation.

# Introduction

Perspectives on green growth continue to evolve in the discourses of international institutions such as but not limited to the United Nations Environment Programme (UNEP), the World Bank, the European Union (EU) and the Organisation for Economic Co-operation and Development (OECD). In many respects, the OECD has developed the most extensive green-growth framework, as it has issued a series of publications to facilitate the understanding of the concept, e.g. a report on indicators for monitoring green growth.

The EU has integrated the concept of green growth into the strategy “Europe 2020” which echoes the common understanding that the economic and financial crisis is a point of departure for the tripartite priority of “smart, sustainable and inclusive growth”. These priorities are rooted in five headline targets of which green growth is most evident in the commitment to increase resource use efficiency, adhere to the 20/20/20 energy and climate targets, and invest 3% of GDP in R&D.<sup>3</sup> Regions in the EU member countries will need to consider a shift towards a low-carbon economy as one of the thematic objectives of post-2013 EU Cohesion Policy.<sup>4</sup> In this context, “Smart specialisation” is an approach which incorporates green growth and eco-innovation. It involves a new conceptualisation of regional innovation strategies, and the presence of a smart specialisation strategy is to be

part of the new ex ante conditionality framework for any region that wishes to use the European Regional Development Funds (ERDF) for innovation activities.<sup>5</sup>

The Nordic Council of Ministers through the Nordic Prime Ministers’ Working Group for Green Growth has set the objective to make cooperation a key priority through a unified vision titled “The Nordics – leading in green growth”.<sup>6</sup>

This report synthesises the work carried out within the framework of the project “Regional Strategies for Green Growth and Innovation” which comprises the working papers “Scoping Green Growth and Innovation in Nordic Regions”,<sup>7</sup> and “Green Growth and Innovation in Nordic Regions: Case Studies”.<sup>8</sup> This report first introduces key concepts which are relevant in studies of green growth and innovation. Second, a quantitative study provides a mapping exercise of green-growth performance in Nordic regions. Third, a synthesis is presented of case studies of an urban and a rural region which aim at utilising place-based potential and have targeted public development initiatives within the area of green growth. Finally, in the light of quantitative and qualitative studies policy implications for green growth in post-2013 regional development strategies are discussed, and suggestions for further research provided.

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<sup>3</sup> Charles et al., 2012

<sup>4</sup> NCM, 2011

<sup>5</sup> Olsen and Weber (Eds), 2012

<sup>6</sup> Olsen et al., 2012

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<sup>3</sup> EC, 2010

<sup>4</sup> Commission Staff Working Document, 2012



# Key concepts: An overview

Three key concepts are especially significant in the context with which we are dealing: green growth, eco-innovation, and environmental technologies. Definitions

of these concepts drawing especially on the work of the OECD and the EU are given below.

## Green Growth

The Nordic Prime Ministers' Working Group on Green Growth proposes to apply the OECD's definition of green growth as a basis for a Nordic approach. The OECD states:

*“Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities”.*<sup>9</sup>

The concept of green growth is not intended to replace sustainable development; rather, green growth embodies sustainable development.<sup>10</sup> The aim of green growth is principally the same as that of sustainable development, i.e. to achieve balanced, resource-efficient growth that does not degrade the environment. Yet green growth has a more direct focus on the conceptual, policy and monitoring tools necessary for innovation and investment that can give rise to competitive sources of economic growth.

## Environmental technologies

The Environmental Technologies Action Plan (ETAP) was adopted in January 2004 as a co-operative initiative between the European Commission, member states and industry to overcome barriers hindering the development of environmental technologies. Within the framework of the ETAP, member states developed national roadmaps for eco-innovation.<sup>11</sup> The definition of environmental technologies in the ETAP is:

*“All technologies whose use is less environmentally harmful than relevant alternatives”.*<sup>12</sup>

The development of environmental technologies is an approach designed to support eco-innovation. The Eco-innovation Action Plan was launched by the European Commission in December 2011 as a successor to the ETAP. The new Action Plan will build on the experience gained to date, especially in promoting eco-innovation's development and uptake. The plan will focus on developing stronger and broader eco-innovation actions across and beyond Europe.

<sup>9</sup> OECD, 2011a, p. 9

<sup>10</sup> OECD, 2011a, p. 9

<sup>11</sup> Barsoumian et al., 2011

<sup>12</sup> EIO, 2012

# Eco-innovation

The Eco-Innovation Observatory (EIO) began in 2010 as a three-year initiative by the European Commission's Director General of the Environment to develop an integrated information source on the current state and potential of eco-innovation. This takes place in the context of the Europe 2020 flagship initiative to achieve a resource-efficient Europe. The EIO has developed the following definition of eco-innovation:

*“Eco-innovation is the introduction of any new or significantly improved product (good or service), process, organisational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle”.*<sup>13</sup>

Eco-innovation should be understood as a response to either minimising or fixing environmental impacts from consumption and production activities, and handling the present overconsumption of natural resources. It is recognised that technological innovation alone is not sufficient to enable the transition of Europe to a resource-efficient economy, and the role of procedural and organisational eco-innovation is now being further emphasised as a means to reduce environmental impacts while maintaining economic performance as a priority. In addition to the important role of eco-innovation in industry, more transformative innovations are needed that shift entire systems from unsustainable consumption behaviours to more circular systems of material use and reuse. Public acceptance and social changes are key to this transition, and everyone will need to contribute to this change in their everyday lives.<sup>14</sup>

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<sup>13</sup> EIO, 2011, p.2

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<sup>14</sup> Ibid.



# Mapping of Indicators of Green Growth and Innovation

Following work by the OECD and the Eco-Innovation Scoreboard of the EIO,<sup>15</sup> 24 indicators based on an assessment of the availability and relevance of each indicator to the Nordic context have been identified. These 24 indicators have been grouped into three themes: socio-economic conditions, innovation capacity and performance, and natural assets. Generally speaking however, of statistical analysis of indicators of regional green growth performance presents a number of challenges in Nordic countries, which are discussed below.

*Conceptual:* The broadness of the notion of green growth, which encompasses a large spectrum of economic activities, means that it is not very conducive to aggregate indicators in a composite measure of performance or potential at the Nordic level. Because of the high number of region-specific variables and the complexities that characterise their relationships, it appears that comprehensive (multi-sectoral) green-growth analyses may be preferable only when the activities and opportunities within individual regions are under investigation.

*Applicability:* In numerous cases the OECD green-growth indicators are either not applicable to a Nordic context or do not possess regional dimensions that will distinguish between Nordic regions. For example, OECD indicators include life expectancy as a socio-economic measure of growth, the availability of sewage treatment and drinking water as a measure of

the natural asset base, and environment-related taxation as an indicator of green-growth policy responses.

*Consistency:* Although there is no shortage of data regarding the economy and environment, it is difficult to conduct comparative analyses because of national differences in classifications, terminology and the currency and comprehensiveness of data accounts.<sup>16</sup>

*Scale:* The OECD's collection of green growth indicators is based at the national level. On one hand, this allows for the inclusion of indicators which are simply not available at a higher resolution. On the other hand, this limits the ability to analyse the importance of a number of territorial dimensions that can only be explained when digging deeper into sub-national, regional trends. As such, this report is completed with regional (NUTS 2 or 3) statistics to the extent that they are available.

*Inability to interpret statistics:* A continuing challenge highlighted by the OECD is the extreme difficulty of delivering quantitative and statistical appraisals of the environmental dimension of quality of life and of policy responses to green growth. For this purpose, case studies of specific regional examples have great value in characterising the regional dimensions of green growth.

The three themes of socio-economic conditions, innovation capacity and performance, and natural assets are analysed at the regional level in the Nordic countries in the following.

## Socio-economic conditions

The socio-economic conditions present in a region underpin the basis of any discussion of growth, including green growth. From this perspective, well-performing regions in terms of production, human capital and competitiveness (as represented by strong GDP, low unemployment, a low dependence ratio and a suitably skilled workforce) are better equipped to invest in a switch to a green economy.

There is a great range of regional population densities across the Nordic countries, from extremely

sparsely to extremely densely populated regions. Denmark naturally has the highest values because of its small size, with Copenhagen in particular being the outlier. There is a north-south divide characterising the remaining countries, with higher densities in the south and extremely sparsely populated areas in the north.

Map 1 shows the population development during the period 2006 to 2011, which shows the most negative development in the northernmost regions of Sweden and Finland, Satakunta, the regions in eastern Finland,

<sup>15</sup> OECD, 2011c; EIO, 2011

<sup>16</sup> OECD, 2011c

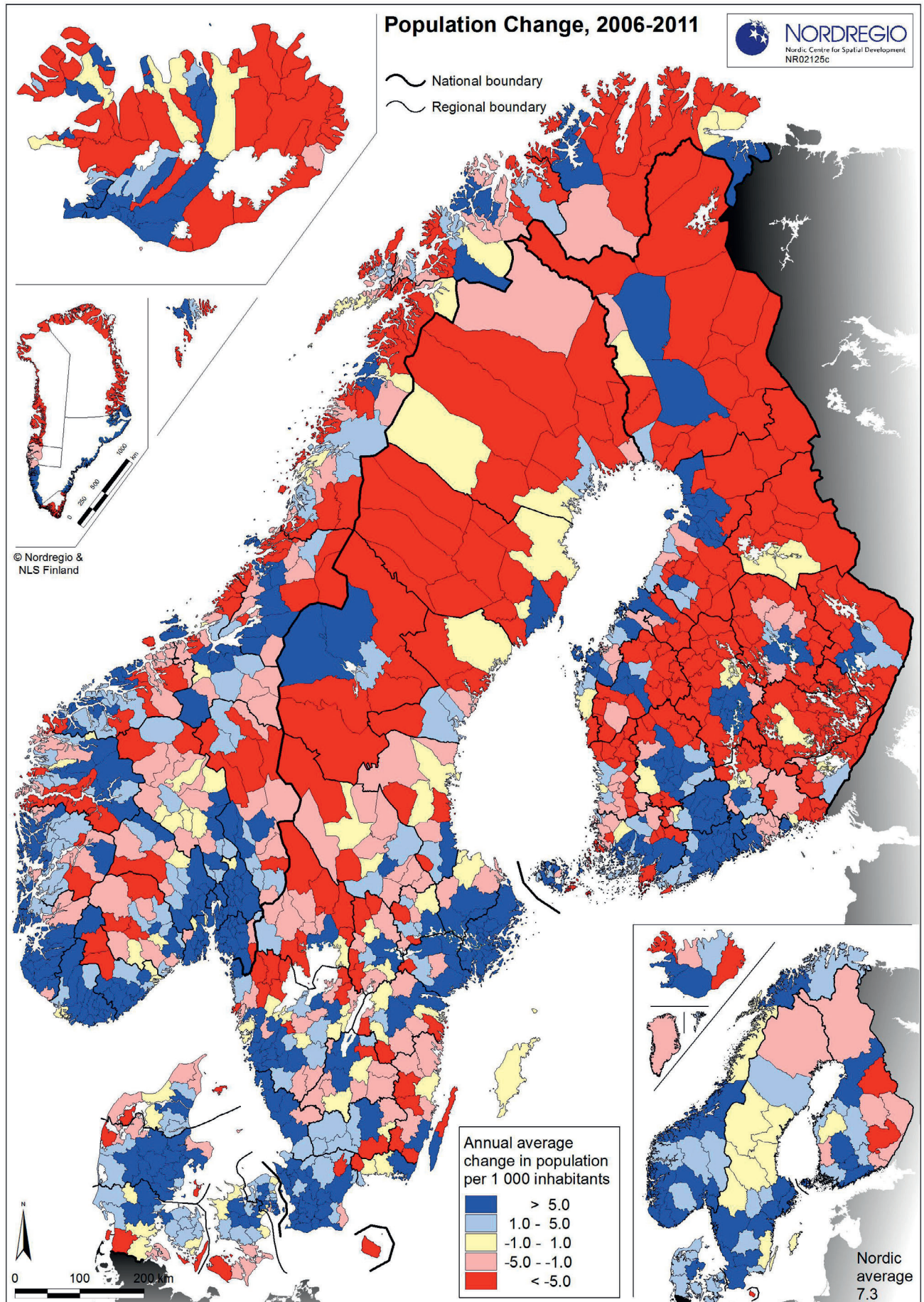
as well as Bornholm. Further, a number of regions in mid- and southern Sweden, Nordland in Norway and Southern Ostrobothnia have experienced a negative population development. Iceland, most of Denmark and Norway, as well as mainly southern Sweden and the south-western regions of Finland have had a positive development.

Map 2 presents GDP per capita. Although the Nordic countries as a whole are well above the European average in terms of value of production (which is taken as an indication of regional economic prosperity), significant internal variations exist. The range of values suggests that the wealthiest region is roughly nine times richer than the poorest. At the top of the spectrum lie the capital regions, along with Birkaland in Finland, the birthplace of Nokia, which still hosts many of the company's operations. The seemingly poor economic performance of a large part of Norway is the result of the dominant role of offshore oil-related activities that are attributed not to any one region's GDP but rather to the national aggregate only. When this Norwegian statistical anomaly is excluded, Finland appears to be the only poorly performing country, with its south-eastern border and western coastal regions lying at the lower end of the spectrum.

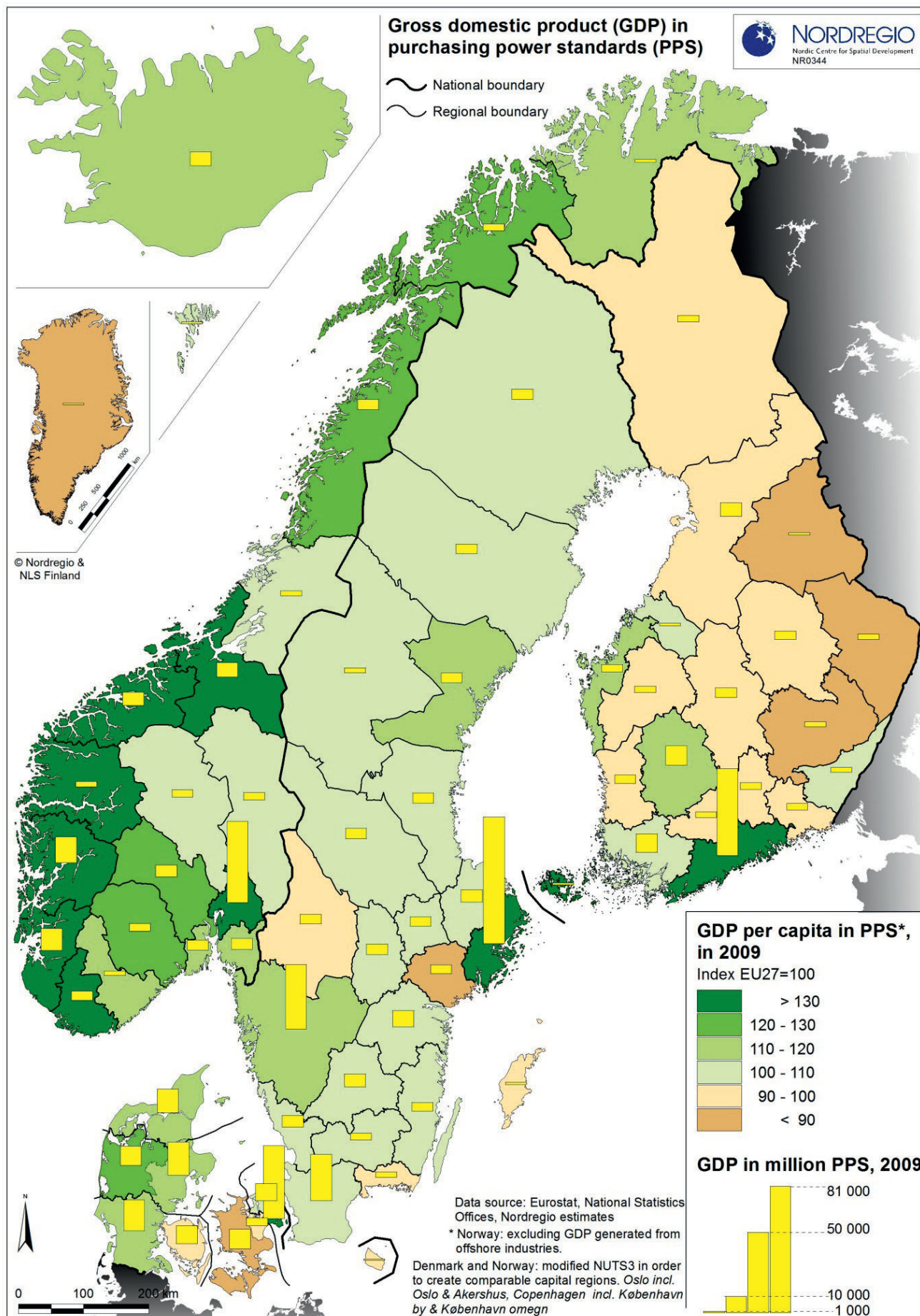
Map 3 presents unemployment and labour

force participation (LFP) rates. The former measures the percentage of people actively seeking jobs and the latter is an indirect measure of the percentage of the population of working age not participating in the labour force (and therefore economically dependent on those who do participate). It is clear that Norway has the lowest unemployment rates and relatively high LFP rates. The highest unemployment figures can be found in the northern reaches of Sweden and Finland, in a cluster of regions in central and eastern Finland and in the county of Örebro in Sweden. LFP rates are reasonably high in Sweden and are comparable to those in Norway. Iceland exhibits the highest LFP rates, which translates to very low dependence rates. Denmark exhibits rates slightly lower than those of Norway and Sweden, whereas Finland appears to have the lowest rates, with a significant percentage of its working-age population not participating in the labour market. This is particularly pronounced in the eastern Finnish regions, which also exhibit low GDP per capita figures, painting a rather unfavourable socio-economic picture. As expected, the core-periphery dichotomy is apparent in all the Nordic countries, with the capital regions exhibiting much better functioning labour markets than others. This is the focus of further analysis below.

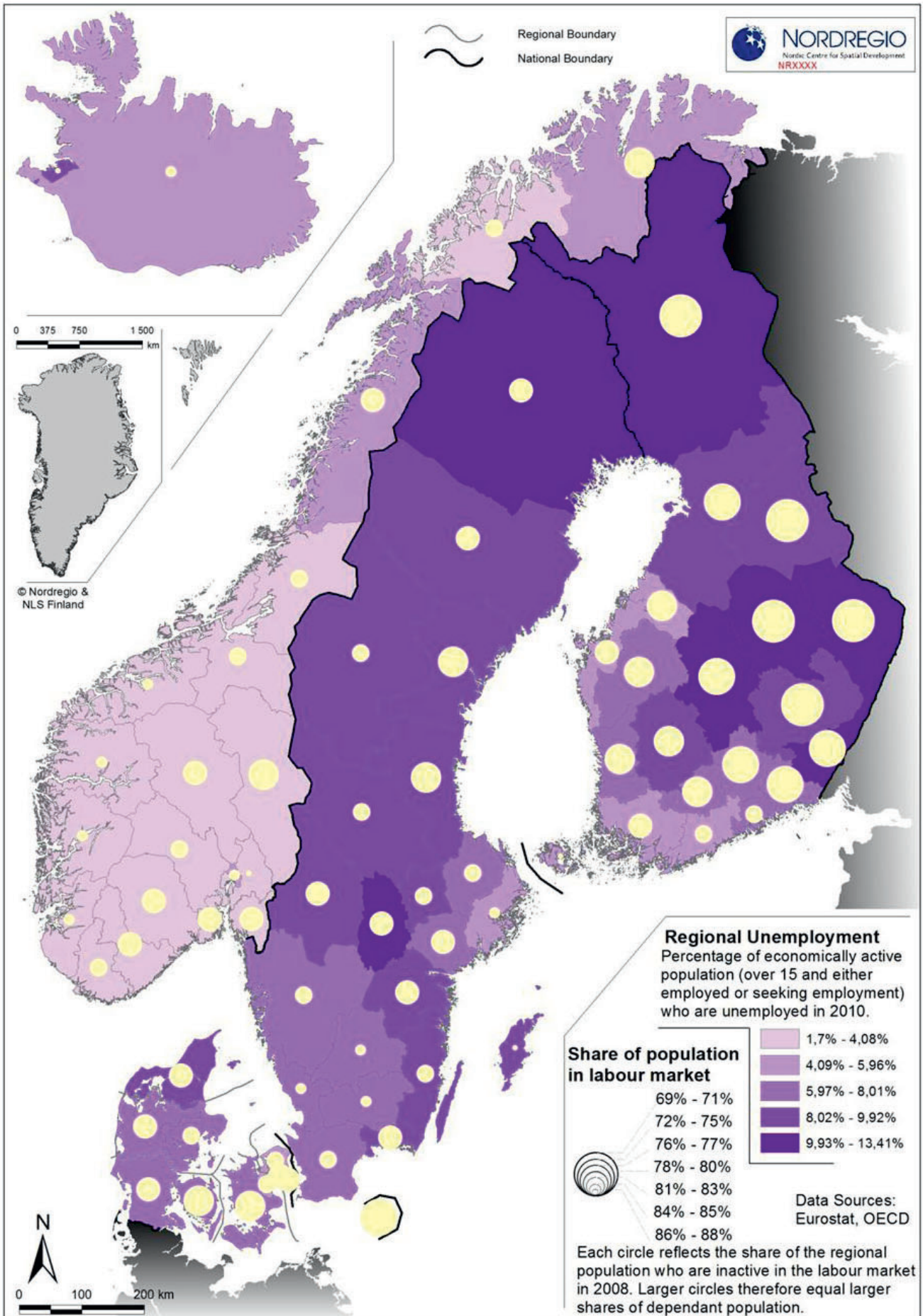
Map 1: Population change 2006-11.



Map 2: GDP per capita in purchasing power standards in 2009.



**Map 3:** Regional unemployment as a proportion of the economically active population.



# Innovation capacity and performance

The OECD's Oslo Manual for Measuring Innovation provides the following definition of innovation: "An Innovation is the implementation of a new or significantly improved product (good or service), or process, a marketing method, or a new organizational method in business practices, work-place organisation or external relations".<sup>17</sup> Today, most innovations are developed through interaction in a learning process where a number of different actors are involved. A recent study has suggested that one way to improve quantitative studies of innovation in regions would be to explore three main elements: preconditions for innovations (e.g. a competent labour force); regenerative capacity (e.g. conditions and ability to support entrepreneurship); and market ability (e.g. international networks, ability of commercialisation).<sup>18</sup> This working paper takes a closer look at preconditions for innovation and performance in terms of patent productivity, while noting that only part of the innovation capacity and performance is captured by these indicators.

Maps 4 and 5 consider three indicators found to be closely correlated with innovation. These are: the number of students and level of education in the population (representing the regional stock of human capital that acts as the medium through which investments in R&D lead to innovations); investment in R&D (the main input in the process of developing innovations), and patent statistics (the most widely used proxy for innovation output), including the number of "green" patents identified as environmental technology. Here it should be noted that the manner in which green innovation and R&D is captured, i.e. through measurement of the number of green patents as a percentage of total patents, is limited because green patents are defined to include only a subset of all innovations that drive a green economy in practice.

Map 4 illustrates that when it comes to the educational attainment level of the local population, the picture is rather mixed. The number of students in higher education correlates almost exactly with the number of local institutions of higher education. It is interesting to note the close correlation between the number of students in higher education and patenting activity as shown in Map 5, which attests to the effect of university research on innovation.

In Map 5 it is clear that Finland appears to be outperforming all other countries in terms of R&D

investment. The country can be divided into three distinct blocs: one covering the northern part of the country and scoring highest, one covering the southern part of the country and scoring next best, and the structurally weaker eastern regions which invest less than the rest of the country, although they still outperform several other regions in the Nordic countries. The picture in Sweden is more mixed, with the regions including the main urban centres of Gothenburg, Malmö and Stockholm and the northern part of the country investing heavily in R&D, whereas the rest of the country performs only moderately well or poorly. Icelandic investments are close to the Nordic average, whereas Norway (with the exception of the capital and the Trøndelag region) and Denmark (again with the exception of the capital region) appear to invest the least in R&D.

In terms of innovation output (as measured by patenting activity), as illustrated in Map 5, southern Finland, central Sweden and Denmark appear to be performing best, with Danish regions also producing the highest percentage of green patents, probably because of the patent intensity related to the high percentage of wind-energy production. This reflects Denmark's status as a world leader in eco-innovation output, as demonstrated by the fact that more than 700 firms are involved in eco-innovation, particularly for clean water and energy systems such as wind turbines. Thus, relatively low investments in R&D actually reflect an industry that already stands out as a competitive performer.

In a national context, the strong performance of Finland, and to a lesser extent Sweden, is constrained by the fact that high levels of eco-innovation input stand in contrast to lower output performance. In Finland, the relatively low output is indicative of poor investment turnover. According to the Eco-Innovation Observatory Finland has Europe's highest negative correlation between eco-innovation input and positive environmental outcomes. This is because of very low material productivity, which in turn relates to the challenge of an economy that is highly dependent on the export of natural resources, coupled with very environmentally irresponsible domestic resource consumption habits. In Sweden, the level of eco-innovation is high, but the export-based market for the resultant technologies is not developing as expected.<sup>19</sup>

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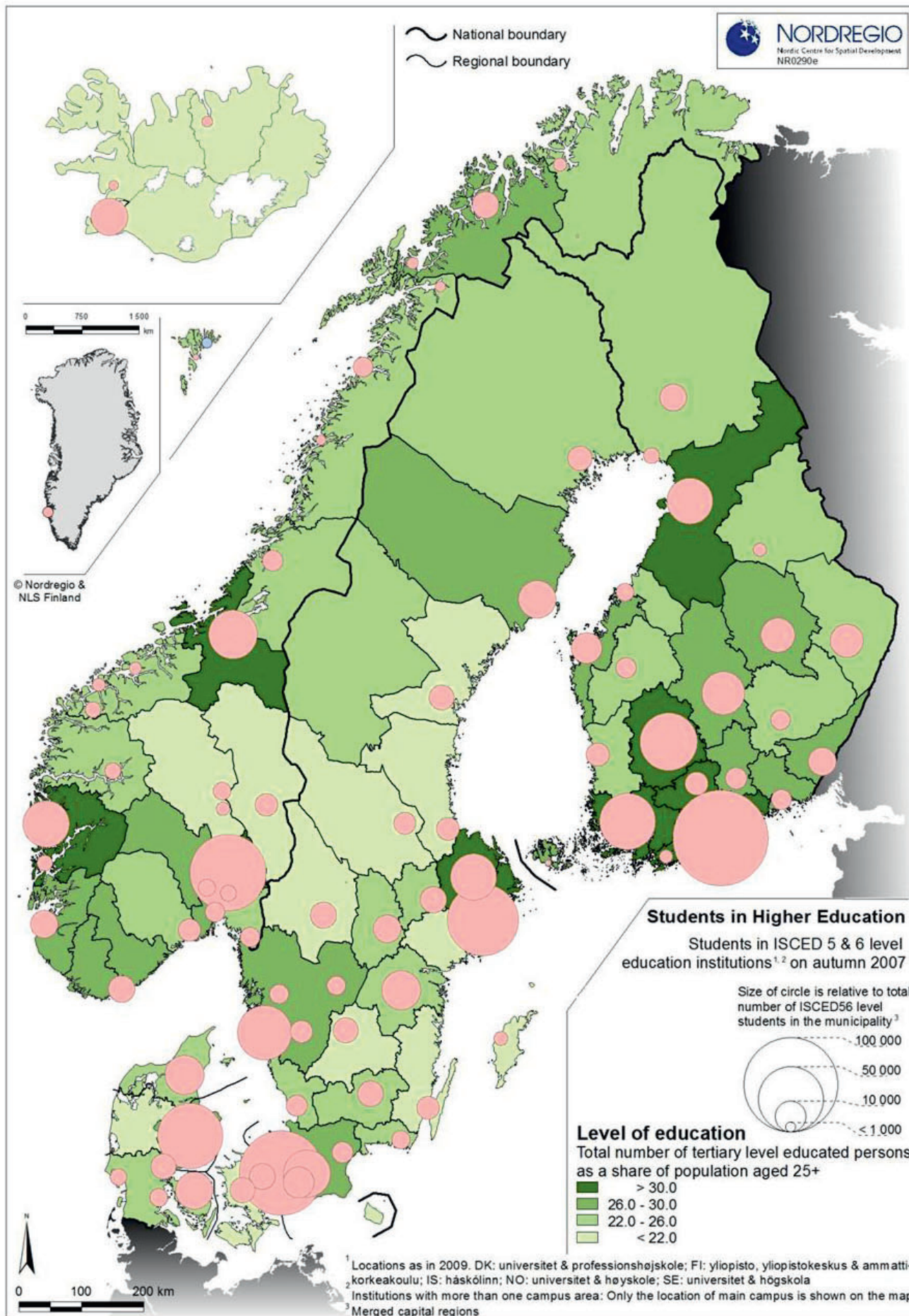
<sup>17</sup> OECD, 2005, p.46.

<sup>18</sup> REGLAB, 2011

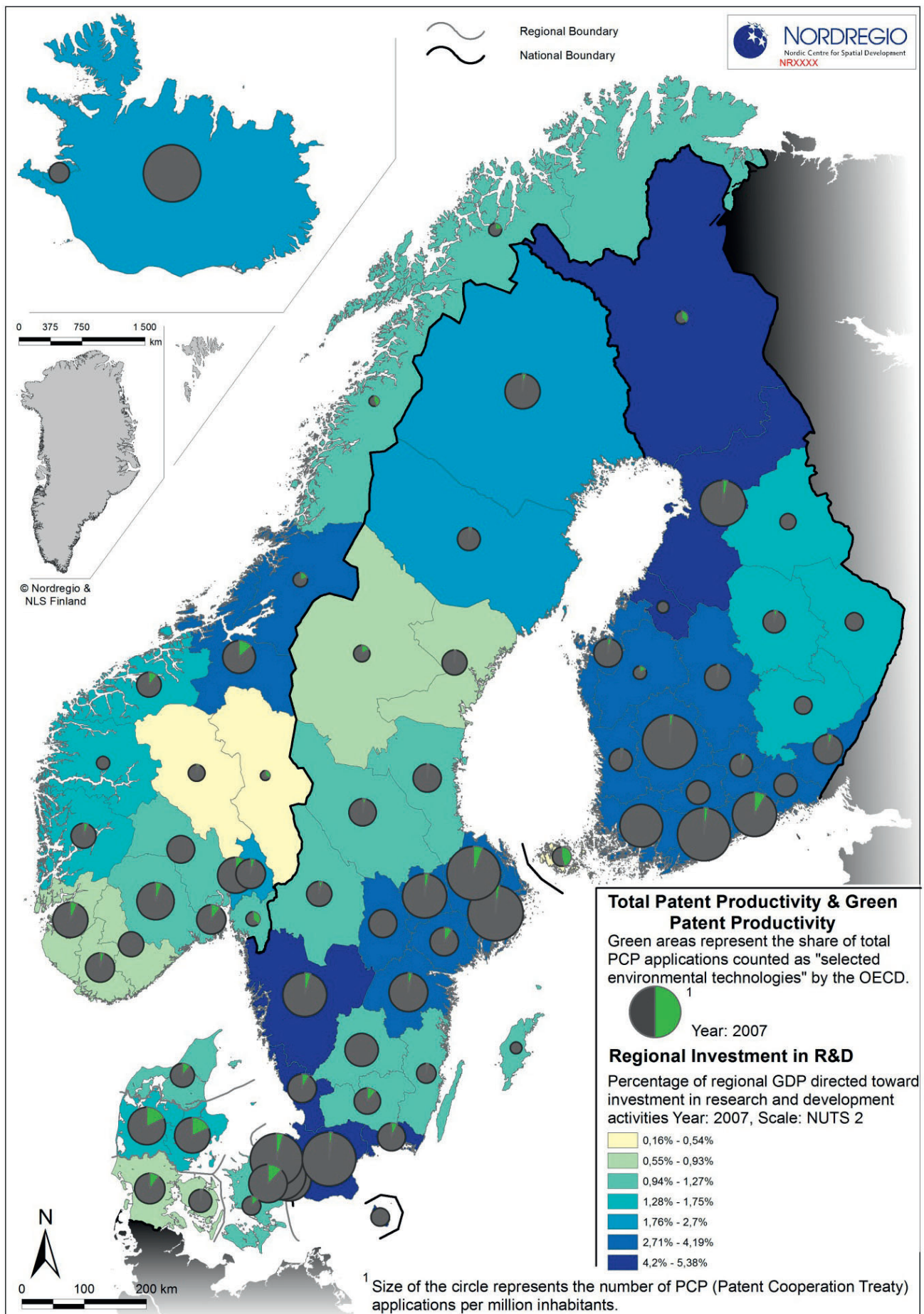
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<sup>19</sup> EIO, 2011

**Map 4:** Tertiary-educated residents as a proportion of the total population, and the distribution of students enrolled in higher education institutions in 2007.



**Map 5:** Distribution of investment in R&D activities, the distribution of total patents, and the proportion of total patents counted as “environmental technologies” in 2007.





## Natural assets (energy)

The degree of dependence on renewable energy sources, which is closely related to a region's natural resources and geography, to a great extent defines the sustainability of local production and consumption. Map 6 shows regional electricity generation by source, volume and proportion of total electricity production. It reveals a number of territorial components that describe the Nordic countries as performing well overall but with significant regional differences.

The most important energy sources for the Nordic countries are oil and renewable energy sources (mainly hydropower and geothermal and wind energy), nuclear power, coal and natural gas. National performance in renewable electricity production is mainly related to hydropower in Norway and Sweden; to hydropower and geothermal energy in Iceland; and to wind power in Denmark and southern Sweden. Nuclear power constitutes an important energy source in Sweden and Finland.

In Norway, renewable energy sources generate nearly 100% of all electricity, mainly from hydropower. In Iceland, hydropower accounts for roughly 75% of the total electricity supply, and the rest is provided by geothermal power. Denmark shows very high performance in wind technologies and wind power. The high proportion of wind-power production is also notable on the island of Gotland in Sweden, which indicates the viable role of such energy sources as significant components of overall power production, which could provide a high measure of self-sufficiency in smaller and/or isolated regions. Innovative solutions are expanding in relation to bioenergy production, particularly in Denmark and southern Sweden—and

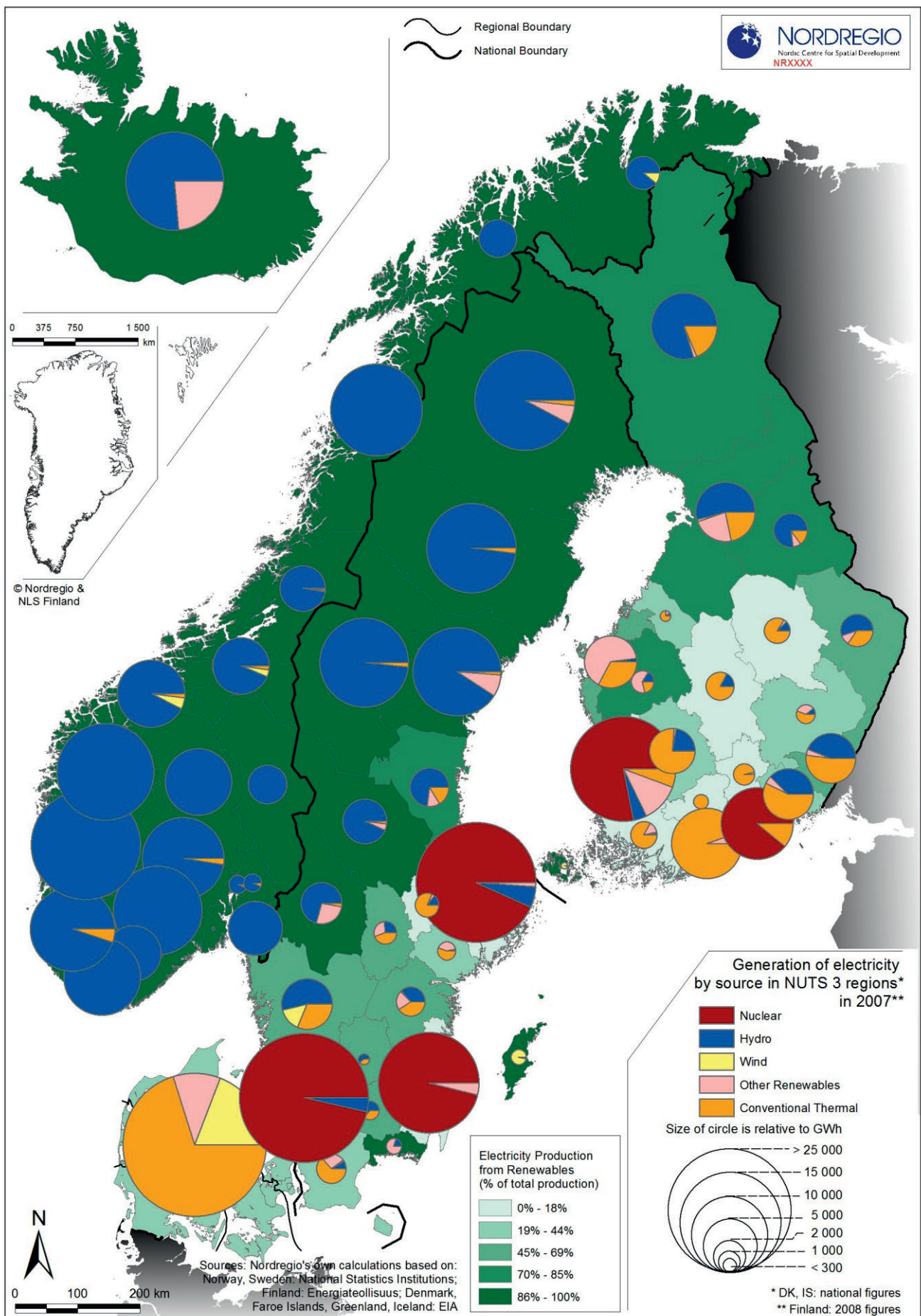
especially in Finland, where it has become an important component of the energy mix.

It should be noted that the map does not provide a full overview of renewable energy production in the Nordic countries, since it only refers to electricity supply and not to total energy supply. Here some additional points are relevant:

- Denmark is highly dependent on imported coal, which is processed as “conventional thermal” electricity.
- To varying degrees, each Nordic country maintains dependence on oil for space heating, particularly in the winter months, when hydropower production is constrained.
- Thanks to favourable national policies, selected regions in Sweden and Finland are notable for their production of nuclear energy. These regions are therefore exporters of electricity through the common Nordic electricity grid.

There is a clear relationship whereby regions with electricity production from high-capacity, centralised hydro or nuclear infrastructure also generally have a poor record of developing other renewable energy sources. Conversely, those regions with hydro constraints—or with national policies restricting nuclear development—have responded with the development of more decentralised, complementary renewable sources. This suggests that energy complementarity through development of all regional renewable energy potentials will be a key component of green growth in the Nordic countries.

**Map 6:** Electricity generation in Nordic regions by source, volume and proportion of total electricity production in 2007.

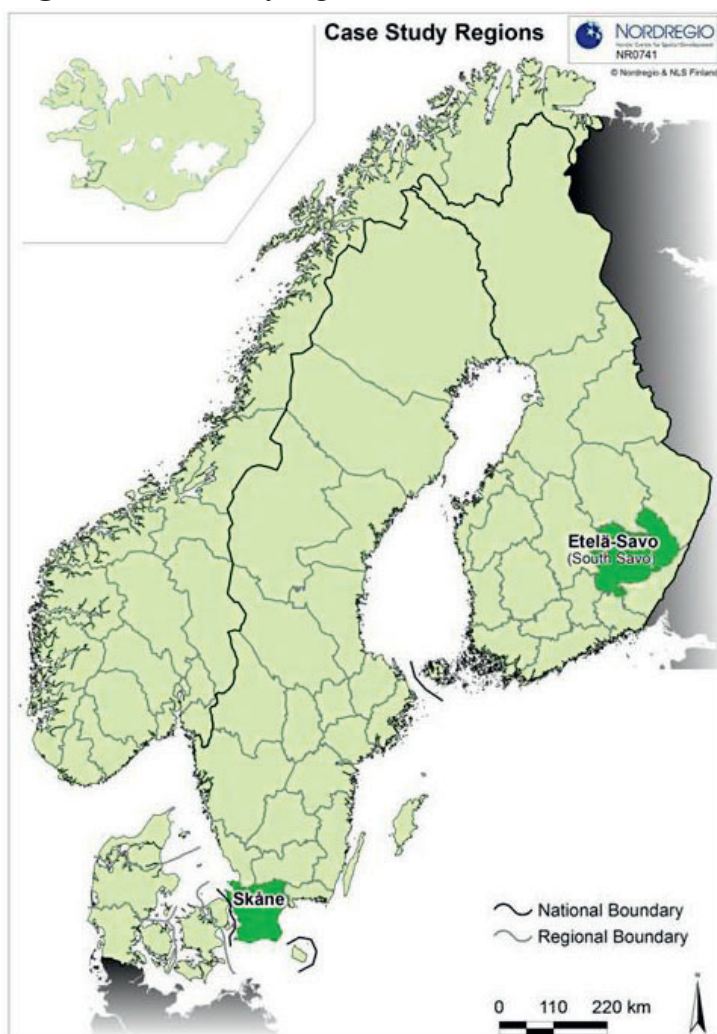


# Green Growth and Innovation in Urban and Rural Regions: Two Case Studies

Quantitative analysis suggests that challenges for regional development are related to the issue of population change, especially in terms of the flow of people to urban regions at the expense of population loss and ageing in rural areas. Urban regions are noted for population growth, comparatively low unemployment and high GDP per capita. Because knowledge and innovation institutions, as well as economic production, are largely concentrated in these areas, they are also the recipients of the majority of R&D funding in the Nordic context. Many green production activities are located in rural areas whereas a vast majority of resource consumption

takes place in urban settings. This is an increasingly important consideration in the Nordic countries as growth of just a few large urban centres continues to take place at the expense of the vast rural areas. The urban-rural dimension as a territorial context frames the conditions of green growth and eco-innovation to some extent, and has been the point of departure in the selection of case studies. The case studies concern the region of Skåne in southern Sweden with a focus on the activities in cleantech, and the region of South Savo in Eastern Finland and its activities in bioenergy. Their location is illustrated in Figure 1.

**Figure 1:** Case study regions



# Regional Context for Green Growth and Innovation

This section introduces the regional context of the two case study regions in relation to the three themes which were used in the quantitative study above. Here it is possible to elaborate further on the specific place-based characteristics of the two regions in terms of socio-economic characteristics, innovation capacity and performance and natural assets.

## Socio-economic conditions

Map 1 shows the population change during the period 2006-11, and here it is evident that the region of Skåne, along with other urban regions, has experienced a positive population development with an average increase of more than 1% each year, whereas South Savo has experienced a negative population development, decreasing up to 1% each year. Map 2 shows GDP per capita in 2009. Skåne, similarly to most regions in Sweden, has a GDP slightly above the EU27 average,

whereas South Savo like most regions in the northern and eastern parts of Finland has a GDP slightly below the EU27 average. Map 3 shows that Skåne has a slightly higher unemployment rate and more people dependent on the labour market compared with the Stockholm region but has a favourable position in a national perspective. South Savo demonstrates a slightly higher unemployment rate than Skåne, and has a high dependence ratio, which reflects the increasing out-migration from the region and the increasing elderly population. This situation is similar to other regions in the north and eastern parts of Finland. Key facts regarding the socio-economic situation of the two case study regions are summarised in table 1, which also demonstrates the difference in population densities of the two regions, illustrating in a Nordic context the urban and rural characteristics of Skåne and South Savo respectively.

**Table 1: Socio-economic characteristics of the case study regions**

Skåne (SE)	South Savo (FI)
<ul style="list-style-type: none"> <li>- Population density: 112.7 people/km<sup>2</sup></li> <li>- Increasing in-migration</li> <li>- Employment proportion 73%</li> <li>- Regional GDP 35,195 € per capita (national average: 38,794 €)</li> </ul>	<ul style="list-style-type: none"> <li>- Population density: 11.1 people/km<sup>2</sup></li> <li>- Increasing out-migration</li> <li>- Employment proportion 65%</li> <li>- Regional GDP 24,500 € per capita (national average: 32,500 €)</li> </ul>

The business structure of the two case study regions is briefly described in the following, which also shows cleantech in Skåne and bioenergy in South Savo in the context of the overall regional economy.

*Skåne:* Having enjoyed a strong agricultural and industrial history the region is at present characterised by a private and public service sector economy. Large and medium-sized companies provide the major source of private employment, often in transnational companies. Small firms particularly operate in farming, business-to-business services and trade. The public sector is a large employer, not least within the higher education and health sectors. There is a decline in employment in primary and secondary industries and a growth in

the service sector. The number of business start-ups is higher in Skåne than the national average, but lower than in the County of Stockholm. The south-western part of Skåne, which includes the cities of Malmö and Lund, is the most urbanised area and the business services sector and research and development are significant sectors.<sup>20</sup> Cleantech comprises firms dealing with environmental technologies, and as illustrated in the table below cleantech comprises several economic sectors and is classified differently in the regional economy; e.g. it involves manufacturing, construction, and business service sectors. The overview of the sector was compiled by the cluster organisation Sustainable Business Hub in 2008.<sup>21</sup>

<sup>20</sup> Region Skåne, 2009, 2011

<sup>21</sup> Sustainable Business Hub, 2008

**Table 2: The cleantech sector in Skåne**

The cleantech concept originates from the United States and has increasingly been used in the Nordic countries to describe firms dealing with environmental technologies. Cleantech comprises 11 environmental technology sectors, which span different industry sectors.<sup>122</sup> According to the latest available survey there were 311 cleantech firms in Skåne in 2008. Some were relevant for several sub-sectors, and they were therefore included more than once in the overview (below) of the cleantech sector in Skåne:

- Energy – 90 firms
- Construction and urban development – 84 firms
- Water and wastewater – 59 firms
- Waste and disposal – 55 firms
- Technical consultants – 50 firms
- System, measure- and regulation technology – 25 firms
- Air – 21 firms
- Transport – 11 firms
- Remediation – 5 firms
- Material – 3 firms
- Others – 34 firms

Within the largest category of cleantech firms, energy, the two largest groups of firms comprised 35 firms within bioenergy and 30 firms working with energy efficiency. In wind energy eight and in solar energy four firms were active.

Especially in water and wastewater management and sustainable urban construction, a large proportion of the Swedish competences can be found in Skåne. The water and wastewater industry has been developed over a longer period of time and has several strong players such as the family-owned Malmberg Water, which was established in 1866. The area of sustainable urban development has grown in the region during the last two decades, especially as part of the strategy which Malmö City developed in the 1990s as a response to the ongoing economic restructuring process. New residential areas with a focus on strengthening the environmental profile in areas such as the Western Harbour, a former shipyard area, and a number of other demonstration projects have been developed in Malmö.

*South Savo:* Given the total number of jobs in the region, the number of entrepreneurs is the highest in Finland. Most of the firms are small or medium-sized and 95% of the firms in the region employ fewer than 10 people. Compared with the Finnish average, the role of primary production in South Savo is vital, and the number of firms in agriculture, forestry and fishery is unusually large, covering 20% of the total number

of firms in the region. More than 50% of the primary production products are not processed in the region but exported to other regions. Other significant sectors in terms of jobs are the metal industry, tourism, food, construction, commerce, and healthcare and social service sectors.<sup>23</sup> The forestry and bioenergy sector in South Savo is described further in the following.

<sup>22</sup> Malmö Cleantech City, 2012; Swentec, 2009

<sup>23</sup> Regional Council of South Savo and Centre for Economic Development, Transport and the Environment, South Savo, 2012; Centre for Economic Development, Transport and the Environment, South Savo, 2011

**Table 3: The forestry and bioenergy sector in South Savo**

Forestry is significant for the regional economy and the forest sector makes up 10% of the regional GDP in South Savo. More than 50% of the primary production products exported from the region consist of raw wood and wood products. In 2009 the forest sector in South Savo employed approximately 4 000 people, of whom 1 700 worked in forest management, timber harvesting or other tasks. Some 2 440 people worked in sawn timber, wood products, furniture or paper product manufacturing. Seventy-seven per cent of the South Savo forests are privately owned, usually by families, and forest owners have become economically less dependent on their forests. A growing number of forest owners live outside the region or in urban areas and may put recreational or landscape values above economic profit from the forests.<sup>24</sup>

In 2008, a total of 78 SMEs in the bioenergy sector were active in South Savo and employed a total of 242 people. Most of the bioenergy companies are micro firms and very few of them have notable international business activities. Most of them are only active in the region of South Savo. Also, technology firms active in bioenergy in the region are small or medium-sized and focus on different parts of the wood-chip production chain. A study has estimated that the use of wood chips could safely be quadrupled and in turn potentially create a further 600 new jobs in the bioenergy sector in the region.<sup>25</sup>

This brief overview has shown the different socio-economic conditions of the two regions. For example, Skåne has a relatively diversified economy increasingly dominated by knowledge-intensive services, and a positive population development, whereas South Savo has a continuing predominance of primary industries in the regional economy, and a negative population development.

### Innovation capacity and performance

In any study on green growth and innovation, it is necessary to develop an understanding of the innovation capacity and performance of a given region. As described above there is some difficulty associated

with categorising innovation results based on R&D investments and number of patents since innovation is much broader in nature and difficult to measure, but the maps give an indication of preconditions which favour innovation. From Map 4 it is clear that there is a significant difference between the education level and number of students in tertiary education between the two case study regions. Map 5 shows total patent productivity and the proportion of green patents and demonstrates that there is a high proportion of patents in Skåne, and R&D investment is also high with more than 4.2%. South Savo has a low level of investment in R&D with less than 1.75% and also a low level of patent productivity. Table 4 summarises tertiary education and R&D activity in Skåne and South Savo.

**Table 4: Innovation capacity and performance in the case study regions**

Skåne (SE)	South Savo (FI)
<ul style="list-style-type: none"> <li>- Some 26 to 30% of the population have tertiary education</li> <li>- High investment in R&amp;D</li> <li>- High patent productivity, low number of environmental technologies</li> </ul>	<ul style="list-style-type: none"> <li>- Less than 22% of the population have tertiary education</li> <li>- Medium investment in R&amp;D (low in national context)</li> <li>- Low patent productivity, no green patents</li> </ul>

Following the introduction of the quantitative study on level of education and investments in R&D, higher education institutions and other knowledge institutions and their relevance for the cleantech and bioenergy activities in the two case study regions are discussed.

*Skåne:* As illustrated in Map 4, Skåne together with the Capital Region of Denmark has a high number of students of higher education. Lund University is one of Scandinavia's largest institutions for education

and research and has about 35 000 students and 6000 employees. A study on the future need for human resources in Skåne clarifies that the majority of students of higher education in the region come from Skåne and most of them are subsequently employed in the region. A large group of higher education graduates that supply the private sector labour force are engineers in energy and electro-technology and construction.<sup>26</sup> Higher education institutions that are especially relevant

<sup>24</sup> Finnish Forestry Centre, 2011

<sup>25</sup> Miktech, 2012a; Finnish Forestry Centre, 2011

<sup>26</sup> Lindell et al., 2010

for cleantech are the Faculty of Engineering and the International Institute for Industrial Environmental Economics (IIIEE) at Lund University. Malmö University also has education programmes that are of relevance for cleantech firms: e.g. they are concerned with sustainable urban planning. Kristianstad University's Master's programme in sustainable water management is of relevance, and the Swedish University of Agricultural Sciences in Alnarp has relevant programmes in the fields of biotechnology and biochemistry.

In spite of the fact that Skåne has a large proportion of the population with higher education and a number of education programmes relevant for cleantech firms, several case study respondents stated that firms in the biogas industry especially are experiencing problems in recruiting the number of engineers they need. One respondent stated that this is mainly an issue for the smaller firms that recruit newly educated engineers, who need approximately two years' further training before they can work at 'full capacity', and after these two years the graduates are often offered a job at one of the big companies which is able to offer them a better salary. Some stated that the appropriate engineering programmes are in place, but the main issue is that not enough young people choose this type of education. It was also noted that not only technical competences are significant in the cleantech sector. There is a lack of competences in parts of the cleantech industry that deal with increasingly important issues such as the linkages between IT and environmental technologies. In this context, it is also argued that a greater knowledge of the cleantech sector is needed by business school graduates for their better understanding of the specific organisational, export and market conditions of the sector.

*South Savo:* Whereas South Savo has a low proportion of inhabitants with tertiary education, the number of inhabitants with secondary education is slightly higher than the Finnish average. Mikkeli University of Applied Sciences is based in the region. There are no opportunities for Master's education related to forest energy, but Mikkeli University of Applied Sciences educates engineers for more practical research and development positions. Moreover, the University of Eastern Finland and Aalto University have set up campuses that provide tertiary education in South Savo within disciplines such as business administration, tourism, nursing and engineering. Lappeenranta University of Technology is also present in the region with a focus on research activities, e.g. in the field of bioenergy. Respondents referred to this as the most important higher education institute in terms of its contribution to bioenergy development through the coordination of R&D projects and cooperation with SMEs particularly in various bioenergy projects (the

bioenergy professorship was set up for this purpose). Furthermore, the secondary education institute South Savo Vocational College, for example, trains forest machine drivers for the forest industry. It was stated in the interviews, however, that in general the range of relevant education in the region is narrow.<sup>27</sup>

So far there have been no real difficulties in attracting the necessary labour force in the bioenergy sector as the bioenergy firms in the region are relatively small and even the bigger power plants do not require a large number of employees. As the current strategic focus of the region is to significantly increase the use of wood energy in the region, however, it may become a challenge to recruit a workforce for harvesting and logistics, although relevant secondary education is available. The targets of increasing the use of forest energy and developing the bioenergy sector are set high, and more labour will be needed at the beginning of the bioenergy production chain. Similarly to the situation in Skåne there will be a demand for more engineers and for business school graduates with knowledge of the bioenergy sector. As regards the development of the region, it is seen as important to attract employers paying higher salaries in order to recruit a more qualified labour force. The proportion of high-technology firms in South Savo is low and the salaries are also considerably lower than the Finnish average. Even small high-competence firms paying slightly higher salaries could contribute to making the region more attractive to highly educated people.

Both regions provide opportunities for higher education, although the range of programmes is wider in Skåne and the number of students much higher. The preconditions for innovation in the sense of the presence of a competent labour force in the regions also vary, and would appear to be stronger in Skåne where a relatively high proportion of the population has had tertiary education. From the perspective of attracting the right human resources for the cleantech and bioenergy jobs available and for future development needs, both regions are experiencing some challenges.

## Natural assets

An indication of the proportion of renewable energy sources in the case study regions can be derived from Map 6 which gives an overview of the electricity production at the regional level. Here Skåne and South Savo have very similar profiles, and in a Nordic context both have a relatively low proportion of renewables in electricity production. More than half of the electricity production comes from conventional thermal, a small

<sup>27</sup> Regional Council of South Savo and Centre for Economic Development, Transport and the Environment South Savo, 2012; Centre for Economic Development, Transport and the Environment, South Savo, 2011

proportion from hydropower, and approximately one-third from “other renewables” which in both cases include bioenergy. The map only refers, however, to electricity supply and not to total energy supply and therefore does not provide a complete overview. Both the region of Skåne and South Savo have a number of firms active in the bioenergy sector (35 and 78 respectively). In Skåne, however, bioenergy is derived from agriculture, whereas in South Savo it is part of the predominant forest industry in the region. The state and utilisation of natural assets in the case study regions is further elaborated in the following.

*Skåne:* Skåne has a strong energy sector, and after bioenergy most firms are active in the field of energy efficiency, and a few in the fields of wind and solar energy. The south-western part of Skåne in particular has the characteristics of an urban region, which implies a need to improve energy efficiency. Statistics have shown that urban regions of Europe are responsible for up to 80% of all energy consumption, and over half takes place in buildings.<sup>28</sup> The focus on sustainable urban construction in Skåne is well in line with the rationale of greening buildings and promoting energy efficiency.

*South Savo:* Approximately 88% of the land area in South Savo is forest land and 6% of all Finnish forest

land is in the region. In South Savo, the proportion of forest land is the highest in Finland and the forests grow exceptionally fast. Traditionally South Savo has had a role as raw material provider in the Finnish forest economy. The amount of wood processed in the region has been small and approximately three-quarters has been processed outside as there is no paper industry or big sawmill in the region.<sup>29</sup> In 2008, 40% of the energy consumed in Eastern Finland was wood energy. The wood fuels used consist mainly of wood chip, wood residue from industry, sawdust and bark. In South Savo, the use of wood chips in bioenergy is especially well-developed and approximately 40% of the wood energy produced in the region was from wood chips in 2010. The forest resources in the region could safely allow the use of wood chips to be quadrupled, however. The biggest potential for the future is to utilise the forest biomasses to produce new kinds of biofuels (such as processed wood pellets and wood-based biocoal) that could for example be used in traditional coal-power plants. It is also believed that biocoal could in future be exported to global markets.<sup>30</sup> It is reasonable to assume that the forest industry in South Savo has utilised its natural assets well, but there is greater potential for the utilisation of biomasses.

## Why cleantech / bioenergy?

What are the driving forces behind a strategic focus in Skåne's case on cleantech and in South Savo's case on bioenergy? This section aims to answer the question in order to gain a deeper understanding of some of the factors which were important in terms of developing targeted public policy in the case study regions.

*Skåne:* The development of the cleantech sector was first initiated by Region Skåne during the 2000s on the basis of the collaboration between the environmental strategy division at the regional development department and the business development department at Region Skåne on establishing the network organisation Sustainable Business Hub (SBH) in 2001.

In 2005, the potential of the cleantech sector was further clarified when it was found that too little development had happened with the establishment of Sustainable Business Hub (SBH) and a clear strategy for the area needed to be developed. The environmental strategy division at the regional development department and the business development department at Region Skåne in cooperation with an environmental

consultant carried out analyses in order to identify the region's main strengths in the environmental area. Three sectors were identified as potential environmental areas to be developed: agriculture and food; transport; and cleantech (especially sustainable urban construction, and the water and wastewater industry). It was decided to focus on the area of cleantech, where Skåne was found to have a competitive advantage compared with the rest of the country. It was in 2006 that cleantech became a strategic focus area of the region.

In 2006, the political environment became more focused on the opportunities offered by environmentally driven business development, and the Regional Council substantially increased SBH's annual funding. This was crucial for the development of the cleantech sector. The strategy shift increased the focus on the sector, and the increased funding meant that it was possible for SBH to improve its organisation and activities. The continuing financial support of the Regional Council remains crucial for the operation of SBH.

Malmö City has also been an important driving

<sup>28</sup> Jaeger et al., 2011

<sup>29</sup> Miktech, 2012a; Finnish Forestry Centre, 2011

<sup>30</sup> Finnish Forestry Centre 2011; Miktech, 2012b



force behind the development of the cleantech sector, especially with its strong profile of sustainable urban construction. The city's focus on sustainable urban construction arose when local policymakers attempted to cope with the economic restructuring process of the

region during the 1960s to the 1990s when industrial production and engineering were in decline, especially in Malmö. The political focus of Malmö City on developing a profile of sustainable urban construction was initiated during the 1990s.

**Table 5: Main drivers for public policy focus on cleantech in Skåne**

- Initial cooperation between the environmental strategy division at the regional development department and the business development department (who had not previously cooperated) at Region Skåne to establish the network organisation Sustainable Business Hub (SBH)
- Regional analysis to strengthen the focus on environmental business development - cleantech (especially sustainable urban construction, and the water and wastewater industry) was identified as the main area of strength
- Commitment of the Regional Council to provide funding to SBH/cleantech development
- Local level/Malmö City focus on sustainable urban construction

*South Savo:* The region of South Savo has vast forest resources and forestry has traditionally been an important sector in the region. The bioenergy sector in South Savo is strongly linked to the biomass-producing potential of the forests and the role that forestry has in the region. The logistical position of the region is also seen as its strength in relation to bioenergy and it is one of the reasons why the region has seen potential in producing wood fuels. The region is situated near the Russian border and a new deep-water harbour is to be built in Ristiina in order to ship biomass by water to markets in the Baltic Sea region.

The two municipally-owned energy companies Etelä-Savon Energia and Suur-Savon Sähkö have been important in the move towards systematically coordinated bioenergy development. A carbon dioxide tax system favouring the use of wood, wind energy and waste fuel was established on a national level in Finland in 1990, when the energy companies also started to favour wood fuels in their power plants. Thanks to their

early activities in bioenergy, a bioenergy production chain from forests to power plants was created and several companies were established to support the chain. Without the two forerunner companies being active in using wood fuels, it would not have been possible to build a network of enterprises active in different parts of the production chain. At the same time, the national-level focus on promoting renewable energy had a role in facilitating the companies' use of wood fuels.

Finally, the energy foundation Suur-Savon energiasäätiö founded during the 1990s by Suur-Savon Sähkö and its owner municipalities has been a significant actor in terms of providing funding to almost all bioenergy development projects in South Savo. The board of directors of the foundation consists of representatives from the municipalities, and the funds that the foundation allocate come from the dividend income that the energy company pays to its biggest owner, the foundation.

**Table 6: Main drivers for public policy focus on bioenergy in South Savo**

- The vast natural resources have meant that forestry has traditionally been an important sector in the region, and bioenergy is strongly linked to the biomass production potential of the forests
- A carbon dioxide tax system favouring the use of wood, wind energy and waste fuel was established on a national level in Finland in 1990, and in general the Finnish energy policy and its support schemes favouring renewable energies have been incentives for a bioenergy focus
- The two municipally-owned energy companies Etelä-Savon Energia and Suur-Savon Sähkö contributed to the shift towards systematically coordinated bioenergy development initiated in the 1990s
- The energy foundation Suur-Savon energiasäätiö was founded during the 1990s by the energy company Suur-Savon Sähkö and its owner municipalities, and it has since then been a major funding body for almost all bioenergy development projects in the region

# Regional and local development strategies

This section provides an overview of some of the regional and local development strategies in place in the two case study regions in order to explore how cleantech and bioenergy are respectively integrated into current strategies both in terms of regional/local focus and more outward-oriented strategies.

## Region Skåne

Region Skåne's Regional Development Programme is an important strategy document supported and realised through a number of sectoral-oriented development strategies and action plans. The sectoral activities relating to the issue of green-growth activities are mainly the Environmental Programme, Climate Programme, Business Development Programme, and the recently launched International Innovation Strategy. The last especially directly involves the cleantech sector.

The Regional Development Programme for Skåne 2009-2016 is the main strategic document outlining the strategy for regional development in the region. The overall objective and vision of the programme is that Skåne will be a dynamic region and a sustainable society. One important goal which explicitly shows the region's high ambitions in sustainable development is the aim to be fossil fuel-free by 2020.

Region Skåne is one of the few regional authorities in Sweden that has developed a regional innovation strategy, title the "International Innovation Strategy for Skåne 2012-2020". The strategy is partly a response to the Europe 2020 strategy in which the European Commission outlined future development directions towards the "Innovative Union". It introduces the vision that Skåne will be Europe's most innovative region in 2020. An international action plan will be developed in order to support the implementation of the strategy and the realisation of the vision. It will form part of the national innovation strategy and make regular contributions to the government's research and innovation proposals. National stakeholders, such as VINNOVA and the Swedish Agency for Economic and Regional Growth, and the government will be included in discussions to develop the action plan.<sup>31</sup>

A sub-strategy for Skåne's innovation strategy entitled "From cluster initiatives to open innovation arenas in Skåne" has been developed. According to the strategy the clusters developed in Region Skåne will develop into open innovation arenas, which will attract more national and international resources from outside the region. This requires clearer international positioning and profiling, and increased participation in

international platforms. Two specific areas are prioritised as global innovative arenas with great potential for international collaboration, where the aim is to develop platforms around which several clusters can collaborate: "personal health" and "smart, sustainable regions/cities". In the region of Skåne there are currently seven cluster initiatives which are working to strengthen the competitiveness of firms in the region; one of them is Sustainable Business Hub.<sup>32</sup>

During 2011-12 Region Skåne has been working on a project to enhance the open innovation arena within the area of smart and sustainable cities. The aim of the project titled "Intelligent, smart processes, innovations and test beds" is to establish a cross-sectoral consortium, which will facilitate the innovation process in smart energy solutions and new collaboration forms in the field of sustainable and attractive cities. The project is co-financed by VINNOVA within the programme "Challenge-Driven Innovation", the objective of which is to strengthen Sweden's innovation capacity.<sup>33</sup>

## Malmö City

Malmö City, where many of the cleantech firms are located, has its own initiatives to support the cleantech sector, which are related to the four environmental targets the City has set for the period 2009-20. The objectives for 2020 are: (1) Malmö will be the "climate-smartest" city in Sweden (more renewable energy, changing transport and travel habits, etc.), (2) the city will lead the way in sustainable urban development, (3) it will ensure sustainable use of natural resources, and (4) it should be easy to do the right thing (public procurement of Malmö City will be characterised by high environmental standards, etc.).

Within the framework of the local initiative "Malmö Cleantech City" there are three projects which help the cleantech firms to get marketing assistance, new meeting-places and business opportunities. The first project, Malmö Cleantech Cluster, involves marketing initiatives to collectively promote the firms based in the city. This also includes efforts to promote the gathering of cleantech firms in four specific areas of Malmö where there is high activity in the cleantech sector. The second project, Malmö Cleantech Centre, is a physical meeting-place for cleantech firms and a demonstration site for visitors who come to Malmö to learn more about firms' environmental technologies. The final project is called Malmö Cleantech Test Bed and involves matchmaking activities to set up meetings

<sup>31</sup> FIRS and SIS, 2011, a

<sup>32</sup> FIRS and SIS, 2011, b

<sup>33</sup> VINNOVA, 2012

between cleantech suppliers and potential clients, both firms and municipalities.<sup>34</sup>

Malmö City has developed cooperation with the City of Copenhagen on a number of policy issues within the framework of green growth. The joint efforts for green growth were initiated by the current mayors of respectively Malmö and Copenhagen who realised they had similar political priorities, especially concerning their ambitions regarding environmental issues. Examples of how the two cities cooperate range from large development projects, such as the development of a wind farm, to cooperation on how to integrate learning for sustainable development in the education system.

In addition to Copenhagen across the Sound, Malmö City has established cooperation with Hong Kong. This started when the Mayor of Malmö and the head of the environmental management department were invited to the meeting of the C40 Cities Climate Leadership Group in Hong Kong. The representatives of Malmö City and Hong Kong discovered opportunities to learn from each other. In Hong Kong there are problems with air pollution and waste management, which are areas in which Malmö-based firms have strong competences. In turn, Malmö has much to learn from the public transport system and innovation system management in Hong Kong. In the summer of 2011 the discussions between the parties led to a cooperation agreement, which the Ministry of the Environment of Hong Kong came to Malmö to sign. Further, the cooperation with Hong Kong may provide business opportunities for cleantech firms based in Skåne, and the director of Sustainable Business Hub visited representatives in Hong Kong in the autumn of 2011 in order to discuss opportunities.

### Regional Council of South Savo

Regional-level strategies are developed by the Regional Council of South Savo. The Regional Development Programme 2011-2014 comprises an Environment Report which has the overall objective of increasing energy self-sufficiency by increasing bioenergy-related R&D activities and the number of pilot projects in the region. In the Programme bioenergy is also linked with more general climate targets. Overall, bioenergy is emphasised as pivotal in contributing to the region's opportunities to reach its targets in terms of climate and energy efficiency, innovation and successful business activities. Concerning forests and forestry, it is stated that the aim is to have well-functioning, successful and eco-efficient businesses within the sector and to increase wood processing in the industry in order to move away from producing only raw materials. The programme has

set targets to increase the use of renewable energy by 20% and increase energy efficiency by 20%.<sup>35</sup>

The South Savo Innovation Strategy 2010-2015 focuses on technology and service innovations. Globalisation and changes related to sustainable development, new technologies and an ageing population are seen as the main challenges that the region has to respond to by improving its specialisations and competences. Bioenergy is highlighted as one of the most important growth sectors in the region. New business and material possibilities in forestry are seen as a way to link South Savo actors to other Eastern Finnish actors such as higher education institutions and core enterprises. A demand for bioenergy innovations especially in Russia is noted as is the possibility of commercialising the ideas for the global markets as well. The innovation strategy wants to see five significant technology innovations related to bioenergy, material technology or other biomass industry in the region by 2015. By 2015, there should also be up to three pilot or demonstration plants developing bioenergy. Bioenergy and material technology should create 50 million euros of new business activities annually as well as at least a hundred new jobs.<sup>36</sup>

The Education and Research Strategy of South Savo 2009-2015 aims at diversifying the education offers in the region, and at institutionalising the existing education and research units as essential parts of the regional research structure. The Regional Council considers that the existing research activities in the region are not sufficient to render the region a high competence area that would attract employers paying competitive salaries that would in turn draw employees with high qualifications to the region. The strategy emphasises the importance of developing high-level RD&I activities in the region and bioenergy is again highlighted as an important opportunity.<sup>37</sup>

The Eastern Finland Bioenergy Programme 2020 has been developed in collaboration between all regions in Eastern Finland (South Savo, North Savo, Kainuu, South Karelia and North Karelia). It aims at concretising national and regional climate and energy targets and profiling Eastern Finland as a bioenergy pioneer that has both the raw material from forests and high-level competence in bioenergy and machine building. The programme emphasises the positive consequences that the development of bioenergy can have on the regional economy and employment. The focus is on forest energy with different targets related to e.g. the use of wood pellets but solar energy and biogas are also discussed.<sup>38</sup>

<sup>35</sup> Regional Council of South Savo, 2010a

<sup>36</sup> Regional Council of South Savo, 2010b

<sup>37</sup> Regional Council of South Savo, 2008

<sup>38</sup> Regional Council of North Karelia, 2011

<sup>34</sup> Malmö Cleantech City, 2012

## City of Mikkeli

Bioenergy became a strategic focus in the City of Mikkeli in 2011. It had been included in different strategies earlier, but in 2011 it was chosen as one of the most important development areas. The general strategy of Mikkeli of 2009 promotes the city of Mikkeli as the stronghold of the South Savo region where enterprises, education institutes, and research institutes work closely together with the municipality to reach common goals.<sup>39</sup>

Several municipalities in the South Savo region are at

the moment in the process of putting together a common Vitality and Competitiveness Programme. The municipalities will provide funding within different priority areas that are decided in the programme. Bioenergy is expected to be an important priority area in the programme as it is not only of importance for the more central and more urbanised areas of the City of Mikkeli but also for smaller and more rural municipalities in its surroundings.

## Cluster development

Cluster development is a widely used policy tool at national and regional level in the Nordic countries and beyond. This is also the case in the two case study regions. The public authorities have initiated the cluster organisation Sustainable Business Hub in Skåne for cleantech firms, and recently in South Savo the bioenergy cluster organisation Biosaimaa has been initiated in order to support the continuation of the development started by the national Centre of Expertise Programme.

### Skåne: Sustainable Business Hub

As introduced above, Sustainable Business Hub was first established in 2001 as a network organisation for environmental firms, but developed a more strategic focus on cleantech firms in 2006. Today, SBH has approximately 120 paying members, and 12 employees. The limited company has a board of directors with seven members, including a representative from Region Skåne and a representative from Malmö City. It is in charge of the strategic development of SBH.

Sustainable Business Hub is one of six cluster initiatives developed by Region Skåne, and, an evaluation of them was carried out in connection with the recently developed innovation strategy. The results of a questionnaire sent to members of SBH suggest SBH has contributed to increasing knowledge of the industry, new networks and increased cooperation between the members. Approximately 30 per cent of the firms have developed new products and services and have strengthened their competitiveness, 10 per cent have hired new employees, and 20 per cent have experienced increased sales from SBH membership.<sup>40</sup>

Much of the organisational development at SBH has happened with the help of the ERDF co-financed project “Swedish Model for Clean Growth” which was run during the period 2007-2010. This project was one of the first large ERDF projects to be implemented in

Skåne. The project owner was Region Skåne, and it was managed by SBH. The purpose of the Swedish Model for Clean Growth was to develop an environmentally-targeted innovation system to strengthen the competitiveness of cleantech firms. A number of sub-projects were carried out.

A so-called functional project within the Model involved supporting initiatives and structures for business development, and export development. Within this project SBH also carried out market analyses and compiled an index of all firms in the region which dealt with environmental technologies; they aimed to support the development of networking between firms; and to facilitate firms’ use of research in their product development. Public procurement was another issue covered, and involved working with public authorities at the regional and local level to encourage them to take into consideration environmental requirements in public procurement, and thereby support public investments in environmental technologies. The “test-bed” approach was developed as part of these initiatives.

*The test-bed approach:* The idea behind the test-bed approach is that municipalities can provide essential business support to firms by testing new products for them before they are brought to the market. The CEO of the new start-up firm Knycer AB was involved in the process of developing the test-bed approach at SBH. Knycer was established to develop a drying cabinet which does not use heat and thereby consumes less energy than other drying cabinets commonly used in Sweden. When a first version of the drying cabinet was ready to be tested, SBH set up a meeting with purchasers from Malmö City, who agreed to provide a test bed for two cabinets at a local kindergarten. The opportunity to test the practical use of prototype cabinets in a real environment was essential in the initial development, and the product was launched on the market after a period of testing and adjustment. Knycer’s drying

<sup>39</sup> City of Mikkeli, 2009

<sup>40</sup> Oxford Research, 2011, p.64

cabinet is today exhibited at Malmö Cleantech Centre, and visitors who come to Malmö to hear about activities in the cleantech area are introduced to the product, along with other innovations from cleantech firms in the region. Malmö City is described by respondents as an important actor in green innovation procurement in the region, which is also one of the environmental targets of the municipality.

*Involvement of higher education institutions:* According to the project leader of Swedish Model for Clean Growth, the project provided a useful opportunity for SBH to test a number of different approaches. Although the test-bed approach was considered successful, another project, “Hands-on Environmental and Industrial Demonstration Initiative” (HEIDI), was less so. The purpose of this project was to promote the growth of cleantech firms by offering them a physical space at Malmö University for product development and product demonstration in cooperation with researchers. In a longer-term perspective it was intended that cleantech firms would be able to rent space in the demonstration centre, which could also be used for visitors who came to the region to learn about its cleantech activities. HEIDI was run for one year as part of Swedish Model for Clean Growth, after which it was intended to be run by Malmö University. It was then found that Malmö University alone did not have sufficiently broad disciplines to run the research and demonstration centre, however. Respondents argued that it would have been useful to include the relevant technical departments at Lund University. This initiative to develop cooperation between cleantech firms and higher education institutions, which was not continued after the project period, has so far been the only one of its kind within the framework of SBH.

The role of SBH in relation to higher education

institutions in Skåne is currently being discussed by the board of directors. As yet, there is no formalised cooperation or coordination with higher education institutions. As noted earlier, there are several education programmes which are relevant for cleantech firms, but there is no coordination between the institutions, and no coordination with the cleantech sector. Potential ways in which SBH may play a role would be as an arena for bringing together representatives of education programmes and representatives of cleantech firms in order to discuss the development of the industry and the needs of education in terms of new graduates from the universities in the region. In addition to the question of a dialogue between industry and universities about higher education, the question of potential R&D cooperation between researchers and cleantech firms is also being discussed by the board. It is argued by some respondents that the higher education institutions themselves would have to “own” this question and be in charge of coordination between researchers and the cleantech industry, whereas others suggest that SBH could play an important role as a mediator between research and industry.

*An approach to support export of sustainable solutions:* The most important results of the ERDF co-funded project Swedish Model for Clean Growth is that an approach to organising sales missions has been developed which involves a focus on “sustainable solutions” that could bring together firms from different industries to provide solutions abroad. Further, cooperation in a number of sub-clusters has been initiated within SBH in the areas of: water and wastewater treatment, biogas, energy systems, and sustainable urban development.<sup>41</sup> A firm-level example of developing export collaboration is introduced in the following.

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<sup>41</sup> Ramböll Management, 2010

**Table 7: Firm-level example - Export collaboration in the water and wastewater industry**

An example on export collaboration involves three firms in the water and wastewater industry: Malmberg Water and Läckeby Water based in Skåne, and Nordic Water based in the region of Västra Götaland. These three firms are among the largest and strongest in the water industry both in a regional and in a national context. All are medium-sized companies with between 80 and 200 employees. They have developed their products in close cooperation with municipalities and industry. All of the firms have been exporting products and services to countries such as Germany, Poland, Lithuania, the United Kingdom, and China since the 1960s and 1970s. They deliver similar products and services, and they joined forces in order to expand their business to the Ukrainian market, which has resulted in the establishment of a common limited company, Swedish Water Experience AB (SWE).

SWE was initiated within the framework of SBH at the beginning of 2011 after discussion between the firms, SBH, and VARIM (Swedish Association of Suppliers of Effluent and Water Treatment Equipment). SBH is in charge of administrative tasks and financial support, as well as more coordinative functions to support contacts with national authorities and arrange exhibitions abroad. At national level the Swedish Trade Council assists SWE with contacts with Ukrainian authorities and other issues concerning the export process. The Swedish Trade Council administrates the national initiative SymbioCity, founded by the Swedish government and Swedish industry. SymbioCity is the national marketing concept developed to promote the Swedish experience in sustainable urban development and in exporting products and knowledge worldwide. The Swedish Agency for Economic and Regional Growth supports SWE financially.

During the creation of SWE all involved actors discussed the potential markets for exporting environmental technology services and products. The decision was to focus on the market of Ukraine. The main reason for choosing Ukraine is that the country has a high demand for environmental technology solutions, especially in the area of water infrastructure systems. Another important reason is the relative geographical closeness to the Ukrainian market, in comparison with other potential environmental technology markets, such as China, India, Brazil and South Africa. SWE firms have also already established relations with neighbouring countries, such as Poland and the Baltic countries, which facilitates market entry into Ukraine.

The three firms which form SWE AB are small in comparison with large multinational companies and firm constellations in other industrial sectors, which is one of the main reasons for creating a consortium. The firms are too big for the Swedish market and too small for exporting individually to Ukraine, which all three had tried unsuccessfully.

The first step towards the Ukrainian market was made in November 2011 when SWE, Sustainable Business Hub, and the Swedish Trade Council participated in the International Water exhibition "AQUI Ukraine 2011". The aim was to establish contacts with Ukrainian municipalities, cities, and ministries. During the exhibition the firms involved established contact with customers in Ukraine and received a request to develop the water infrastructure facilities in three Ukrainian cities: Zhytomyr, Horvlika, and Dymotrov.

SWE developed a memorandum of understanding with the Ministry of Regional Development, Construction and Municipal Economy to deliver wastewater treatment solutions, which was signed in March 2012. One objective is that Ukrainian wastewater management over a five-year period will meet EU standards. Work has now been initiated in the cities of Zhytomyr, Horvlika, and Dymotrov.

Each of the SWE firms owns one-third of SWE AB and the board consist of two representatives from each firm. Current plans involve establishing a joint firm based in Ukraine, which will be owned 100% by SWE AB. The chairmanship of the board will rotate between the firms. All projects implemented in Ukraine will be owned by the Ukraine-based firm. As regards the project management in Ukraine, one common project team has been appointed to realise the projects and the staff will be employed by SWE Ltd. Ukraina, Malmberg Water, Läckeby Water and Nordic Water. The projects will be run as a so-called "open book-project".

In a policy perspective it is important to acknowledge that regional actors, such as Sustainable Business Hub, hold an important position in the start-up phase of the initiative. This includes administrative tasks and financial support, as well as more coordinative functions to support the contacts with national authorities and arrange exhibitions abroad. In relation to market entry, however, national actors, in this case the Export Council, were important in terms of securing good contacts with foreign authorities and financial support. Another key issue in relation to national-level support is that the SWE firms stress that some kind of public financial support is needed in order to realise the project in Ukraine as well as in other countries where there is a demand for environmental technology solutions but insufficient moneys in the public sector to realise such projects. Thus, for such projects some form of financial support is often needed to cover the costs. For example, according to one respondent, the Ukrainian public authorities are only covering around 70% of the costs of the project.

*Public policy:* The European Regional Development Fund (ERDF), Region Skåne and the membership fees are the most important funding sources for the management of SBH. SBH depends, however, on regional, national and EU funding for its project-based activities.

The Swedish Agency for Economic and Regional Growth has been the most significant national funding body for SBH activities. Some funding has also been given by the Swedish Energy Agency for internationalisation projects, and recently by VINNOVA. Moreover, funding has been granted by the national programme “The Delegation for Sustainable Cities” (managed by the Swedish National Board of Housing, Building and Planning), which is intended for export projects of new constructions or reconstructions in urban districts or residential areas.

The Baltic Sea Region Programme and other Interreg funds are also important to SBH. These projects are particularly beneficial with regard to establishing collaboration with other regions, especially those with a focus on the Baltic Sea region. Although there are some Interreg-funded activities with partners on the other side of the Sound, several respondents stated that Öresund collaboration on cleantech development has reached its full potential. The management of SBH and Copenhagen Cleantech Cluster have met to discuss opportunities for collaboration which may be initiated at a later stage, e.g. in terms of receiving visitors from abroad and organising sales missions together. Actual cooperation has however not yet been established.

## South Savo: Centre of Expertise Programme and Biosaimaa

In 2002, the Regional Council of South Savo applied for a place in the national Centre of Expertise Programme and in 2003 the technology and innovation centre Miktech started to function as the Mikkeli Centre of Expertise. The Programme is coordinated by the Ministry of Employment and the Economy and is based on national cross-regional clusters based on a bottom-up principle whereby regional actors initiate cooperation with other regions and make proposals to the Ministry which then chooses the cluster initiatives with the most potential. The programme is meant to function as a tool for combining high-level research with technological, design and business competences.

The Mikkeli Centre of Expertise has been participating in the Forest Industry Future cluster whose mission is to combine the know-how of companies and research institutes to create product, material, service and production innovations to produce profitable business. Other regions participating in the cluster are from North Karelia, the Kokkola sub-region, south-east Finland and the Oulu and Jyväskylä sub-regions.

Interviews suggest that this cluster initiative has not been very successful in terms of establishing inter-regional cooperation. The projects within the Forest cluster have mostly been regional or local and development has been slow. On the basis of the evaluations conducted in 2010, the Forest Industry Future cluster in the Programme was reorganised and development of a new biocomposite and bioenergy competence area was initiated. Miktech as the Mikkeli Centre of Expertise became a member of the new competence area and the focus of its activities in the Forest Industry Future cluster shifted from wood structures to bioenergy.<sup>42</sup>

Miktech Ltd developed the Bioenergy Business Development Programme in 2011 related to both activities within the Centre of Expertise programme and the new municipal strategy's focus on bioenergy which states that specific strategies will be developed for all the strategic spearheads of the city. The programme identifies the main actors involved in bioenergy, i.e. firms, research institutes, associations and public authorities, and the potential of the bioenergy sector in South Savo. It determines the targets and priorities of the development work and describes the activities of the new bioenergy cluster initiative Biosaimaa which was initiated in 2011. The vision of the programme is that in 2020 South Savo will be the most important producer of processed forest energy products and a nationally recognised forest energy technology developer and user.<sup>43</sup>

In 2011, Miktech started to establish the forest energy cluster organisation Biosaimaa with the main purpose of implementing the bioenergy-related goals and that part of the Centre of Expertise Programme dealing with bioenergy. The aim of the organisation is to increase the business activities of the bioenergy firms, increase the use of forest biomass and its processing in the region and brand the region as an expert in forest energy. In general, Biosaimaa and the activities undertaken within its framework are closely related to the main challenges and weaknesses of the bioenergy sector identified by Miktech such as the low amount of raw material processed in the region, the few international activities and the need to make the production chain from harvesting to logistics and processing more efficient in order to decrease dependence on national subsidy schemes. The organisation is also seen as a good way to communicate and brand the bioenergy sector in South Savo more visibly. The Centre of Expertise Programme is relatively unknown to many firms even though it has been active in the region for ten years.

The Biosaimaa cluster activities are run with funding received for the Centre of Expertise activities from the Ministry of Employment and the Economy,

<sup>42</sup> Forest Industry Future, 2012; Centre of Expertise Programme, 2010

<sup>43</sup> Miktech, 2012a

the City of Mikkeli, the Regional Council of South Savo, the City of Mikkeli, and the energy foundation Suur-Savon energiasäätiö. In future, membership fees will be charged to the cluster member companies. The aim, via competition, interaction and specialisation, is find synergies and innovations across business sector boundaries. The member companies cooperate in working groups on different themes related to the strategic priorities of the cluster organisation. The concrete activities within the priority areas include developing R&D projects and searching for funding and partners, systematic development of SMEs, arranging workshops, promoting the establishment of new bioprocessing facilities, promoting the establishment of a new bioenergy logistics centre in Ristiina, developing a communications plan and making the organisation more visible in the media as well as increasing the utilisation of students from the higher education institutions of the region.

At the moment, the cluster organisation has 12 member companies including the two main energy companies in the region as well as several small and medium-sized firms working in different parts of the bioenergy production chain. Some of them are bioenergy companies but many are looking to bioenergy to expand their activities and get new support for their business from the bioenergy sector. They might have had their main activities in other sectors but are interested in applying their services or technology to bioenergy production. It is expected that

several new biocoal firms will be set up in the region. In 2011 a new firm working with heat treatment of wood was established. The research and education institution members of the organisation include LUT Savo (Lappeenranta Technical University), Aalto University School of Small Businesses, South Savo Vocational College, Ruralia Institute, Mikkeli University of Applied Sciences, Forest Centre South Savo, Forest Owner Association, Savo Forest Management Association and MTT Agrifood Research Mikkeli.<sup>44</sup>

*Involvement of higher education institutions:* According to the interviewees, so far LUT Savo has been the institute that has been most actively involved in bioenergy development in practice. The research centre of Lappeenranta University of Technology, based in South Savo, has established a bioenergy professorship, which is a position funded by EU Structural Funds and the energy foundation Suur-Savon energiasäätiö. Small firms often need support from the research unit when they are testing their products' applicability to the bioenergy sector and this is a demand that LUT Savo has been able to respond to. LUT Savo has also supported bigger companies which have considered its support very useful when for example new procedures for securing the availability of fuels for power plants need to be studied.

One example of LUT Savo's role in the development projects of small firms is evident in a firm-level case study which involves the application of composite technology to the bioenergy sector.

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<sup>44</sup> Miktech, 2012a



**Table 8: Firm-level example - Applying composite technology to bioenergy**

Fibrocom was established in 1993 with the purpose of further developing a specific channel composite technology which the founder had developed in the late 1980s and early 1990s while working at another firm. Channel composite is a new kind of composite that can be used in e.g. containers and trains. The composite is light but resistant and from the 1990s onwards Fibrocom has applied the composite in various transport vehicle projects. Fibrocom has also been participating in various composite projects with funding from TEKES and it has been a partner in an international project funded by the European Commission. Today Fibrocom has 11 employees.

In 2003, Fibrocom was contacted by VTT Technical Research Centre of Finland, which together with the bioenergy company VAPO was studying how to reduce the weight of peat and wood chip transport vehicles. VTT knew about the channel composite technology developed by Fibrocom and was aware of its application in railroad transport. In 2003, calculations were conducted showing that the weight of peat and wood chip transport vehicles could significantly be reduced by using channel composite containers. In 2004, the first prototypes for bioenergy transport were built and in 2005 the technology was tested in practice. From 2005 onwards, channel composite containers have been manufactured for customers.

As bioenergy increasingly became a focus of national and regional policy, new biofuel and biodiesel power plants were expected to increase the demand for wood-chip energy, and therefore Fibrocom decided to further develop its bioenergy container solution. The earlier solution was only applicable to lorry transportation as the containers were built in. The built-in container solution was too inflexible for long-distance transport if the material had to be moved from lorries to trains and ships. In order to maximise the capacity and the imposed load, development of a new transferrable container was initiated. The aim was to build lightweight containers that could be used like traditional containers and transported easily by rail and sea. The new solution was a significant shift in the transportation of forest energy. It has high potential as transport expenses of bioenergy products make up 20 to 50% of the total product prices and logistics is the only part of the production chain where the expenses could still be meaningfully decreased.

During the autumn of 2009, Fibrocom started to contact firms in the forest industry to find out if there was any interest in such a solution. Several large companies were interested as they thought the new container could be economically profitable. In early 2010, Fibrocom contacted TEKES for funding and a pre-study was conducted. Fibrocom appointed LUT Savo as an external consultant to do the required calculations. In the event it was found that the new logistical solution could reduce transport expenses by 10%, a notable reduction.

After the pre-project phase the aim was both to demonstrate and test the new container solution and to do research on e.g. its competitiveness and the logistic chain. Fibrocom applied for funding from TEKES, but was informed that its funding terms did not cover manufacturing. With a loan from TEKES and a small grant from the energy foundation, however, work was eventually started.

The development project also includes a research part for which LUT Savo is responsible. It is funded by TEKES, ERDF, and the several companies who are included in the firm consortium and participate in it by e.g. testing the product (including VR, UPM, Stora Enso, Fortum, and several smaller energy and logistics companies). The container project is on-going until 2013. By summer 2012, three containers had been built and tested and LUT Savo had compared them with traditional container technology.

In its activities in the material technology sector, the Mikkeli University of Applied Sciences has been a significant cooperation partner of Fibrocom, and researchers and students have carried out smaller studies and research projects. In relation to bioenergy, the role of the LUT Savo Unit is more central. In the region there is no education directly related to Fibrocom's activities, which could become a challenge in the future when employees with the right competences to develop and market Fibrocom's products are needed in order to fulfil its national and international goals.

In the early 2000s, Fibrocom took part in the activities related to the material technology focus area of the Centre of Expertise Programme in Mikkeli. When the focus of the Centre of Expertise programme shifted from composites to bioenergy, it was natural for Fibrocom to become part of the Biosaimaa cluster organisation as the firm wished to apply its composite technology in bioenergy. Within Fibrocom the firm has become part of a group of companies working with e.g. harvesting and wood-chip drying. It sees the cluster initiative and the firm group as a way to find synergies and build bigger bioenergy entities (from harvesting to processing) that could be exported. Biosaimaa could be a suitable support for the internationalisation activities that Fibrocom so far has lacked. For Fibrocom, the most important outcome of the Biosaimaa cluster would be concrete projects with other firms. Previously Fibrocom has been an occasional supplier of big international companies but as a small firm finds it difficult to establish cooperation with big companies and function as their supplier.

By summer 2012, most of the actual projects within the Biosaimaa cluster organisation were still in their early stages. Focus is on projects dealing with bioenergy logistics solutions. Examples of projects under Biosaimaa are establishment of a biolistics centre in 2013 and an associated biocoal plant that will be fully operational by 2015. A pilot project on heat treatment will be carried out at the energy company Etelä-Savon Sähkö during the autumn of 2012. In August 2012, the two Biosaimaa member energy companies Etelä-Savon Energia and Suur-Savon Sähkö also took the decision to increase their use of wood fuels substantially. Etelä-Savon Energia will open a new power plant with 100% wood fuels and reduce its use of peat by half and Suur-Savon Sähkö will build a new bio-heating plant that uses local wood chip and wood residue.<sup>45</sup>

*Public policy:* The EU Structural Funds and funding from the energy foundation Suur-Savon energiasäätiö have been crucial for the R&D projects in bioenergy. Almost all of the bioenergy-related projects have received money from the Structural Funds and the energy foundation, which both have clear regional connections. Several actors in the region are concerned about the expected decrease in national-level regional development funds. As a small region with limited resources it is difficult for South Savo to compete for funding from larger EU and national programmes. Miktech and LUT Savo have been searching and applying for EU projects and programmes but without success. Similarly, small and medium-sized enterprises interested in co-funding opportunities provided by the national agency TEKES (the Finnish Funding Agency for Technology and Innovation) for R&D projects usually contact the Centre for Economic Development, Transport and Environment that represents the funding agency in the region. Three technology experts represent TEKES at the Centre and they provide advisory services to technology companies applying for money from TEKES. TEKES requires 50% co-financing from the firms themselves. As technology firms in South Savo are usually small, however, it is often difficult for them to come up with the co-funding required in order to receive funding from TEKES. Further difficulties are expected in the South Savo region given the current discussions on post-2013 innovation policy in Finland.

*Changes to the post-2013 national innovation policy:* The expected change in Finnish innovation policy after 2013 is an important factor influencing the bioenergy development in South Savo and also one of the background factors behind the decision to establish a bioenergy cluster initiative in South Savo to implement the Centre of Expertise Programme and promote bioenergy. The Centre of Expertise Programme will end at the end of 2013 and will not be continued. According

to a representative from the Ministry of Employment and the Economy, the Centre of Expertise Programme will be replaced by an “innovative cities programme” and a “competence and innovation networks programme”. Both programmes are still under construction but the aim is to build stronger innovation centres in bigger cities and decrease the number of innovation centres and clusters across the country. The reason for this is that current innovation measures and activities of the Centre of Expertise Programme have proved beneficial to smaller regions but may have been constraining the development of bigger cities.

In the new innovative cities programme, the aim is to build stronger and more influential entities based on a bottom-up principle whereby regions can come up with cluster suggestions or proposals after which the most internationally competitive Finnish regions will be chosen for the programme. The programme aims at supporting “smart specialisation” and aims to concentrate the research, development and innovation resources to the nationally most significant themes and projects. It is of great importance that the chosen activities are based on market demand or demand based on big societal challenges. Smaller regions will not be able to participate in the new innovative cities programme directly but, within a new network implemented with EU Structural Funds, they can participate in specific activities within the programme and cooperate with the bigger cities. Structural Funds will be used to promote networking between the innovation centres in the innovation cities programme and other regions in order to spread knowledge and develop innovation activities, *inter alia*.<sup>46</sup>

The regional actors in South Savo consider the Biosaimaa cluster initiative as an effective way to improve the opportunities of South Savo’s forest energy sector in getting a position in the innovation system after 2013. It is intended that the cluster organisation will help to promote South Savo as a bioenergy region and to make the forest energy activities more visible. The interviewees expect that if the region is able to show a functioning bioenergy development programme, a network of firms and some concrete results already starting to form, it is more likely that the region will get a role in some of the new larger innovation centres post 2013. Miktech and the Biosaimaa cluster organisation are also preparing for the end of the Centre of Expertise Programme by starting cooperation with other Centre of Expertise in Savonlinna and Varkaus, which are both within 100 kilometres of Mikkeli. The idea is that the bioenergy activities in Mikkeli, Savonlinna and Varkaus could combine to form a stronger entity which could apply for a place in a future bio-economy innovation concentration. According to the interviewees, such

<sup>45</sup> Etelä-Savon Energia, 2012; Suur-Savon Sähkö, 2012

<sup>46</sup> Ministry of Employment and the Economy, 2012c

a site is expected to be located in a larger city such as Jyväskylä or Joensuu. The actual content of the cooperation between the centres is still unclear and

negotiations were still on-going between the cities of Mikkeli, Savonlinna and Varkaus in summer 2012.

# Policy implications for post-2013 regional development strategies

As mentioned above, the international policy discourse on green growth and eco-innovation will have a direct impact on regions in the EU member countries, as a shift towards a low carbon economy is one of the thematic objectives of EU Cohesion Policy post-2013.

Moreover, the development of a smart specialisation strategy is required as part of the new ex ante conditionality framework for any region that wishes to use the European Regional Development Funds (ERDF) for innovation activities.

## Analysis of regional context and potential for green growth

To recap, the concept of green growth as defined by the OECD refers to fostering economic growth while ensuring that natural assets continue to provide the resources and environmental services needed in society; to this end, investments and innovations should give rise to new economic opportunities. In order to develop public policies for green growth, regional analyses may be carried out with an initial focus on the three themes introduced in this report, i.e. socio-economic characteristics, innovation capacity and performance, and natural assets. Which areas of the existing business structure of the region may have potential to be developed further or be utilised in new ways to support eco-innovation? What is the availability of relevant education and knowledge institutions within this field? Are there gaps in the competences needed in the region in order to further develop certain economic sectors? What natural assets are available in the region, and is there unused potential, e.g. for renewable energy production?

In this context, a case study example from Skåne is relevant. It analysed the initiative of the Business Development and Environmental Department of Region Skåne to identify which economic sectors would be best to focus on in terms of measures to support environmental business development. Agriculture and food, transport, and cleantech were relevant sectors identified in the analysis. Subsequently, however, the potential to support measures in agriculture, e.g. organic

farming, was not as good because of the dominant local farmers' association which had a relatively conservative view on land use. Green transport in the form of biogas production was also identified as a strength of Skåne, but it was assumed that a region such as Västra Götaland with its strong automotive industry would always be superior in this field to Skåne. The analysis determined that cleantech, and especially energy efficiency, water, and sustainable urban development were areas where Skåne had a competitive advantage compared with the rest of the country.

The guidelines for "smart specialisation" stress the importance of regions taking into consideration their position in relation to other regions of Europe when making strategic decisions, i.e. identifying competitive advantages through systematic comparisons. This was done to some extent in Skåne at a national level when cleantech was identified as a strategic focus area. Another aspect is that regions should be able to identify relevant linkages and flows of goods, services, and knowledge revealing possible patterns of integration with other regions. When similarities or complementarities with other regions are detected, interregional collaboration may be a relevant course to pursue.<sup>47</sup> An example of this is the South Savo case study: the region has developed a common bioenergy strategy with neighbouring regions in Eastern Finland. Similarly, at the local level Malmö City and Copenhagen City have developed a common green-growth strategy.

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<sup>47</sup> Smart Specialisation Platform, 2012

# The role of higher education institutions

*Education:* In conducting analysis of innovation capacity within certain economic activities, it is relevant to explore the presence of higher education opportunities. In Skåne a number of relevant education programmes are in place, but within the cleantech area some parts of the sector have problems recruiting the number of engineers they need, especially small firms which have problems matching the salaries of bigger companies. It is not a lack of education programmes but young people's lack of interest in becoming engineers that is seen as an issue. One way to deal with it may be to put in place initiatives to promote the attractiveness of this type of education and subsequent job opportunities to high school students and younger pupils. In South Savo, the level of education is lower than in Skåne, and it is not possible to get a Master's degree that is directly relevant to the bioenergy sector in the region. A major challenge to South Savo is that to increase the number of high-technology firms and knowledge-intensive jobs to support the development of the bioenergy sector it is necessary to attract firms and people with relevant higher education from outside the region. This is difficult in the current situation where generally the salary level is well below the national average. In both Skåne and South Savo respondents referred to an increasing demand for employees with a business economics degree combined with sector-specific knowledge. At the moment it is difficult to find such candidates. The challenges which the business community is experiencing or expecting in future need to be discussed, especially with representatives from higher education institutions and the regional and local authorities.

*Regional partnerships:* A previous study on the role of higher education institutions in regional development found that different types of partnerships have been established in order to strengthen regional development in the Nordic countries. One example is formal partnerships, such as the Regional Growth Fora in Denmark which are in charge of regional development strategies and the distribution of development funds. Another is the recent initiative of the Norwegian government that requires all higher education institutions in Norway to establish Councils for Cooperation with the Business Community, which includes collaboration on the development of education programmes.

These partnerships include representatives from knowledge institutions, regional and local authorities, and the business community. Another type of regional partnership involves on-going communication between representatives from higher education institutions and cluster organisations in the region, who discuss development needs of businesses and competences of human resources.<sup>48</sup> Such partnerships are relevant both in terms of creating a better understanding between the higher education institutions and the business community and in exploring opportunities to develop education programmes to better match the needs of the surrounding business community and facilitate researcher involvement in firms' R&D activities.

*Incentives to support research and development cooperation:* The innovation performance of a region may be strengthened by the involvement of researchers from higher education/ knowledge institutions in the R&D activities of firms. In Skåne, within the area of cleantech there is no organised cooperation with higher education institutions on R&D activities. One reason is that there are several relevant institutions in the region, one of which, Lund University, is large and has many different departments, making it more difficult to establish collaborative links/networks with relevant actors. A lack of incentives for researchers to become involved in cooperation projects with smaller firms in the region is another issue in this context. An example of creating incentives is evident in South Savo where the LUT Savo research institute with support from public funding has established the "bioenergy professorship" (as well as professorships in other areas), which provides the opportunity for the professor to support small firms with R&D activities in the field of bioenergy. This is a concrete example of how initiatives are taken to raise the level of competences and to further develop the existing firms in the region, which in many cases would not on their own have the resources to utilise other R&D support opportunities, e.g. from TEKES, which requires 50% co-finance. A point in this regard is that it may be easier to establish links between knowledge institutions, regional authorities and the business community in a region where there are fewer actors and institutions and where there is an obvious need to deal with challenges such as increasing out-migration and a generally low level of education.

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<sup>48</sup> Lindqvist et al., 2012

## Cluster or networking initiatives

The cluster approach has been promoted by the OECD, EU and national governments and has been widely implemented at the regional and local level. It is a common public policy approach used for the purpose of stimulating learning and innovation activities in certain economic areas. An approach found in both case studies is the establishment of cluster organisations, partly funded by regional development funds and partly by the firms that are members of the organisations. Often EU Structural Funds' projects and projects funded by national level programmes are implemented through cluster organisations, as evidenced by the case studies. This has meant that Sustainable Business Hub in Skåne has been able to develop competences in organising export collaboration for firms, bringing together different actors from within the cleantech sector to provide "sustainable solutions" in export markets. Cluster organisations can function as mediators by bringing together actors from different sectors, as is evident in South Savo where logistics firms, for example, have joined the new cluster organisation to be able to move into the bioenergy field. As mentioned above, cluster organisations can be mediators in terms of fostering partnerships with regional and local authorities

and knowledge institutions in order to discuss the need for human resources and development in the industry.

Although firms can benefit from participation in firm networks at the regional or local level, the question of whether there is enough critical mass in the region to facilitate the desired development needs to be tackled. Interregional cooperation may be highly relevant in this case in the sense of supporting the development of business networks across regions, whether through the support of cluster organisations or other business support organisations. An interregional approach is relevant in both urban and rural regions, but may be slightly more critical in rural and peripheral regions in terms of mobilising critical mass. In connection with the interregional focus, it can be useful for a cluster organisation to open up to members from outside the region, which is the case, for example, with Sustainable Business Hub. In terms of internationalisation, cluster organisations can play a role in marketing member firms abroad, establishing links with new markets, and developing collaboration with similar cluster organisations nationally and internationally to exchange knowledge and develop collaboration between firms.

## Business start-up and product development

In the start-up phase the availability of business advisers in the local and/or regional business support organisations is essential. One of the firm-level case studies concentrated on the start-up phase of an entrepreneur who wished to develop an energy-efficient drying cabinet. Here the opportunity to be based at a business incubator was important, as was the fact that the advisers were able to persuade the necessary contact to provide specialist knowledge in the product development phase. Early venture capital investments in the firm were essential, e.g. support from "business

angels". An organisation such as Cleantech Scandinavia, which specialises in the cleantech market and provides membership advice to interested investors, can play a significant role in promoting investment in cleantech development. National, regional and local policy may help the product development of cleantech firms through providing programmes that provide the opportunity to apply for loans, grant opportunities, or business idea competitions which target the cleantech sector and/or more broadly eco-innovations.

## Export

In terms of entering new export markets, national-level actors proved to be significant in the firm-level case study of three firms that formed a consortium to export their water infrastructure solution to the Ukrainian market. The Export Council was especially important in terms of securing good contacts with foreign

authorities. National-level funding programmes also played a role, and the national association for the water industry was helpful in terms of facilitating the process. The need to form consortia to export environmental technology solutions can be facilitated by a cluster organisation which brings together relevant actors, not

least for smaller firms interested in collaborating with bigger companies. One point which emerges in this case is that when environmental technology solutions are exported to “developing” countries where there is

an urgent need for environmental solutions, additional financial support is often needed to cover the costs. This may call for better integration with international environmental policy goals.

## Eco-innovation in public procurement

Studies have indicated that public procurement can be more important for supporting innovations than different forms of R&D support. Some arguments for this are that public authorities can act like demanding customers; public demand can quickly lead to critical mass in demand and new solutions are distributed to several public institutions; and unlike R&D programmes public procurement can lead directly to demand in the market.<sup>49</sup> One approach to innovative public procurement is to provide demonstration installations or “test beds”, which is highly relevant in terms of testing environmental technology solutions. Regional and local authorities can play a role here in terms of purchasing products which need to be tested before they are launched on the market. Public authorities can act as demanding customers and help drive the innovation process of a new solution, e.g. a solution which is more

energy-efficient than existing alternatives. Firms will subsequently have reference projects which may help them on both the domestic market and export markets when they launch new projects, and the solution which has been tested may lead to increasing demand by other public institutions and support efforts to improve energy efficiency in the public sector.

An increasing awareness of environmental concerns in public procurement should be broader than a mere focus on environmental technology, and be guided by the awareness of the need to reduce the use of natural resources and decrease the release of harmful substances in all sectors. An obvious benefit for regional and local authorities of increasing their focus on eco-innovation procurement is that it will support their work towards reaching environmental as well as economic targets.

## The roles of national, regional and local funding sources

It was found in the case studies that national-level initiatives to support innovation in clusters, export initiatives, sustainable urban construction, and energy efficiency play a significant role in cleantech and bioenergy development. In the Swedish case it was argued by respondents that the institutions and programmes would benefit from better coordination and from focusing funding on fewer projects instead of spreading it thinly on many smaller initiatives. In the Finnish case regions which are considered to have low innovation capacity and performance are at risk of being excluded from the post-2013 national programmes to support regional innovation measures as these will be concentrated on the urban areas that perform best in terms of having stronger socio-economic and innovation profiles. One issue with national-level funding is its fixed character, which means it relies on calls for proposals and is less flexible than initiatives which are decided at regional and local levels.

At regional level both case studies showed that the EU Structural Funds, especially the innovation priority of the ERDF, have been widely used for development

projects in cleantech and bioenergy. The advantage of the Structural Funds is their flexibility, which allows for some degree of experimentation with new approaches and for adaptation to changes during a project. In South Savo another significant source of funding for development projects is the Energy Foundation, set up by one of the energy companies in the region, which in turn is owned by a number of municipalities. Profits from the energy production are utilised for bioenergy business development, and thereby the municipalities are able to generate funding to support innovation and utilise the potential for renewable energy production in the region, which has a weak socio-economic and innovation profile. Consequently, the region may also be less vulnerable to the apparent increasing centralisation of national innovation policy.

In a green growth perspective, national-level authorities may benefit from taking a more place-based approach in the prioritisation of funding programmes in order to ensure a balanced development which also includes advances in utilising the potential of the natural resources in regions with more rural characteristics.

<sup>49</sup> Nutek, 2006

# New approaches in the development of green growth strategies

This project has studied regional-level strategies identified as incorporating the concept of green growth in the sense of simultaneously working towards reaching environmental targets and supporting innovation and economic growth through targeted public policy initiatives. In conclusion, four main points should be emphasised as important in the development of green-growth strategies as opposed to traditional regional development strategies: (1) ensuring the integration of the concept of green growth in all regional development strategies; (2) the need for an increasing focus on the proper utilisation of natural resources; (3) ensuring cross-sectoral collaboration in the development of strategies, e.g. between environmental and business development departments of public authorities, and including third-sector parties such as environmental and nature protection NGOs; and (4) demands for new ways of identifying potentials for green growth in existing economic sectors in a given region.

As suggested by the OECD green growth needs to be incorporated in existing policy processes rather than created through stand-alone policy documents or agencies.<sup>50</sup> This is also the case at the regional level where green growth considerations should be integrated into regional strategies, including climate and environmental strategies, innovation and education strategies, etc. In one of the case studies an example of a green-growth strategy was found at the local level in the form of a cross-border initiative between Malmö City and the City of Copenhagen. This strategy has meant that cooperation has been initiated between all departments of the two municipalities in order to find ways in which they can collaborate on green growth. Consequently the cities are now cooperating on a number of projects ranging from large-scale wind-turbine development to the integration of sustainable development in teaching at public schools. This indicates that green growth can bring together municipalities as well as regional authorities for cross-border collaboration to strengthen efforts towards green growth.

The integration of green growth in regional development strategies entails increasing concern for the utilisation of natural resources. The concept of eco-innovation may be integrated in strategy documents as an approach to minimising and dealing with environmental impacts from production and consumption activities and reducing the consumption

of natural resources. It requires the whole lifecycle perspective of eco-innovation to be considered, which involves increasing energy efficiency in the business community and expanding renewable energy production. At the same time it involves citizens and asks how the public sector might help support more sustainable consumer behaviour. This for example could mean better waste management in private households and public institutions, and exploiting the potentials for utilisation of biological waste for energy and biogas production in municipally-owned energy companies.

The integration of green growth in regional development strategies will require a greater focus on cross-sectoral cooperation, especially between the environmental and business development departments of regional and local authorities. Furthermore, in order to ensure the implementation of green growth in development strategies in the region, wider partnerships are required. In the context of “smart specialisation” it is stressed that in addition to triple helix constellations of industry, knowledge institutions and government in the development of innovation strategies, innovation users or groups representing the demand-side perspectives and consumers, relevant non-profit organisations representing citizens and workers should all be taken on board in the design process.<sup>51</sup> An approach to regional governance partnerships to integrate green growth in development strategies would require a wider involvement of actors; for example, non-profit organisations representing environmental interests, industry associations, and labour and employer organisations. A key concern is to guarantee synergies and coherence between the strategic priorities of different sectors within the public authorities and that they reflect the place-based potentials and needs for green growth, while ensuring a dialogue with relevant actors in order to support implementation of green-growth objectives in both the private and the public sector.

In the case study regions analyses have been carried out to identify the potentials for development of the cleantech and bioenergy sectors. Strengthening eco-innovation would entail the development of approaches to analysing existing industries in a region in order to identify their green-growth potential, not least those industries that contribute most to the environmental pressures on the economy.

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<sup>50</sup> OECD, 2011b

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<sup>51</sup> Smart Specialisation Platform, 2012, p.22



# Directions for further research

Achieving sustainable development through the principles of green growth is rooted directly in the EU's headline policy - Europe 2020. In response to this, and to keeping with the economic and innovative strengths of the Nordic countries, the Nordic Council of Ministers has decided to prioritise green growth as an area for cooperation on regional development during the period 2013-2015.

In a European perspective, the EIO lists a number of sectors that will contribute the most toward greening the economy. These include:

- Agriculture: including consumer food, beverages and alcohol products;
- Electricity: including the production and consumption of energy resources, electricity, gas, steam and hot water;
- Transport services;
- Basic manufacturing: including refinery and chemical products, non-metallic mineral products and basic metals;
- Construction works: including buildings and infrastructure.<sup>52</sup>

One of the case studies in this report discussed local approaches to improve energy efficiency through sustainable construction. This is an area that needs to be put in additional focus, not least because the building sector is the most energy intensive sector in Europe, and we live in a relatively cold climate with an abundant need for energy for heat. Further research is also necessary on the relationships between eco-innovation, the remaining economic sectors listed above and the opportunity for regional-level policy initiatives to support development. Studies have also shown that the tourism activities contribute significantly to climate change, and there is an increasing focus on measures to reduce the sector's environmental impact.<sup>53</sup> Sustainable tourism would therefore be relevant to explore further in

terms of regional strategies for green growth, especially in a Nordic context of rural regions where tourism is often a prioritised area for public policy.

It is also clear that further development of knowledge-driven, export-oriented green innovation will underpin the continued transition toward green growth for the Nordic countries. Here, regional scale analysis is especially crucial for a number of reasons. For instance, many of these innovations are based on bottom-up entrepreneurship activities; especially ones that benefit from local and regional support. Therefore, research that can discover and highlight the actors and processes underpinning the success of these developments is advantageous.

But in addition to this, our on-going work continues to highlight the lack of robust indicators of regional performance and potential for green growth, especially at the EU level. While innovative research such as the technical potentials of bio-economy residuals for energy production exemplifies important research results so far, much more is needed. The analysis in this report was mainly limited to general indicators that account more for underlying regional characteristics that act as drivers and enablers of green growth than they do for actual green growth performance. As such, evidence-based, information on green growth in the Nordic countries could benefit greatly by investing in the development of a comprehensive statistical database that can measure green growth performance of key sectors in the Nordic regions going forward. While seeking out this information from national statistical institutions would require up-front investment, it would promote the development of relevant indicators and provide regional policy makers with cost-effective monitoring of performance that can be easily updated going forward. Not least, it would further confirm the intentions of the Nordic countries to lead Europe in the pursuit of a greener economy.

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<sup>52</sup> EIO, 2011

<sup>53</sup> Kaae, 2011



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