

ESPON



Co-funded by
the European Union
Interreg

sweden
2023.eu
Nordregio

WORKING PAPER //

Territorial perspective on green industrialisation

Final version // October 2023



This working paper was compiled within the framework of the ESPON 2030 Cooperation Programme, partly financed by the European Regional Development Fund.

The ESPON EGTC is the Single Beneficiary of the ESPON 2030 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States Iceland, Liechtenstein, Norway and Switzerland.

The content of this publication does not necessarily reflect the opinions of members of the ESPON 2030 Monitoring Committee.

Authors

Michaela Gensheimer, Marjan van Herwijnen – ESPON EGTC
Nora Sanchez Gassen, Carlos Tapia – Nordregio

Acknowledgements

Sverker Lindblad – Ministry of Rural Affairs and Infrastructure, Sweden
Wolfgang Pichler – Swedish Agency for Economic and Regional Growth
Ulf Tynelius – Swedish Agency for Growth and Policy Analysis
Daniel André – National Board of Housing, Building and Planning, Sweden

Information on ESPON and its projects can be found at www.espon.eu.

The website enables users to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

ISBN: 978-2-919816-69-9

© ESPON 2030

Published in October 2023

Layout and graphic design by BGRAPHIC, Denmark

Printing, reproduction or quotation is authorised provided the source is acknowledged and a copy is forwarded to the ESPON EGTC in Luxembourg.

Contact: info@espon.eu

ESPON



Co-funded by
the European Union
Interreg

sweden
2023.eu



Nordregio

WORKING PAPER //

Territorial perspective on green industrialisation

Final version // October 2023

Foreword by the Swedish Presidency of the Council of the European Union

Climate change is a big challenge to handle. The EU is leading and must continue to lead the way in mitigating climate change by delivering on ambitious climate goals and boosting growth and competitiveness. Furthermore, the Russian aggression against Ukraine has emphasised the importance of Europe accelerating the green transition and taking greater responsibility for our own energy supply. Achieving our common climate goals and increasing our sustainable energy production is crucial in this context. Consequently, the green and energy transitions were priorities during the Swedish Presidency of the Council of the European Union.

In periods of industrial and technological transition, early movers have a competitive edge, and European companies and industries are already leading the transition to and transformation into a green economy. Sweden is one of the front runners in green industrialisation, and we hope to inspire the whole EU with good examples of how to use this potential in both rural and urban areas. Investments in green and fossil-free steel production, electric vehicle battery production, the development of sustainable mining, new green fertilisers and new solutions within the bioeconomy and forestry are just some examples. Increased production of cheap and reliable fossil-free electricity is key to these developments.

Fostering significant potential also means that challenges have to be handled. Demographic change leads to shortages of skilled labour in both the private and public sectors. Production of renewable energy is a land-consuming activity that easily leads to conflicts with local people. Rural areas may lose out in the competition for skilled labour. Governance and planning capacity must match the needs of a growing population and industry.

This ESPON working paper takes a closer look at both the possibilities and challenges in relation to green industrialisation from a territorial perspective, and it also gives examples of solutions from Sweden and other countries.



A handwritten signature in black ink, appearing to read 'Peter Kullgren', written in a cursive style.

Peter Kullgren

Minister for Rural Affairs

Introduction

As part of the European Green Deal, the European Commission presented a Green Deal Industrial Plan in February 2023, aiming to enhance the competitiveness of Europe's net-zero industry, support a fast transition to climate neutrality and end the age of fossil fuels in Europe (European Commission, 2023a).

Published at an opportune moment, this working paper aims to contribute to the implementation of the Green Deal Industrial Plan and support European regions in their green industrialisation processes by discussing local and regional development opportunities, obstacles and possible solutions enabling them to benefit from green industrialisation.

The working paper was jointly developed by ESPON – the European Territorial Observation Network – with Nordregio and the Swedish Presidency of the Council of the EU (for the first semester of 2023), focusing on two of the presidency's priorities: the green and energy transitions.

It aims to support decision-makers at local, regional, national and EU levels to learn about the benefits of implementing green industrialisation solutions and the possible challenges that can be encountered. In addition, it sets out to inspire stakeholders by presenting approaches implemented in different regions and Member States to address these challenges.

This working paper should be read as a detailed overview of issues encountered by regions throughout their green industrialisation processes. The paper first looks into the question of why regions actually need green industrialisation and then moves on to discuss how green industrialisation can be seen as part of the solution to global challenges. Chapter 3 addresses opportunities and challenges that can be experienced by local and regional public authorities in relation to restructuring existing industries and/or regarding the creation of green industries in their territories. The issues discussed are accompanied by helpful practical examples from Sweden and the rest of Europe. The final chapter offers conclusions and some policy advice.

This working paper was used as an input into the ESPON seminar in Luleå, Sweden, on 14–15 June 2023, so that expert opinions on the issues addressed by the event could be incorporated into the final version of the paper. The outcomes of the discussions were used to finalise Chapters 1–3 and informed the conclusions and policy recommendations in Chapter 4. The working paper has also been condensed into a shorter and more focused [policy brief](#).

1 Why regions need green industrialisation

Climate change is acknowledged as an urgent global challenge, one that must be addressed through various cross-sectoral mitigation and adaptation measures at all levels of governance. Greenhouse gas emissions are the main driver of climate change. The reduction of these emissions requires a move towards renewable energy sources and more efficient energy systems. The greening of carbon-intensive industrial sectors is an important step towards reaching carbon neutrality by 2050, while at the same time offering multiple development opportunities for regions that have experienced structural challenges for decades. The transition process of green industrialisation will need to be supported by multisectoral policies across governance levels, not only to accelerate the deployment and distribution of clean energy but also to ensure value generation for the regions that host the relevant industries.

1.1 Dealing with climate risks

Over the past few years, European regions and cities have seen more and more extreme weather events, such as exceptional heat, droughts, wildfires and floods, because of a globally changing climate. In response to these events, governments, at all levels of governance, have started taking measures to both mitigate the effects of and adapt to climate change. However, even if global efforts to reduce greenhouse gas emissions prove effective, most regions' risks of experiencing climate-related hazards are expected to increase (see Map 1.1),¹ resulting in more frequent and intense extreme weather events in many regions (ESPON, 2011b, 2022a; EEA, 2016).

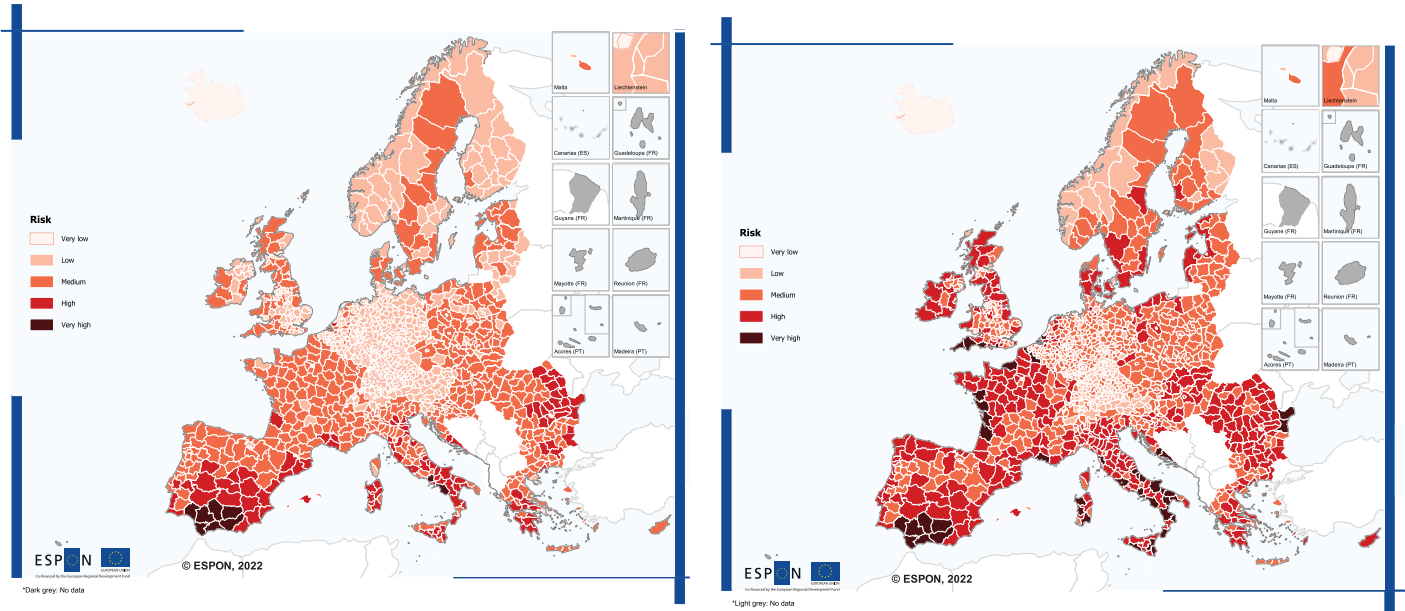
¹ The baseline climate scenario (Map 1.1 – left panel) reflects European regions' real risks of being affected by climate-related hazards in 1981–2010. During that time, southern Europe showed a higher risk of being affected by climate change hazards than northern European countries. The risk scenarios developed in the framework of the ESPON Climate Change and Territorial Effects on Regions and Local Economies in Europe (CLIMATE) update project (ESPON, 2022a) induced hazards to the end of the 21st century (i.e. they considered what the effect of future hazards would be on society and the environment).

The risk levels were derived from combining climate-related hazards with regional exposure and vulnerability. The indicator-based methodology applied to characterise the three risk components was based on up-to-date data sources (Eurostat, Copernicus, Risk Data Hub, Peseta IV, etc.) and aligned with other European initiatives (steered by the Joint Research Centre and the European Environmental Agency).

Vulnerability and risk were calculated for different impact chains at NUTS 3 level, consisting of the combination of given hazards with specific sectors or systems. These risk analyses (for the impact chains and at aggregated level) were conducted using both absolute and relative exposure, and in four different climate scenarios: baseline climate (1981–2010); low emissions (2070–2100 RCP2.6); intermediate emissions (2070–2100 RCP4.5) and very high emissions (2070–2100 RCP8.5). RCP stands for 'representative concentration pathway' (developed by the Intergovernmental Panel on Climate Change) and the numerical values represent greenhouse gas concentrations.

Map 1.1

Aggregated risk of climate change induced hazards: baseline climate (1981–2010) with absolute exposure (left); and very high emissions scenario (2070–2100 RCP8.5) with absolute exposure (right)



Source: ESPON-Climate Update, 2022
 Origin of data: COPERNICUS, RDH, PESETA, EUROSTAT, ESPON, EIGE, 2022
 Regional Level: NUTS 3 (2016)
 © UMS RIATE for administrative boundaries

In the very high emissions scenario (Map 1.1 – right), many European regions’ risks of being affected by climate-induced hazards increase towards the end of the century, with a pattern of extreme risk in coastal areas. Following from that scenario, it is expected that the risk of hazards typically associated with southern European countries (i.e. extreme heat, droughts, wildfires) will become more widespread in the rest of Europe. As a consequence, ecosystems, economic sectors, and human health and well-being will continue to be adversely affected across the continent, for example by floods.

Against this backdrop, the population’s risk of river flooding is expected to significantly increase by the end of this century. It is mainly Belgium, France, Germany, Ireland, northern Italy, the Netherlands, Sweden and the United Kingdom that will be affected by more frequent and intense river floods. The risk due to climate change that is expected to increase most by the end of the 21st century is regions’ risk of coastal floods affecting infrastructure, industry and service sectors.² According to the very high emissions scenarios developed and analysed in the latest ESPON CLIMATE update (ESPON, 2022a), practically all European countries with a coastline will have regions that are at a high risk of having their infrastructure, industry and service sectors affected by coastal flooding by the end of this century. Coastal regions in Denmark and the Netherlands are likely to be the worst affected in this context.

² The following seven impact chains were analysed in the ESPON CLIMATE update (2022a): risk of heat stress affecting the population; risk of coastal floods affecting infrastructure, industry and service sectors; risk of river floods affecting the population; risk of river floods affecting infrastructure, industry and service sectors; risk of flash floods affecting the cultural sector; risk of wildfires affecting the environment; and risk of droughts affecting the primary sector.

1.2 The clean energy challenge

The European Green Deal, presented in December 2019, strives for a clean energy transition that shifts energy production away from fossil-based sources towards renewable sources (European Council, 2019). Russia's war against Ukraine initiated a period of profound instability and risk, including unprecedented energy insecurity and a cost-of-living crisis. As a consequence, the European Commission, together with the Member States, made several adjustments to energy and commodity markets and flows (e.g. limiting excessively high gas prices, cutting energy costs for households and businesses) (European Council, 2023). The Russian war against Ukraine reaffirmed the principles of the European Green Deal, confirmed its ambition and could act as a catalyst for the green transition in Europe, as it revealed the continent's dependence on energy imports and spurred ambitions to accelerate the clean energy transition to meet the goals laid down in the European Green Deal.

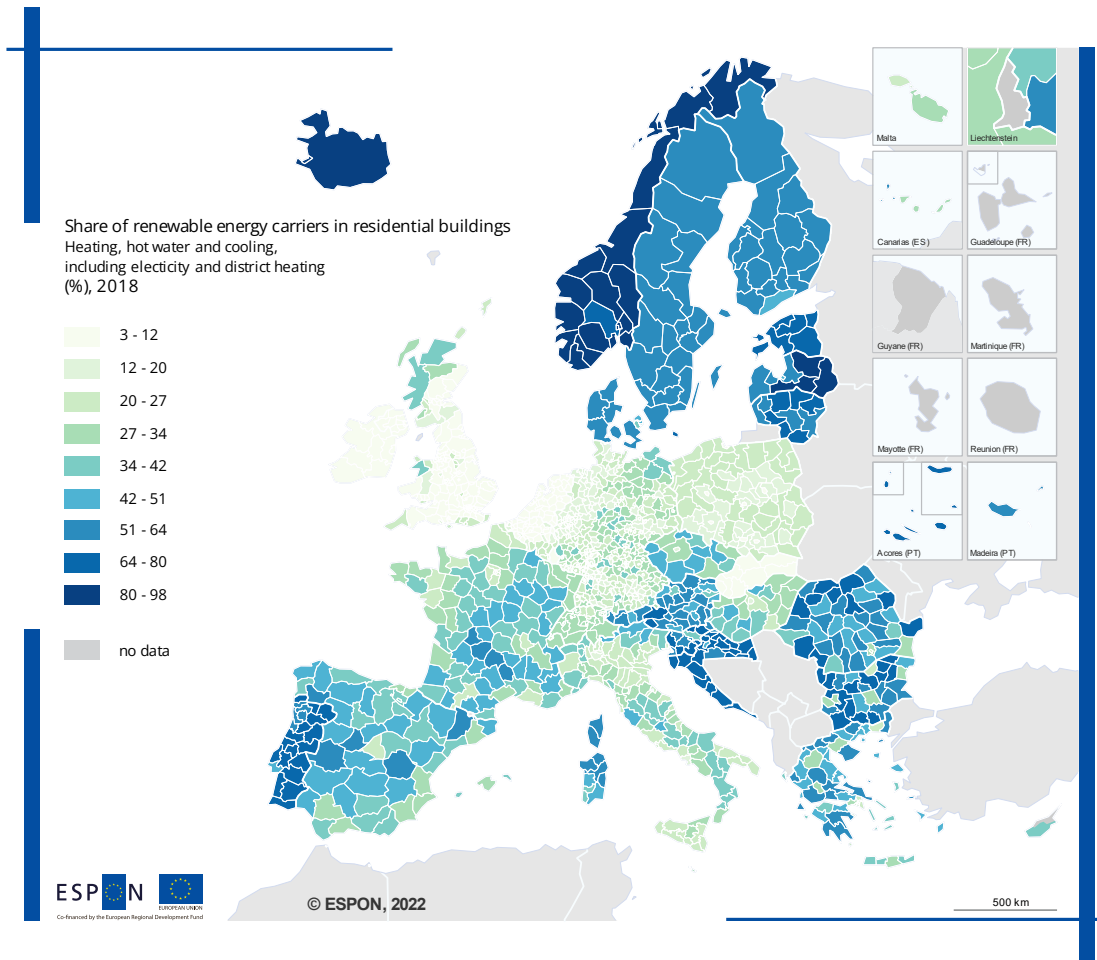
The heating and cooling of buildings account for about half of the EU's energy consumption, with space heating and hot water production making up the biggest part of households' final energy consumption (ESPON, 2022b). Renewable energy will play a crucial role in the decarbonisation of this sector, although the transition process advances at different rates across Europe. Some regions show greater improvements in electricity generation from renewable energy sources and reductions in energy consumption for heating and cooling. However, other regions lag behind, and much more needs to be done to advance decarbonisation, including further integration of decentralised production from intermittent sources and reduction of demand following the thermal renovations of buildings. These measures become more and more pressing, particularly in regions such as Northern Sweden that (will) host green industries. These industries will increase local/regional demand for clean energy in the years to come.

The highest share of renewable energy carriers in final energy consumption for heating and cooling can be seen in the Baltic countries, the Nordic countries and Portugal (see Map 1.2). However, this territorial pattern does not correspond to the highest potentials for the same renewable energy sources. Rather, regions with the strongest policies and market conditions favouring renewable energy deployment fare better. For instance, as the ESPON Territories and Low-Carbon Economy (LOCATE) project update shows, between 2012 and 2018, the largest increases in electricity generated by solar panels took place in France, Germany, the Netherlands and the United Kingdom (ESPON, 2022b). The challenge is that regions with high solar potentials and low levelised costs³ of solar panel electricity generation often have comparatively low disposable income levels. These regions could be assisted by public policies that promote solar energy and include it in territorial planning, particularly in urban areas where other renewable sources are not available. In contrast to the territorial pattern of solar panel electricity generation, onshore wind generation increased considerably between 2012 and 2018 in European regions with high or very high potential for that type of renewable energy (i.e. particularly in France, Germany and the United Kingdom).

³ Levelised cost of electricity is defined as the price at which the generated electricity would need to be sold for the system to break even at the end of its lifetime (Papapetrou and Kosmadakis, 2022).

Map 1.2

Share of renewable energy carriers in residential buildings, 2018



Regional level: NUTS 3 (2016)

Source: ESPON LOCATE, 2022

Origin of data: Eurostat, own calculations, 2020

© UMS RIATE for administrative boundaries

Altogether, the ESPON LOCATE update shows that most European regions are not yet in line with the policy ambitions set out in the Green Deal regarding the absolute share of renewables (i.e. 49 % by 2030 in the building sector, with an annual increase of 1.1 %) (ESPON, 2022b). High energy prices due to the post-COVID-19 economic recovery, the relaxation of travel restrictions and the Russian war against Ukraine have intensified the need to accelerate the clean energy transition. However, as consumers and businesses across Europe are confronted with a cost-of-living crisis, they may be less able to bear the costs of the energy transition. In fact, the second Hamburg Climate Futures Outlook report concludes that the 1.5 °C goal⁴ laid down in the Paris Agreement is not plausible, and that ‘corporate responses and consumption patterns ... continue to undermine the pathways to decarbonization, let alone deep decarbonization’ (Engels et al., 2023). According to that study, the decarbonisation process has been significantly affected by the consequences of the COVID-19 pandemic and the war in Ukraine: ‘Recovery programs and measures to relieve the socioeconomic impacts of the COVID-19 outbreak have locked in fossil-fuel dependence, making transformations to deep decarbonization less plausible than previously expected’ (Engels et al., 2023).

⁴ The Paris Agreement envisioned holding global warming to well below 2 °C and, if possible, to 1.5 °C, relative to pre-industrial levels (UN, 2015, Article 2, paragraph 1a).

2 Green industrialisation as part of the solution for global challenges

During the early 2020s, the COVID-19 pandemic defined our way of life and how businesses and industries were run. As the world was edging out of the pandemic, international organisations, financial institutions and business representatives urged world leaders to ensure that the recovery process led to a greener and more sustainable global economy (Bailey et al., 2020; Carbon Brief, 2020; SDG Knowledge Hub, 2020). This process would need to include the goal of accelerating the transition from carbon-intensive industrial structures and processes towards more sustainable, environmentally friendly solutions. This transition process has been termed 'green industrialisation' (sometimes also referred to as the 'green industrial revolution'; Clark, 2014). In this chapter, we define this concept, explain the status of the green industrialisation process in Europe, with a focus on Sweden and other Nordic countries, and highlight some of the benefits that can accrue from green industrialisation processes for local areas and societies at large.

2.1 Defining green industrialisation

The United Nations Industrial Development Organization (UNIDO) defines green industries as those that promote 'sustainable patterns of production and consumption i.e. patterns that are resource and energy efficient, low-carbon and low waste, non-polluting and safe, and that produce products that are responsibly managed throughout their lifecycle' (UNIDO, 2011a). The process of achieving green industries (i.e. green industrialisation) is described as a process that aims to attain sustainable economic growth and promote sustainable economies. To be successful, green industrialisation relies on three transformations (UNIDO, 2011b; Fücks, 2019):

- the move **from fossil fuels to renewable energy sources**, entailing a complete overhaul of how energy is generated, transported, stored and used;
- an **increase in resource efficiency**, so that the same amount of raw materials or energy can be used to do more;
- the **transition to a circular economy** in which all waste will be recycled and reused – in other words, decoupling economic development from resource depletion, environmental degradation and pollution.

To accomplish the transformations envisaged, UNIDO asserts that a two-pronged strategy is needed (UNIDO, 2011b).

1. **Greening of existing industries.** Existing industries need to become more sustainable and reduce the environmental impact of their production processes and products, for example by using resources more efficiently, by replacing fossil fuels with renewable energy sources and by reducing pollutant discharges (Luken and Clarence-Smith, 2019). There should also be a focus on extending the lifetime of products and building circular systems in which products and materials are repaired, reused or recycled at the end of their lives.
2. **Creating new green industries.** The development and expansion of new green industries that provide sustainable goods and services should be stimulated. This includes activities related to material recovery, recycling, waste management and energy conservation.

In addition, many commentators argue that changes to tax systems are required so that the prices of goods and services reflect their real ecological cost (Fücks, 2019; European Commission, Directorate-General for Taxation and Customs Union, 2020).

BOX 1**Green industrialisation and the Sustainable Development Goals**

On 25 September 2015, the UN General Assembly adopted the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs). The SDGs are 17 interlinked global goals that aim to protect our planet, people and prosperity and promote peace and partnership. They are to be reached by 2030. The SDGs encompass environmental goals (SDG 13, 'Climate Action', and SDG 14, 'Life Below Water'), social goals (SDG 1, 'No Poverty', and SDG 10, 'Reduced Inequalities') and economic goals (SDG 8, 'Decent Work and Economic Growth', and SDG 9, 'Industry, Innovation and Infrastructure').

By striving towards more sustainable industrial production and consumption patterns, the green industrialisation process contributes to reaching the SDGs, in particular the economic goals such as promoting inclusive and sustainable industrialisation (SDG 9) and responsible consumption and production (SDG 12). In addition, the green industrialisation process contributes to achieving the social and environmental goals, for example by creating new and good quality jobs and reducing pressures on the environment. The green industrialisation process can therefore be considered an important tool for fulfilling the SDGs and various other aspects of the Agenda for Sustainable Development by 2030 (Assmann and Hastings, 2020).

BOX 2**Green industrialisation and the green transition**

A related concept that has gained traction in Europe, and in particular in the Nordic countries, is the 'green transition'. This can be defined as a far-reaching societal movement towards climate-neutral, green economies that ensures social justice and preserves biodiversity (Cedergren et al., 2022). A green economy, in turn, is defined as one in which 'growth in employment and income are driven by public and private investments into such economic activities, infrastructure and assets that allow reduced carbon emission and pollution, enhanced energy and resource efficiency, and prevention of the loss of biodiversity and ecosystem services' (UN Environment Programme, 2023).

The concepts of the green transition and green industrialisation share an emphasis on the idea that a systematic overhaul of the way we produce, transport, store and consume products and services is required to achieve greater social, economic and environmental sustainability. The green transition focuses on changes to our economies at large, including all sectors. Green industrialisation, by contrast, zooms in on the role of manufacturing and related industrial sectors (UNIDO, 2011b; Luken and Clarence-Smith, 2019), and is therefore suitable for more targeted analyses and discussions of industry's contributions to reaching a carbon-neutral economy and the 2030 agenda.

2.2 A transition on its way

Looking at the available data, it can be concluded that the transition to a low-carbon economy has started. This holds for most EU and European Free Trade Association economies and particularly for the Nordic Region, where total greenhouse gas emission intensity has been reduced by more than 30 % since 2000.⁵ Per capita emissions of greenhouse gases from the production of goods in the Nordic countries have also declined by more than 24 % since 2008 (Eurostat, 2023b). In Sweden, this percentage has reached 27 %.

Progress in the reduction of total greenhouse emissions is related to the adoption of more efficient production technologies. This is demonstrated by SDG indicator 9.4.1: carbon dioxide emissions per unit of manufacturing value added. The indicator shows how the intensity of energy use, the energy efficiency of production technology and the use of fossil fuels have improved in the EU over the previous two decades. In northern Europe, the indicator value decreased from 0.24 kg of CO₂ per US dollar in 2000 to only 0.09 kg per US dollar in 2019 (at constant 2015 prices; UN, 2023), a 62 % leap forwards. There was a slightly more modest improvement for Europe as a whole in the region of 40 % (from 0.38 to 0.23 kg of CO₂ per US dollar).

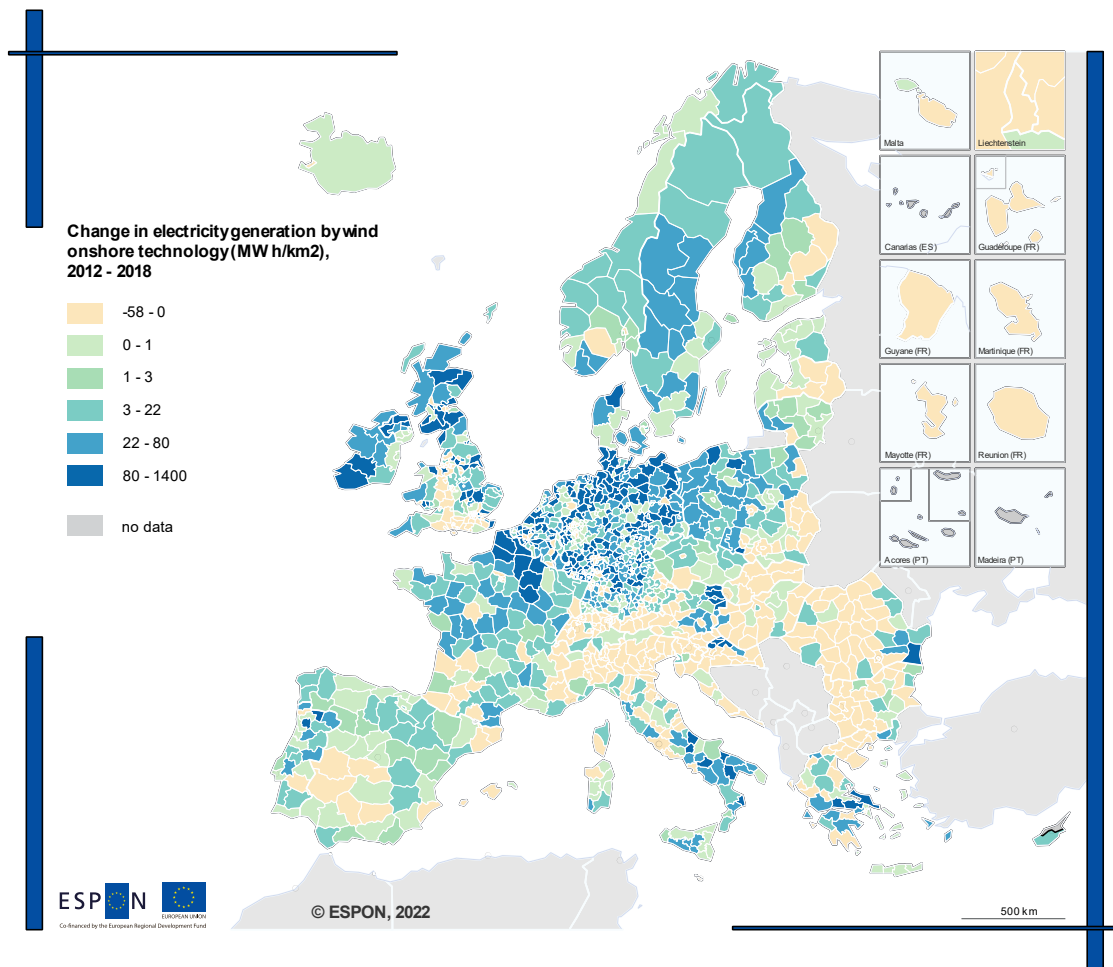
The decarbonisation of European and Nordic economies will depend on far-reaching processes of green industrialisation and innovation. The adoption of renewable energy sources is perhaps the most important sign of such transformations. Between 2005 and 2020, the share of renewables in electricity production experienced spectacular growth in the EU (a 129 % increase). With the exception of Denmark (a 165 % increase), progress in other Nordic

⁵ Greenhouse gas emission intensity is calculated as the ratio of energy-related greenhouse gas emissions to gross inland consumption of energy (Eurostat, 2023a).

countries has been more modest (e.g. a 46 % increase in Sweden). Iceland and Norway already produce virtually all the electricity consumed locally from renewable sources, and Sweden (76 %) and Denmark (63 %) are following suit. By comparison, the EU-27 average in 2021 was 38 % (Eurostat, 2023c). The ESPON projects LOCATE and MSP-LSI (Maritime Spatial Planning and Land–Sea Interactions) suggest that the European market for onshore and particularly offshore wind energy production is very dynamic (ESPON, 2018a; ESPON, 2022c). According to Map 2.1, electricity generation by onshore wind technology increased by more than 20 MWh/km² between 2012 and 2018 in various regions in Europe, including Denmark, Finland, Norway and Sweden. It has the potential to expand even further in the coming years (ESPON, 2018a; ESPON, 2022c).

Map 2.1

Change in electricity generation by onshore wind technology, 2012–2018 (MWh/km²)



Regional level: NUTS 3 (2016)
 Source: ESPON LOCATE, 2022
 Origin of data: Eurostat, own calculations, 2020
 © UMS RIATE for administrative boundaries

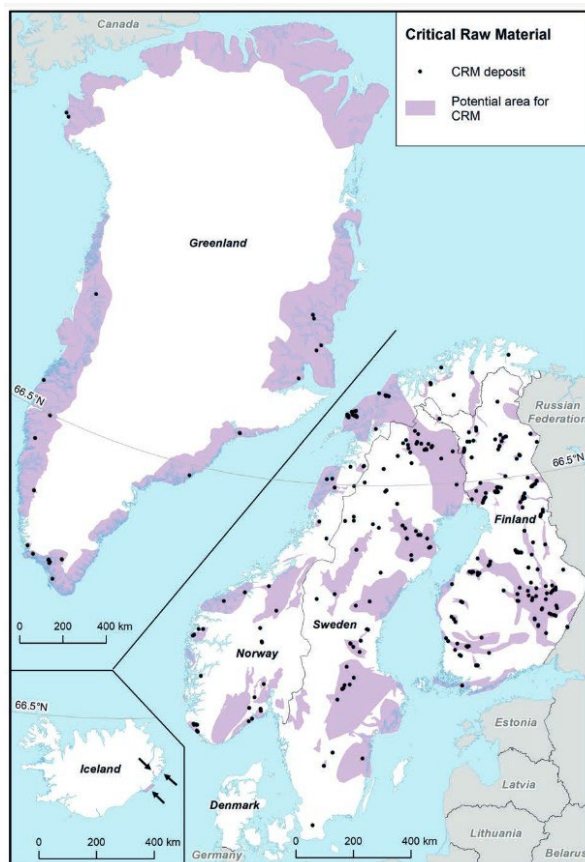
The Nordic countries are innovation champions in many sectors, including green technologies. According to the OECD patents dataset, environment-related inventions in these countries represent roughly 12 % of all domestic inventions, a percentage in line with that of the EU (OECD, 2023a). Between 2005 and 2018, green patent applications in Sweden grew by 55 %. In the Nordic Region as a whole, the number of applications increased by 111 %. These innovations are often commercialised under a business-to-consumer communication scheme. Between 2012 and 2022, the number of eco-label licences awarded in the Nordic countries increased by 19 %, considering both the Nordic Swan Ecolabel and the EU Ecolabel (Nordic Statistics, 2023).

Consumption choices are another important driving force influencing economic decarbonisation. One major development at global level is the mass adoption of electric vehicles. According to the International Energy Agency, 43 % of the cars sold in Sweden in 2021 were electric vehicles (IEA, 2022). In Norway, this share was as high as 86 %. The importance of behavioural change is also reflected in consumption-based statistics. According to the figures available from Eurostat and the Nordic National Statistical Institutes, between 2014 and 2019 consumption-based greenhouse gas emissions declined by 7 % in Sweden, a slightly higher percentage compared to the 5 % reduction recorded in the EU as a whole (Statistics Sweden, 2023; Statistics Denmark, 2023; Eurostat, 2022a). The reduction was 24 % in Sweden and 22 % in the Nordic Region between 2010 and 2020.

The environmental goods and services sector already constitutes considerable shares of the Nordic and EU economies. Measured in terms of gross value added as a percentage of gross domestic product, the sector represents 3.5 % of the economy in Sweden, compared with 2.2 % in the EU. In employment terms, these figures translate into 150 000 jobs in the environmental goods and services sector in Sweden and 4.5 million jobs at EU level (Eurostat, 2023d). Some of these jobs, roughly 1.5 % in Sweden and 1.6 % in the Nordic Region, are generated in the circular economy, including the recycling sector, the repair and reuse sector, and the rental and leasing sector (Eurostat, 2022b).

According to new developments and confirmed investment plans in the EU and Sweden, the future will most probably bring a substantial increase in the number of green and circular jobs in Scandinavia. Considering only the northernmost region of Sweden, it has been estimated that some SEK 1 100 billion (EUR 98.3 billion) has already been committed to new green investments (Swedish Cleantech, 2021). Flagship projects in the pipeline include Hybrit in Gällivare and Luleå (fossil-free steel), Haraholmen in Piteå (green industrial park), H₂ green steel in Boden (green steel and green hydrogen), Markbygden in Piteå (Europe's largest onshore wind farm), Site East and the Northvolt factory in Skellefteå (a climate-neutral industrial area and a gigafactory, respectively), and an electrical aviation project at Skellefteå Airport.

Green investors flock to the northernmost region of Scandinavia in search of accessible and relatively cheap renewable energy and an abundant supply of raw materials. Traditional mining of iron ore and other metals is coupled with strategic deposits of critical raw materials (CRMs), which are also relatively abundant in the region (see Map 2.2; see also Pasi et al., 2021). In early 2023, the Luossavaara-Kiirunavaara Aktiebolag mining company announced the discovery of a 1-million-tonne deposit of rare earths in Kiruna (LKAB, 2023). This can be considered Europe's largest deposit of these CRMs, which are extremely important for green technology, including wind turbines and electric vehicles.

Map 2.2**Locations of known deposits of CRM resources and areas with known or assumed potential for additional CRM resources in the Nordic countries**

Source: Pasi et al. (2021)

However, progress in green industrialisation is not free of challenges. One aspect of concern is the capacity of the energy system to adapt to the new industrial landscape. The increasing demand for renewable energy in the transport sector, together with ongoing industrial transformations (such as the industrial-scale production of green hydrogen using electrolyzers) and the introduction of other types of hydrogen-based innovations (such as carbon-free steel production), may place additional pressure on the electric infrastructure in Sweden. According to previous studies, if grid capacity is not improved in Sweden, as much as 16 GW of new connections, which would enable new investments worth SEK 150 billion (EUR 13.4 billion), may be lost by 2030 (Ingeberg, 2019).

Similarly, in spite of the progress made on greenhouse gas emissions, important challenges remain in many sectors. One key area with substantial margins for improvement is material management. Driven by an increasing demand for raw materials, particularly metal ores and forestry products, the domestic extraction of raw materials increased by 25 % between 2005 and 2020 in Sweden (Eurostat, 2022c). By comparison, the increase at EU-level was only 1 %. In some regions of Scandinavia, the percentage increase in Domestic Material Consumption (DMC)⁶ per capita between 2006 and 2014 was as high as 28 % (Northern Norway). Many

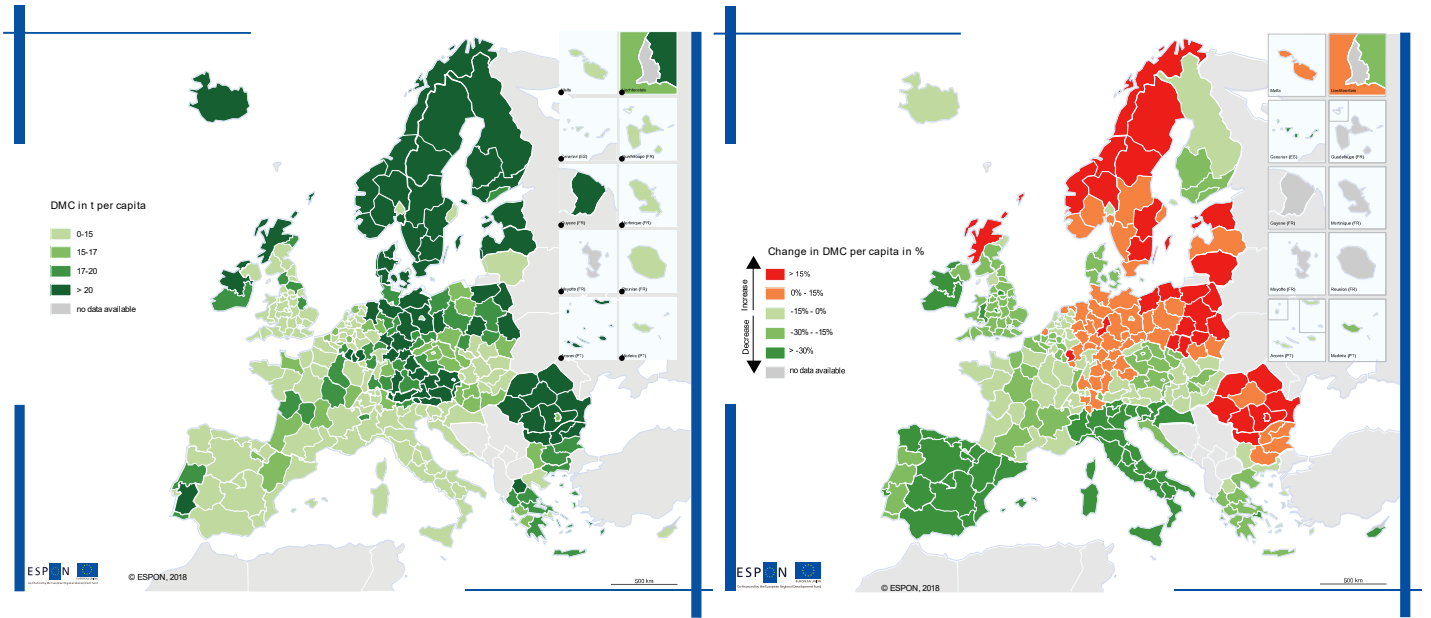
⁶ According to Eurostat (2017), DMC:

measures the total amount of materials directly used by an economy and is defined as the annual quantity of raw materials extracted from the domestic territory, plus all physical imports minus all physical exports.

Nordic regions are among those consuming the most materials per capita (see Map 2.3). This can be explained by the greater importance of the mining and forestry sectors and related downstream activities, such as biomass energy production and the pulp industry. Moreover, many regions of Scandinavia have very low population density.

Map 2.3

Domestic Material Consumption (DMC) per capita, 2014, (left) and relative increases, 2006–2014 (right)



Regional level: NUTS 2 (2013)
 Source: CIRCTER project, 2018
 Origin of data: CIRCTER project, 2018
 © UMS RIATE for administrative boundaries

Regional level: NUTS2 (2013)
 Source: CIRCTER project, 2018
 Origin of data: CIRCTER project, 2018
 © UMS RIATE for administrative boundaries

2.3 Benefits of green industrialisation

With the Russian war against Ukraine, and ongoing inflation and disturbed supply chains, the burdens on businesses and entire industrial sectors in Europe have increased. This has raised concerns that the green industrialisation process in Europe may slow down. Indeed, initial climate commitments among European policymakers seem to have weakened, as questions about energy security and how to avoid bankruptcies and rising poverty rates have moved to the top of political agendas. Several countries – Germany, the Netherlands and Poland, for instance – have extended the lifespan of coal-fired power plants in order to reduce energy prices and increase energy security (Dennison, 2022). Nonetheless, the Russian war against Ukraine and its impacts have also created a strong impetus to move green industrialisation forward, not only to reach climate goals and mitigate global warming but also to make European industries less dependent on the import of fossil fuels and raw materials from less stable world regions.

The DMC indicator provides an assessment of the absolute level of the use of resources, and allows to distinguish consumption driven by domestic demand from consumption driven by the export market. It is important to note that the term ‘consumption’ as used in DMC denotes apparent consumption and not final consumption. DMC does not include upstream ‘hidden’ flows related to imports and exports of raw materials and products.

Accelerated green industrialisation can bring various benefits to societies in Europe. Nonetheless, green industrialisation processes often happen in very localised contexts. This includes municipalities where factories or production sites with high emissions are located, regions where energy infrastructure is built or areas where CRMs are extracted. People living in such municipalities and regions experience the impacts of green industrialisation at first hand, witnessing changes in the local landscape, urban sprawl due to the creation of new industrial sites or residential areas, and changes in access to local green areas. In order to create and maintain public support for green industrialisation, it is important to clearly communicate the benefits that green transition processes bring, not only for European societies at large but especially for people living in areas that are hotspots of green industrialisation processes.

For European societies and economies at large, successful green industrialisation can bring, among others, the following opportunities and benefits.

- **Reaching climate goals.** The industrial sector accounted for around 24 % of greenhouse gas emissions in the EU in 2020 (Tieso, 2023). Reducing these emissions by increasing resource efficiency, phasing out fossil fuels and transitioning to circular production and consumption patterns is one important tool for reaching existing targets on the path to climate neutrality.
- **International competitiveness.** Countries, regions and sectors that are front runners in developing and adopting new green technologies are likely to develop comparative advantages on the global market. They will set regulatory and technological standards, and can export their knowledge and thereby gain economically. With new and innovative green products, they can also tap into an internationally growing market of environmentally conscious customers (Altenburg and Assmann, 2017).
- **Cost reduction and resilience.** Investments in energy and resource efficiency during the green transition will reduce the demand for energy and virgin resources, thereby creating potentials for cost reduction. Where industries start to rely on more locally owned and produced renewable energy, they also become more resilient to global developments and oil price shocks in international markets (Altenburg and Assmann, 2017; Terzi, 2022).
- **Productivity increases.** The green industrialisation process is also likely to trigger productivity increases. Terzi argues that renewables could become the cheapest energy source in history, thus benefiting production and leading to productivity growth across the economy (Terzi, 2022). Digitalisation processes during the green transition are also likely to increase efficiency and productivity in sectors such as health, agriculture, transportation and communications (Lundgren et al, 2020a). In the mining sector alone, various green industrialisation processes could unlock over USD 425 billion worldwide, while reducing CO₂ emissions by 620 million tonnes (Suri, 2020).

For people living in municipalities where key green industrialisation processes and investments take place, the following benefits can accrue.

- **Job creation.** As mentioned above, in the Swedish counties of Norrbotten and Västerbotten, large-scale investments in green steel development, sustainable lithium-ion battery production, and wind power and hydropower expansion are predicted to create thousands of jobs. A key task is to ensure that local populations can profit from these new job opportunities, for example through upskilling and reskilling programmes to prepare the existing local workforce for these changes, make them employable in new green industry jobs and avoid labour shortages.

- **Population growth and public services.** Where investments in green industries lead to the creation of new green jobs, this may offer new prospects for resident populations and thereby reduce outmigration. It may also increase the opportunities to attract migrants from other regions and abroad. With new jobs and population growth, investments in the maintenance of existing public services and the expansion and development of new services may be required, also benefiting established local populations.
- **Increased health and well-being.** Finally, the greening of industries can help to reduce industrial pollution and improve water and air quality, thereby improving the quality of local habitats and environments and the health and well-being of citizens (UNIDO, 2011b). Nonetheless, there is a risk that the green transition may also impair well-being and quality of life at local level, and affect wildlife and traditional livelihoods, for instance if land that was traditionally used for recreation or as grazing grounds is used for new purposes such as the development of wind parks or for the extraction of CRMs.

Chapter 3 discusses how some of these potential challenges and tensions can be addressed and how the opportunities arising from green transition processes for local populations can be maximised.

3 What regions need to achieve green industrialisation

Transitioning to green industrialisation does more than bring about development opportunities and challenges for the industries concerned, as mentioned in Chapter 2. Public authorities in regions and municipalities also encounter opportunities and challenges in relation to the restructuring of existing industries and/or regarding the creation of green industries in their territories. Some of these development opportunities and challenges are addressed in the subsequent sections.

3.1 Demography, employment and shortage of skilled labour

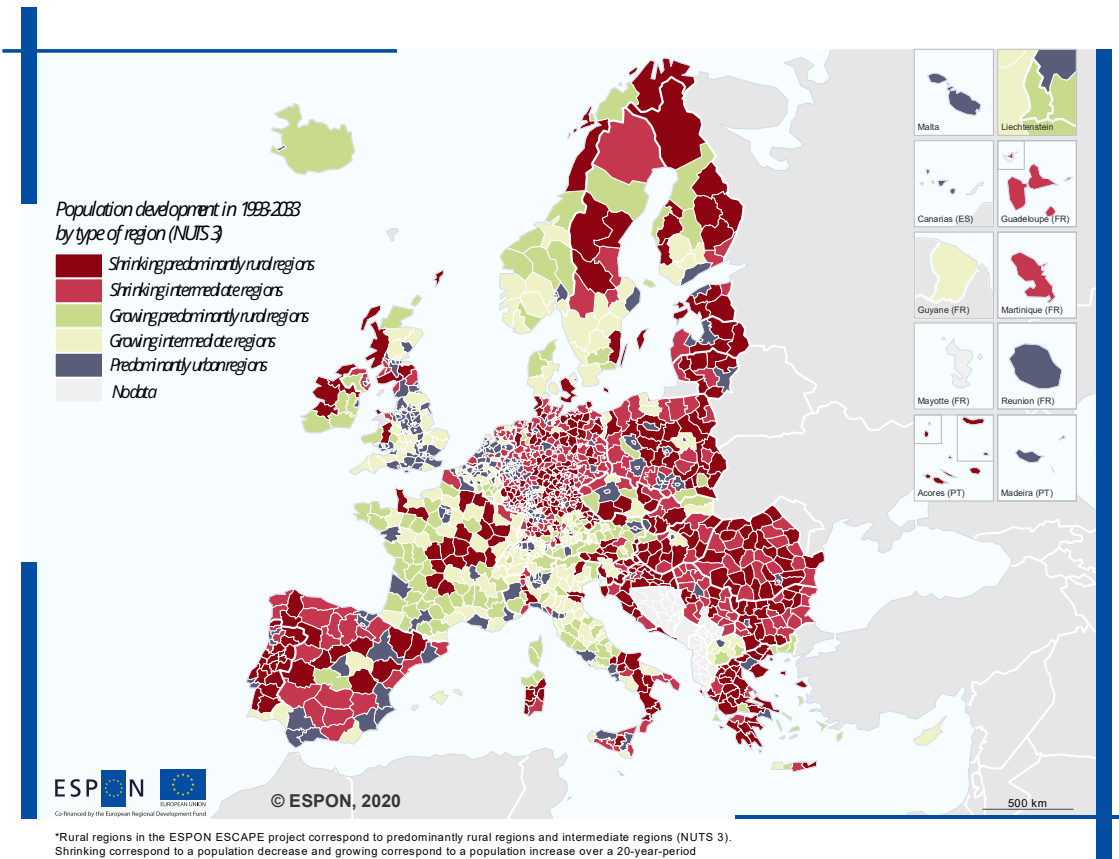
For decades, many rural and remote areas in Europe have experienced outmigration, particularly of young and highly educated women, and the shrinking and ageing of the remaining population. As a consequence, these regions have had to cope with numerous development challenges, for instance ensuring access to public services (such as education, healthcare, social care and transport) and infrastructure (such as leisure time facilities for inhabitants). These demographic dynamics have also resulted in difficulties in recruiting a workforce for social services and other public and private sectors of the economy (Berlina and Lundgren, 2020; Vasilevskaya et al., 2021). Depopulation and economic decline in these regions have created and perpetuated a vicious circle of further shrinking and ageing of the population, loss of productivity and access to public services, and therefore reduced attractiveness of rural areas as places to live and work.

Aware of the particular challenges of rural regions, the European Commission launched its long-term vision for the EU's rural areas to address their specific development issues with a wide range of actions. This vision defines the role and development potentials of these territories in transitioning to a greener society and economy in Europe. In addition, an EU Rural Action Plan was issued to 'pave the way to fostering territorial cohesion and create new opportunities to attract innovative businesses, provide access to quality jobs, promote new and improved skills, ensure better infrastructure and services, and leverage the role of sustainable agriculture as well as diversified economic activities' (European Commission, 2021a). The vision considers rural areas to be important contributors to the production and supply of renewable energy, and areas that can be further sustainably exploited in the bioeconomy sector (i.e. agriculture, forestry, fisheries, aquaculture, and the production of food, feed, bioenergy and bio-based products). Moreover, it mentions the need for 'sustainable and innovative ways to use former mines and mineral extraction sites' (European Commission, 2021a).

Sweden's northernmost region, Upper Norrland, made up of the two counties of Norrbotten and Västerbotten, is no exception to the abovementioned development trends that many European rural regions have experienced in recent decades. However, the two counties display different socioeconomic characteristics and development trajectories. Even though Map 3.1 shows that Norrbotten's population has been shrinking while Västerbotten's has been growing (ESPON, 2020a), the two regions have traditionally been regions of outmigration, where the native population leaves to move to the bigger cities in the south of the country. Both regions have also experienced similar internal migration patterns, with bigger cities/towns such as Luleå, Umeå, and Skellefteå and other municipalities along the coast, have attracted people, while the more rural and remote municipalities in the hinterland have seen population decline. In addition to hosting the largest city in Upper Norrland, Umeå, which is

the biggest local labour market in the region and home to 24 % of the regional population, Västerbotten has an economic structure that is more diverse than that of Norrbotten and also features some small and medium-sized enterprises (SMEs). Conversely, Norrbotten is the traditional mining region in Arctic Sweden; most of the active mines in the country are concentrated in inland Norrbotten, and it has larger production volumes than the rest of Sweden (OECD, 2021).

Map 3.1
Shrinking and growing NUTS 3 regions, 1993–2033



Regional level: NUTS 3 (2010)

Source: ESPON ESCAPE, 2020

Origin of data: Eurostat, ESPON database, Nordregio 2020

© UMS RIATE for administrative boundaries

One of the prime benefits that is expected from green industrialisation is the creation of new green jobs (UNIDO, 2011a). To reduce greenhouse gas emissions, investments are needed, especially in areas such as green energy generation, transmission and storage, the construction and transport sector, manufacturing and metallurgy (Giacometti and Salonen, 2022). These investments are likely to create new jobs and may also offer new development opportunities benefiting people living in rural and remote regions; these regions have been lagging behind in their economic development in recent decades.

Current evidence suggests that newly created green jobs will primarily be good-quality jobs that offer adequate wages, job security, low levels of repetition, and a low risk of automation and delocalisation abroad (Terzi, 2022). Apart from creating new jobs, the green transition will, in the long run, also result in the disappearance of some jobs in traditionally carbon-intensive sectors and some skill sets may become obsolete. Studies suggest, though, that the required upskilling and retraining could mostly happen through retraining on the job, which would

facilitate job transition (Bowen et al., 2018). In any case, there will still be a need also for an unskilled/low-skilled workforce, even in the green transition sector, both in rural regions of northern Europe and in other European regions (NSPA, 2022). Furthermore, as the population in some municipalities and regions grows in the wake of expanding green industrialisation, additional job opportunities should arise in other sectors, for instance public administration, social care and healthcare (see Section 3.2).

BOX 3

Supplying skills in a changing labour market in Skellefteå, Sweden

In 2022, the Swedish battery gigafactory Northvolt Ett started production in Skellefteå, a municipality of approximately 74 000 inhabitants in Västerbotten that promotes itself as 'a growing European centre of the battery industry' (Skellefteå Kommun, 2023). The company hired 600 people in 2022 and plans to have 3 000 employees by 2025, which represents 9 % of the municipality's workforce (Northvolt, 2023). In the wake of Northvolt's operational kick-off in Skellefteå, the Swedish government asked the Public Employment Service 'to contribute to improve the skill supply for large company establishments and expansions in general' (OECD, 2023b). In response, the Public Employment Service opened a new office in Skellefteå to be in a better position to serve the city and the surrounding regions. In addition, the Skellefteå Kommun adult school and Northvolt joined forces to develop 'a six-month automation operator training programme at upper secondary level' (OECD, 2023b; Skellefteå Kommun, 2023). These initiatives can inspire similar actions in other regions that are looking at reskilling their workforces.

As new job opportunities arise in regions hosting and developing green industries, outmigration from the rural parts of these regions may be halted and migration dynamics could be reversed altogether. However, this may only be the case for rural areas in commuting distance of these green industries; for more distant rural areas, the changes could actually lead to increased outmigration. These regions and municipalities may in turn need to transform into 'transition communities' that use sustainable methods of industrial production and doing business to make it more attractive for people to live there (ESPON, 2023). In Norrbotten and Västerbotten, for instance, large-scale investments in green steel development, sustainable lithium-ion battery production, and wind power and hydropower expansion are predicted to create thousands of jobs (Terzi, 2022). In addition, the region has embarked on a 'massive revamp ... to decarbonize the state-run mines', all of which will contribute to turning the tide in the region's development (Liljas, 2022). The region is set 'to grow by 100 000 new talented innovators, creators, builders, and everything else in between', who will contribute to the green industrialisation process (MindDig, 2023).

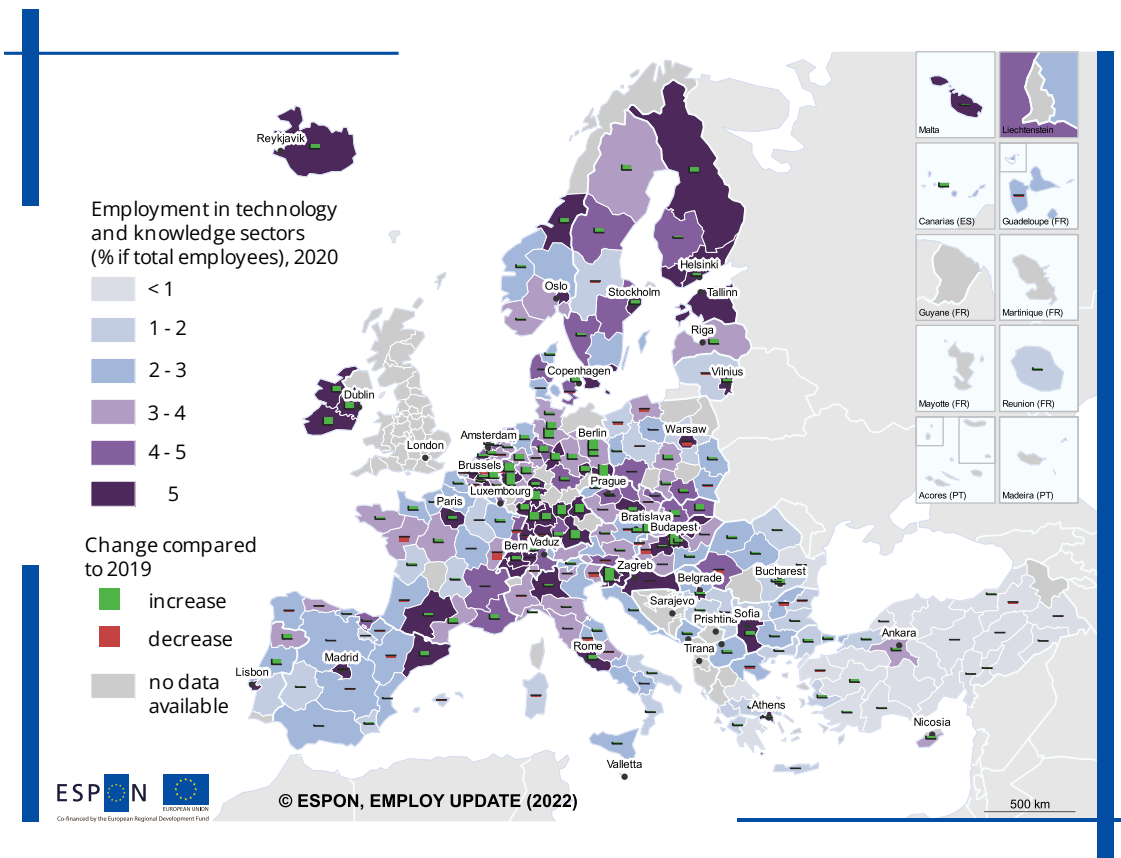
There is increased competition among countries around the world to attract and retain skilled workers. Related policy measures mostly focus on favourable migration conditions but also concern the specific family environment of a country, its skills environment, inclusiveness and quality of life (see Chapter 3.2). Global competition for talent 'has led to a convergence of policy frameworks but significant differences in policies and practices remain' (OECD, 2023c).

Sweden fares very well compared with other countries in this global competition. In the latest update of the OECD Indicators of Talent Attractiveness, the country emerges for the second time as the most attractive OECD country for entrepreneurs, due to its favourable conditions

for international entrepreneurs ‘to enter and run a business’ (European Commission, 2021a). In the category of highly qualified workers, Sweden ranks as the second most attractive country, due to its ‘inclusive and family-friendly’ society and its ‘high standard of living and a strong skills environment’ (European Commission, 2021a). However, attracting the required number of people up north can still be difficult because some people do not manage to overcome existing preconceptions about what it is like to live in these regions and some cannot cope with the climate and living conditions, which can be harsh at times.

For green industrialisation to take off, a large number of people will need to work in jobs related to the knowledge economy. The knowledge economy is an economic sector that is ‘able to produce new knowledge from technologically advanced sectors and/or functions present in a territorial area and/or where knowledge is obtained through links (formal or informal) with other economies’ (ESPON, 2018b). This economic sector is crucial for the design and deployment of solutions to a current pressing development challenge – that is, the promotion of economic growth in the transition process from non-renewable to renewable energy sources (Wang et al., 2022). The proportion of people working in this sector across Europe (see Map 3.2) is growing and amounted to almost 4 % of all employees in 2020.

Map 3.2
Technology and knowledge workers, 2020 and change from 2019



Regional level: NUTS 2 (2016)

Source: IRS Milan, 2022

Origin of data: Eurostat, 2022

© UMS RIATE for administrative boundaries

In recent years, the massive increase in the use of digital technologies for production, for remote working and learning, and for the provision of services has further boosted the significance of the knowledge economy for socioeconomic growth and will have long-term impacts on socioeconomic and spatial patterns. On the one hand, these trends are providing new opportunities for peripheral and marginal areas. On the other hand, they may increase socioeconomic and territorial disparities if access to broadband connections and digital platforms is difficult or impossible for some social groups and territorial areas (see Chapter 3.5), as digitalisation requires not only infrastructure but also digital skills and accessibility (ESPON, 2022d).

The explosion in telework in the wake of the COVID-19 pandemic is likely to have long-lasting impacts on the spatial distribution of work, including in peripheral geographical locations. Telework and ICT-based mobile work offer much greater spatial flexibility, and people may opt to work remotely, either from their home or from other locations, instead of commuting to an urban centre to work from an office. Therefore, telework may not only increase the appeal of non-urban living but also lead to demand-driven developments of co-working spaces or improvements to telecommunications infrastructure (ESPON, 2022d).

BOX 4

Remote working as a tool to promote community development in south Sligo, Ireland

Grow Remote started as a grassroots movement in 2018 in reaction to the erosion of rural communities in Ireland. It applies a community development concept that focuses on the potential of teleworking from remote parts of the country to act as a catalyst for sustainable and thriving local communities. The ambition is to make 'employment ... available and accessible to everybody, everywhere' (Grow Remote, 2023). With the help of government funding, a full-time team was set up to run the organisation and today Grow Remote Ireland is running as a company.

The initiative in south Sligo set out to attract and retain young workers in the region to develop a broader economic base, thereby supporting rural businesses, particularly local retailers and service providers. South Sligo has been significantly affected by demographic changes, resulting in a dispersed, older population, over-reliance on farming, lack of opportunities, loss of services and reduced retail offerings. The Tubbercurry and South Sligo Smart Community Committee facilitated a number of awareness sessions to address the concept of remote working, developed a strong communications plan to address various stakeholders and ran an international conference in the region on remote working. The mobilisation of the regional community led to a repeatable Grow Remote model that has been scaled up to 133 locations in more than eight countries. The regional Grow Remote community got involved in several innovative initiatives, among which was the project Digital Technology Usage in Sligo, which aims to understand the views and visions of rural consumers, businesses and local clubs regarding the future of their local community (Smart Rural 21, n.d.).

The current development of green industries in Northern Sweden will require people from other parts of the country and/or abroad to move to Upper Norrland to fill emerging job vacancies. In the context of increased teleworking, though, some of these jobs may also be performed from outside the region. With people moving to the region, there will be increased

demand for housing and public services, which in turn will require more people working in these sectors and in the local/regional public administrations that plan for and manage these facilities. The remote locations of Norrbotten and Västerbotten might be a challenge for political endeavours to attract skilled labour to the region. However, remoteness could be the very reason why people want to move there.

BOX 5

Attracting new inhabitants to Santo Stefano di Sessanio, Italy

In 2020, the Italian village Santo Stefano di Sessanio, located in the sparsely populated Abruzzo region, launched an innovative pilot project that called on young families to submit expressions of interest in moving to the village and establishing a business there, for which applicants would receive a grant for a given period of time. The village had experienced decades of depopulation and was keen to turn its demographic development around by incentivising immigration. For that purpose, the municipality identified six primary economic activities and occupations for prospective applicants, from among whom a maximum of 10 families were to be selected. The response to the initiative was overwhelming: the municipality was flooded with approximately 28 000 applications. Among the applicants, there were many with established careers who were ready to embark on new professional paths. However, the shortage of human resources in the small municipality and the lack of support from the regional and national governments made it impossible to assess the applications and brought the initiative to a halt (Zoppi, 2023).

The experience in Santo Stefano di Sessanio shows that a shortage of human resources in public authorities can be a limiting factor in spatial planning and in local/regional restructuring, particularly in small municipalities (ESPON, 2011a). In these cases, multilevel governance support is crucial to increase the chances of successful implementation of local initiatives (see Chapter 3.4). Nurturing cooperative governance across different levels and encouraging institutional development are key to enable regions, particularly those that have lagged behind in socioeconomic development for decades, to make full use of their development potentials (ESPON, 2017).

To make sure that newly recruited people stay in regions transitioning to greener economies in the long run, become members of the local society and contribute to the sustainable development of the regional economy, businesses and public authorities may need to offer incentives. These incentives might include a good quality of life provided by being close to unspoilt nature, good access to services of general interest, high-quality food, natural and cultural heritage, good connectivity and good governance. Another important aspect is spouse employability (i.e. the likelihood of a partner also finding employment in a municipality/region). Given the expected growth of green industry in the coming years and the repercussions this will have on job markets in the regions affected, it should be possible for partners of recruited workers to find employment in a variety of sectors. The aspects that can make a region attractive will be further explored in Section 3.2.

3.2 Planning for the sustainable society – housing, local attractiveness and social sustainability

For regions to be attractive to residents and to people who contemplate moving there, the provision of affordable housing, infrastructure, public services, good connectivity and an attractive living environment is key. In the absence of such services and infrastructure, feelings of remoteness and social exclusion quickly accrue. Many rural and remote regions struggle with just these aspects due to long periods of ‘downward cycle’ development and the repercussions of this on human resources and public budgets (ESPON, 2017). Particularly in these challenged regions, towns and cities can play a key role in improving rural attractiveness and development by providing services for their surrounding regions.

In Northern Sweden, most municipalities report housing shortages, although these are less acute than in the main agglomerations in the southern part of the country (Swedish National Board of Housing, Building and Planning, 2022). Following the establishment of Northvolt’s battery gigafactory in Skellefteå (see Chapter 3.1), the municipal population of approximately 74 000 (in 2022) has started to grow and local authorities plan to accommodate up to 90 000 inhabitants or more by 2030. As a consequence, the municipality has started ‘investing heavily in housing, schools, kindergartens, roads, bridges, parks and a major expansion of port facilities. A logistics hub and an industrial park adjacent to Northvolt’s factory are also under construction’ (OECD, 2023b).

When planning for growth, it is important for stakeholders to incorporate the needs of the resident population to avoid friction between newcomers and locals. Rapid transformations such as the green industrialisation happening in Northern Sweden carry a risk of excluding people who do not have the required skill set to find employment in the green economy. When this is combined with an influx of new people who take up jobs, which potentially also allow them to pay for higher quality housing, services and infrastructure, feelings of being left behind can spur public discontent and result in segregated societies. Moreover, newcomers often live in a ‘fly-in, fly-out’ situation and form a kind of parallel society that is not integrated into the overall development of the region. That is why social sustainability is a crucial aspect of any local/regional development strategy. The Nordic Council of Ministers included social sustainability as one of three pillars in its vision for 2030 to ‘promote an inclusive, equal, and interconnected region with shared values and strengthened cultural exchanges and welfare’ (Nordic Council of Ministers, 2020).

Like Northern Sweden, other municipalities and regions that transition to green industrial production are likely to struggle with the predicament that arises from the need to take measures that improve local/regional attractiveness and overall quality of life, although their tax revenues, and thereby their financial resources, will only increase once new inhabitants move there and start paying municipal income tax (OECD, 2023b). Although these measures are important, the ‘attraction (and retention) of talent and visitors, is no longer explained as a mere reflection of production structures and accessibility but increasingly by the quality of places, reflecting place-specific features such as inclusiveness, cultural dynamism, provision of public services and effective institutions’ (ESPON, 2012).

In general, what these municipalities and regions need to invest in, in terms of infrastructure, is clear. However, to really live up to the green transition ambitions, the complete life cycle of materials used in, for example, construction works needs to be considered, as do the future emissions of the infrastructure created, so that waste and potential negative impacts on the environment are reduced.

In addition, it can be less obvious what specifically defines the quality of a place and the overall quality of life there. ‘The challenge ... [is] to achieve good human life ... [by making best]

balanced use of the territory' (Kreisel, 2023). In Skellefteå, for instance, culture is considered an important element in the continued development of the municipality. Culture allows people to get together and to thrive through their interactions, which in turn is vital for the creation of innovative ideas. The cultural vibrancy of a place is one expression of and opportunity for social interaction, as are sports and other leisure activities. Generally, well thought through strategies and dedicated architecture on a human scale, offering meeting places for people, can be instrumental. In Luleå, for instance, 'we don't just design houses, we design communities. It's the life between the houses that makes a community' (Forsberg Johansson, 2023).

BOX 6

Using culture to transform the development of Genalguacil, Spain

Genalguacil is a mountain village of 500 citizens located in Andalusia. The municipality has lost almost 70 % of its population in recent decades due to the lack of employment opportunities, particularly for young people, leaving behind an ageing population.

In the 1990s, the mayor of the municipality decided that a new narrative had to be written for his village to generate development opportunities and create new prospects for the people of Genalguacil. Based on some earlier experiences with artists coming to live and work in the village, artists were actively invited to live there, involve the local community in their work and make use of local materials. In the spirit of the words of a Spanish artist who worked in Genalguacil and commented that 'the light of the village is its citizens', the municipality started to specifically bring in artists who worked with light. In addition, a new concept for exhibitions was created that turned the streets of the village into integral parts of the exhibition space. Since 1994, more than 20 000 artists have come to the village to meet, create art and exhibit selected works throughout Genalguacil, thus forming a museum village. A foundation was created that runs programmes, for instance educational programmes, and the Pueblo Museum, which has become one of the most important museums in Andalusia. 'As these institutions have become more professional, Genalguacil's reputation as a cultural destination has countered the depopulation trend and demonstrated to the regional population that values driven cultural engagement is a vital future oriented strategy' (Lockwood et al., 2023).

The key to the different activities has always been their integration into the local community, through the co-creation of projects between different actors, including entrepreneurs, civil servants, producers, researchers, students and citizens (Pueblo Museum, n.d.). In addition, nature has been a fundamental pillar in the village's transformation process. Over the years, knowledge of traditional ways of producing locally typical artisan products has been collected, which has created various development opportunities for villagers. The village now operates as a pilot lab – that is, 'an open model for exploring how a local, rural economy can foster new artistic and cultural capacities in ways that transform it into a hub for sustainable innovation' (Lockwood et al., 2023).

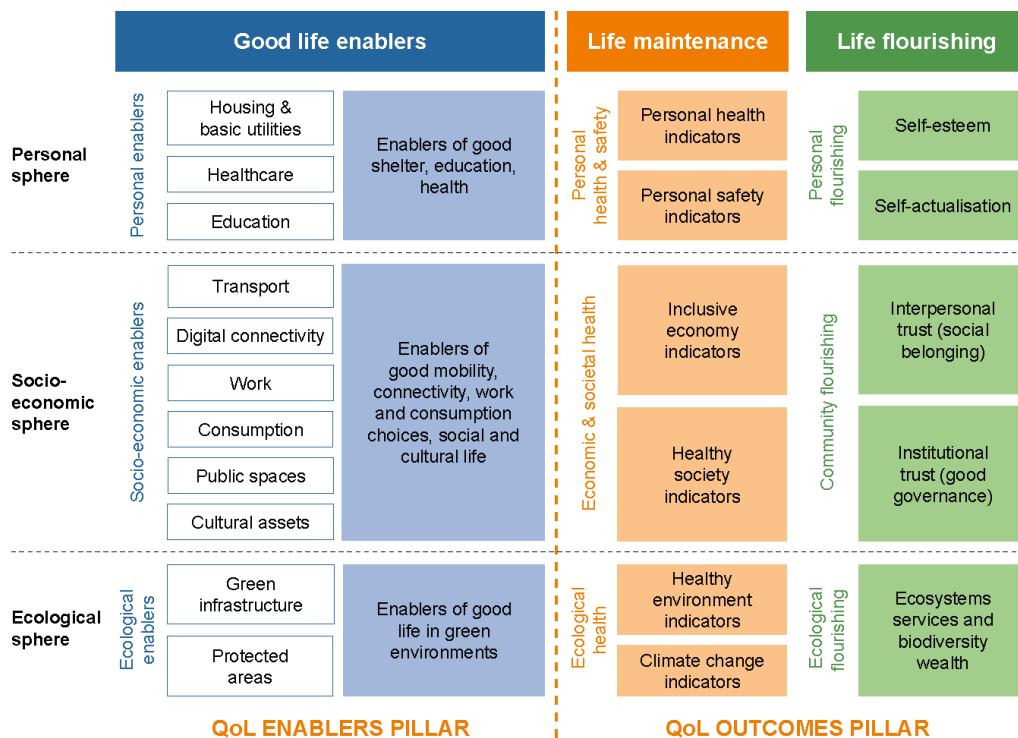
Discussions at the ESPON seminar in Luleå underlined the significance of a sense of community in any given place when it comes to attractive living environments and quality of life. Green industrialisation could even be the starting point for the development of new

communities, as a lot of newcomers to towns and regions will find themselves in the same situation of starting a new life in a new environment. They could be helped in the beginning by ambassadors, representatives of the original residents, who could support new residents in finding their feet in their new home town/region. This would offer a simple way of getting newcomers in touch with natives and could ease the newcomers' integration into the local community (ESPON, 2023).

The quality of services provided to users is clearly one component of quality of life, as it directly affects the standard of living, at least of the part of the population using those services. However, quality of life goes beyond good-quality services. The ESPON Quality of Life project makes the case that it is important to consider the perspectives of people living in a given place but not using certain services, as well as the perspectives of visitors, to get a complete picture of a place's quality of life. Following that approach, 'measuring territorial quality of life means measuring the capabilities of all living beings to survive and flourish in a place, thanks to the economic, social and ecological conditions that support life in that place' (ESPON, 2020b). In this context, the rate of population growth or decline is seen as a powerful proxy for measuring the quality of life in a place.

Figure 3.1 gives an overview of the three spheres and the three dimensions that define and influence a territory's quality of life.

Figure 3.1
Conceptual map for territorial quality of life

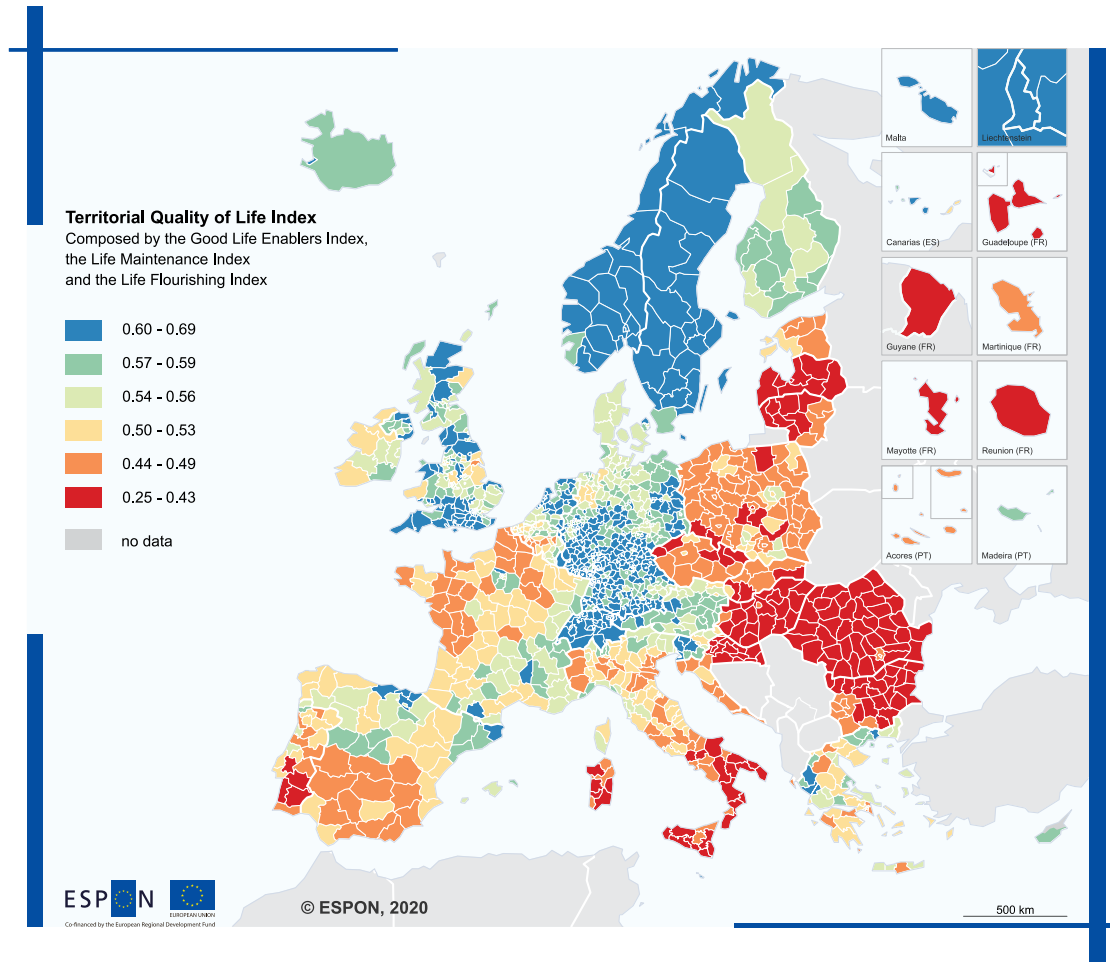


Source: ESPON, 2020b.

On a European scale, the Nordic countries follow a pattern of very high quality of life (see Map 3.3). This particularly applies to Iceland, Norway and Sweden, but Denmark and Finland are also some of the top European countries in terms of quality of life. Looking more closely at Northern Sweden, though, socioeconomic weaknesses emerge in the fields of transport, work and consumption opportunities, while digital connectivity and cultural services'

accessibility fare well. The healthcare sector also fares comparatively poorly, while housing and basic utilities and the education sector rank quite highly in Northern Sweden. Other strong points of the region are the availability of natural areas and the existence of protected areas (ESPON, 2020b).

Map 3.3
Territorial Quality of Life Index



Regional level: NUTS 3 (2016)

Source: ESPON QoL, 2020

Origin of data: Eurostat, ESPON, EU-SPI, Eurobarometer, EEA, 2020

© UMS RIATE for administrative boundaries

These results can serve as valuable inputs into a regional/local development strategy that aims to strengthen and promote a place's specific strong points while addressing the weak points with specific measures. One of the weak spots identified for Sweden in the quality-of-life assessment was the healthcare sector. Due to ageing populations, the health and social care sector in all Nordic countries is strained, particularly in rural and sparsely populated regions. While the demand for services is constantly growing, the number of people working in this sector is shrinking (Penje and Berlina, 2021).

As some municipalities in Northern Sweden are set to grow in the wake of ongoing green industrialisation, the need for a qualified workforce in the health and social care sector will become even more acute. Qualified staff will be needed in fields including kindergartens, schools, medical practices, hospitals and retirement homes. However, rural and sparsely populated regions have particular difficulties filling job vacancies and retaining people in the

health and social care sector, with negative repercussions on the quality of care provided there. Difficult working conditions, temporary contracts, lack of opportunities for professional development and/or increasing competition from the private sector and new industries, where salaries are often higher, make attracting qualified workers even more challenging. That is why recruitment and retention measures alone will not suffice to tackle the sector-specific challenges. Rather, the organisation and delivery of social care services need to be rethought so that institutions can offer new and improved services and new methods of service provision and can implement organisational changes (Penje and Berlina, 2021). Digital opportunities and cross-border collaboration could help achieve this (see Section 3.5 and Chapter 4).

Beyond the health and social care sector, many countries throughout Europe experience skills shortages as skilled workers across sectors approach retirement age while qualified successors are missing, and more people wish to work part time or to reorient their professional lives. As a consequence, many posts remain vacant for longer periods of time. The European Commission acknowledges this ‘talent development trap’ as a risk to territorial cohesion that could hamper the resilience and competitiveness of the EU, and it launched the Talent Booster Mechanism to support EU regions that ‘are affected by the accelerated decline of their working age population to train, retain and attract the people, the skills and the competences needed to address the impact of the demographic transition’ (European Commission, 2023b).

Since many countries in Europe encounter challenges attracting skilled workers, rural, remote and/or shrinking regions, which in general have more difficulties attracting people, could focus on their young people not in employment, education or training. Many young people in these regions do not complete upper secondary education and are left with poor employment prospects (19 %, compared with the EU average of 13 %) (European Commission, 2023b). In addition, the regions facing a talent development trap have a significantly lower rate of adult participation in learning (5.6 %, compared with the EU average of 10 %). To ensure greater inclusiveness, investments in reskilling and upskilling through education, training and lifelong learning are needed to address skills mismatches and labour shortages. Investments are needed in training that focuses on those skills that match the current and future needs of the local labour market. For this, ‘close cooperation between regional and local authorities, social partner organisations, public and private employment services, local businesses and education and training providers’ is needed ‘to ensure that the jointly deployed education, training and lifelong learning efforts focus on the right skills needed in a particular region’ (European Commission, 2023b).

Generally, new approaches to finding and recruiting staff are needed across all sectors of regional economies. Methods of ‘active sourcing’ (a recruitment concept that involves a targeted, proactive search for, approach to and recruitment of potential new employees) will need to be applied a lot more in the future to find and attract the required workers. To facilitate the long-term retention of workers, employers need to develop a holistic approach to talent management that involves the identification of employees’ potentially hidden talents that could be useful to their employer and subsequent internal recruitment. The idea behind this approach is that each employee has very specific talents and that it can be helpful for employers to spot these, develop them further through individual training and put them to good use (Schreiber, 2023).

A useful tool for steering the growth development of any given territory in an integrated way can be the development of a vision as part of a long-term development strategy that relates to attracting particular target groups such as the required workforce and/or tourists. To ensure buy-in to such a vision and strategy by residents and stakeholders alike, it is important not only to communicate clearly but also to educate people about what specifically needs to

change and why, and what the challenges will be in the transition process. In-person meetings with residents and stakeholders are key to create trust and to give people from all walks of life the opportunity to be heard (ESPON, 2023). Likewise, it is crucial to develop appropriate governance structures that secure stakeholder participation and mobilise the resources of different sectors in pursuit of long-term goals. This also indicates the need to define short-, medium- and long-term goals. By the same token, it is useful to set limits on growth to avoid destroying the very assets that make a particular place attractive (ESPON, 2012).

The last aspect is even more pressing in the context of the climate crisis and ongoing biodiversity loss. Any planning for growing towns and cities should therefore be mindful of potential risks of experiencing climate-related hazards such as river or coastal flooding. As seen in Chapter 1, vast parts of Europe are at risk of experiencing river or coastal floods in the years to come. Green industrialisation in Northern Sweden is happening in, among other places, Luleå, Piteå and Skellefteå, all of which are coastal towns that are at risk of having their infrastructure, industry and service sectors affected by coastal flooding by the end of this century. For that reason, flood adaptation strategies and nature-based solutions should be taken on board in planning for growing towns and cities. Flood adaptation measures (e.g. creating water detention areas, flood-proofing buildings and relocating people and assets) are important to lower projected flood losses (European Commission, Joint Research Centre, 2023). Nature-based solutions are acknowledged to provide a triple dividend of adaptation by avoiding future human, natural and material losses; generating economic benefits by reducing risks, increasing productivity and stimulating innovation; and providing social, environmental and cultural benefits (European Commission, 2021b). A major barrier to the deployment of nature-based solutions and green infrastructure remains the insufficient understanding among planners/policymakers of the way natural ecosystems function, how they can be identified and how their benefits can be quantified. All of these aspects often result in an underused potential for nature-based solutions in territorial development (ESPON, 2019a).

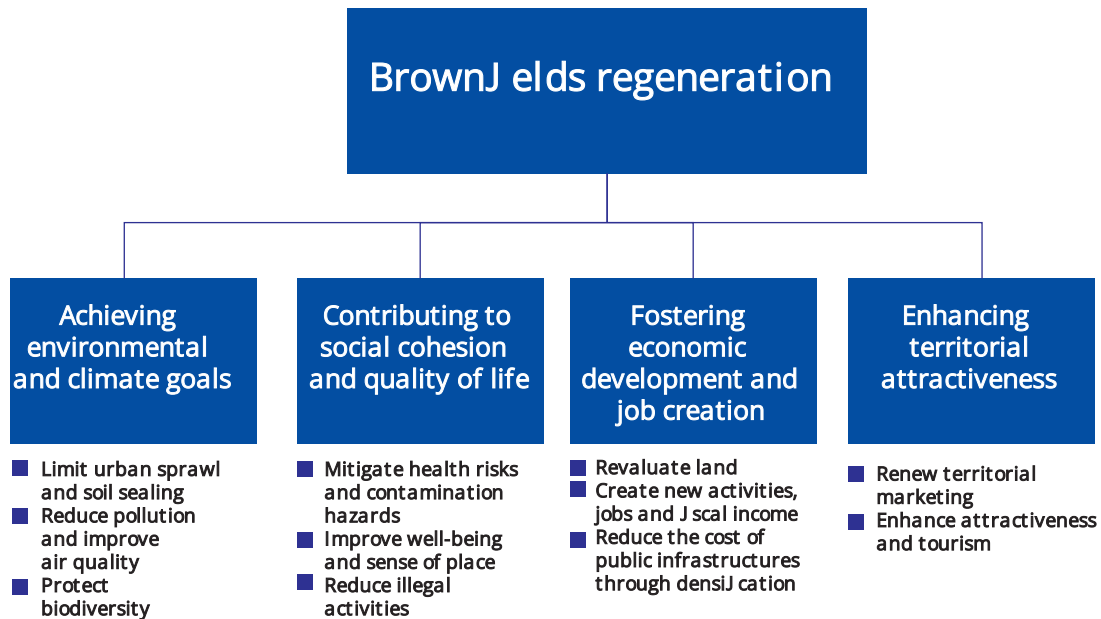
Finally, and in line with the principles of sustainable land use (discussed further in Section 3.3), planning for population growth should also consider the regeneration of brownfield sites to avoid additional soil sealing as far as possible.

3.3 Land take – land use conflicts and divergent interests

Green industries are dependent on clean renewable energy and many types of rare minerals. The production of renewable energy, the extraction of minerals from the soil, the housing of new skilled labour and increased transport needs all lead to new demands on the available land, which may result in land use conflicts among those with competing interests. As land is limited and mostly already used for some other purpose, conflicts between land uses and the interest groups behind them inevitably arise.

To avoid taking scarce unsealed land for new land use demands, such as housing or industries, brownfield sites can be activated. Brownfield regeneration is a sustainable approach to using land that plays a crucial role in achieving climate targets (see Figure 3.2). To support stakeholders engaged in urban planning and governance, ESPON has developed a good practice framework, offering step-by-step guidance on sustainable urbanisation making use of brownfield regeneration (ESPON, 2020c).

Figure 3.2
Benefits of brownfield regeneration



Source: ESPON, 2022e

The attempt to accommodate different user interests and to change the use of land in some instances may lead to highly heterogeneous effects, with benefits for some groups of land users and losses for others. 'Our social and economic well-being is dependent on land. If adequately and sustainably managed, land regulates water and nutrient cycling, supports biodiversity, stores carbon and provides businesses with resources and citizens with employment and sustenance' (Thiaw and Holsether, 2022).

Participation processes around land use conflicts are important and should ideally be inclusive from the beginning – that is, involving people from all walks of life, such as activists, non-governmental organisations, entrepreneurs, local organisations and individual citizens. As pointed out in Section 3.2, it is crucial for any territorial development plan to give ownership to the citizens concerned. Resistance to certain developments often comes from long-term residents who feel that their way of life may be threatened and who therefore oppose the change. Open discussions in the framework of participation processes increase mutual understanding and facilitate the coexistence of different interests. While such participation processes take time, they will eventually be beneficial for all involved in major transition processes, such as green industrialisation, as they can help avoid new challenges, such as gentrification and other causes of social friction (ESPON, 2023).

In addition, it is important in local/regional redevelopment processes to aim for industrial diversification and avoid the predominance of a specific economic sector as the driver of development, as this can increase local/regional vulnerability to economic shocks. Governments could, however, play a role in setting up dialogues with the relevant industries to mediate conflicts of interests between local people and the industries. Solutions that are beneficial for both groups could be found, which could give the industries an opportunity to show more corporate (social) responsibility towards the local population (ESPON, 2023).

Decisions on land use changes that are intended to safeguard sustainability entail trade-offs not only between interest groups but also between dimensions of sustainability (i.e. economic, environmental and social aspects). Trade-offs, however, often lead to one dimension being sacrificed on behalf of another. To avoid this as much as possible, it is crucial that any decision

on land use change explicitly addresses all three sustainability dimensions simultaneously and limits the possibility of trade-offs, or at least ensures that all dimensions step back on their initial goals in an equal way. In practice, multidimensionality appears often to take into account only economic and environmental issues, while social issues are neglected. More generally, economic considerations are normally sufficiently taken into account in land use planning, whereas environmental and social aspects may need to be given more attention to ensure sustainable land use (ESPON, 2020d).

Where local people are affected negatively by certain green industrial developments in their living environments, different means of compensation could be considered. Compensating landowners if their land is to be used or taken for development is normal practice in most countries. However, sometimes land is not for sale. In Czechia, for instance, the owners of a garden were not willing to sell their land for the construction of a main road, although they were offered considerable compensation. They went to trial and managed to delay construction by more than 10 years. In Finland, local authorities with wind turbines within their municipal boundaries are compensated through property tax. The tax revenue they receive depends on the construction costs of the wind turbines, the total capacity of the wind farm and the tax rate determined by the municipality.⁷ Estonia has gone one step further and recently endorsed a regulation to pay local authorities and people who live in a wind farm's area of influence. Wind park owners have to pay the local government and people living within 3 km of the park an annual fee that is based on the wind farm's production and the current electricity price. The fee is then shared between the local government and the households who are eligible for and applied for it. A similar regulation exists for Estonian municipalities whose coastlines are within 20 km of an offshore wind farm. Providing compensation to municipalities and neighbouring citizens can be a useful tool to ensure local benefits and the better cooperation of citizens who are affected by controversial developments (ESPON, 2023).

A way to safeguard sustainability in land use changes is by using the strategic environmental assessment (SEA) procedure. This procedure is a requirement introduced by an EU directive and has been incorporated into the national legislation in all the Member States. An SEA ensures that the potential environmental impacts of all strategies, plans and programmes (SPP) related to green industrialisation are assessed. 'The SEA is intended to ensure that all parties integrate environmental assessment into the preparation and adoption of all SPP at the earliest opportunity in order to provide a high level of protection for the environment and encourage long-term sustainable practices' (ESPON, 2019a).

An interesting intersection of sustainable land use and sustainable energy production can be found in Lower Austria's spatial planning ordinance for wind energy utilisation, which establishes a framework for managing wind park development until 2030. It identifies wind energy zones where wind turbines are allowed (referred to as 'positive zoning') and areas where development for wind energy is severely restricted. From a social and environmental perspective, the ordinance has succeeded in safeguarding valued nature and wildlife assets, yet has neglected other goals of sustainable land use. One main social/environmental cost is that it steers wind turbines into green areas, such as meadows, pastures and forests. Development in these areas, especially in forestry areas, is highly controversial in Austria. The main shortcoming is that it excludes land use combinations that might be more desirable from a sustainability point of view (e.g. the combination of industry and infrastructure) (ESPON, 2020d).

⁷ See: <https://tuulivoimayhdistys.fi/en/wind-power-in-finland-2/wind-power-in-finland/property-tax/property-tax-of-a-wind-turbine> and <https://balticwind.eu/wind-turbines-in-finland-are-the-key-to-self-sufficiency-and-independence-from-russia/>

BOX 7**Land use monitoring by the city of Salzburg, Austria**

Faced with a need to produce a spatial development plan, the city of Salzburg decided to develop and finance a long-term land use monitoring tool that allows for an analysis of the changing land use patterns within the city. The process involved gathering data on the actual use of all buildings in the city and analysing the actual activities through on-site observation. The analyses conducted on these data allowed for a number of important insights into the effects of zoning laws on the use of buildings over time. The tool aimed, on the one hand, to improve the factual basis for spatial planning processes and regional development strategies. On the other hand, the data in the tool were intended to inform discussions of land use patterns by providing a common knowledge base for all actors involved. Factors identified as important for the successful development and use of such a tool are the following (ESPON, 2021b):

- sufficient financial resources for the data collection process;
- sufficient highly educated experts in the spatial planning department;
- long-term commissioning of a data collection project;
- a common agreement by all actors involved that the tool is needed.

Spatial planning can be used as a critical mechanism for reconciling spatial conflicts between actual and potential users of a space. The planning process can be seen as a process whereby various land user interests can come together to determine how space can be allocated to meet the needs of different users. This might involve protecting existing users' rights, creating areas where the protection of the environment takes priority or creating space for new uses and users. The outcome of this process usually takes the form of a plan that represents a negotiated outcome balancing various interests at a particular moment in time. The plan can and will be refined, reviewed and modified over time as societal needs and priorities, including environmental agendas, evolve. Hence, the plan should be seen not as a fixed or static instrument but as one that can adapt and change in response to developing circumstances and political imperatives (ESPON, 2022c). When space is limited, multifunctionality (i.e. the combination of different functions/uses in buildings, the use of rooftops and/or the combination of recreation and agriculture) is key. Planners should look into smart uses of space and consider which functions can be combined and how. In addition, planners should be aware of the impacts of various functions and, by involving all stakeholders concerned, they can find appropriate solutions and combinations.

A first step in conflict resolution is, of course, making an inventory of the conflicts that may develop or already exist between competing users of the land needed for and affected by a green industrialisation process. Instruments and mechanisms that can be used to identify and reconcile competing interests over land use when creating spatial plans are the following (ESPON, 2022c):

- stakeholder engagement in the national context;
- cross-border collaboration;
- transnational collaborations;
- strategic environmental assessment;
- creation of multifunctional spaces;
- use of legal recourse to challenge decisions.

A useful method of addressing social impacts within planning is the social impact management planning (SIMP) tool. This tool helps local planners to outline a strategy to identify, monitor and proactively react to ongoing social impacts of large-scale industrial activities in sparsely populated regions. Local stakeholders, political decision-makers, local authorities and businesses are invited to jointly set goals for industrial development and transform these goals into planning and policy actions. With the help of the SIMP tool, local planners develop a process for identifying and managing social impacts with the involvement of relevant stakeholders, thereby providing strategic planning benefits for municipal planning, the private sector and local residents alike. For municipalities, the SIMP tool serves as a way to predict and plan local development related to large-scale industries. At the same time, it is valuable to the private sector in that it can help in obtaining and maintaining broad community acceptance and support for industrial projects. For local residents, the SIMP tool provides opportunities to air concerns and participate in developing local strategies for the future (Nordregio, 2017).

BOX 8

The use of the SIMP tool in Sodankylä, Finland

The mining industry is booming in Northern Finland. This creates new opportunities for some of the rural communities in Lapland but also raises environmental and social concerns. Sodankylä Municipality recently adopted a mining programme aimed at ensuring sustainable development of the local mining industry. The REGINA SIMP is a key element of the new programme. (Nordregio, 2017)

The REGINA SIMP concept benefits everyone involved. The companies obtain information about the attitude towards mining and the experienced environmental impacts. Municipalities become more aware of the issues that may arise and can adjust their local planning to meet the need for more housing or better traffic infrastructure. Lastly, the local population is given the opportunity to express their opinions and concerns about the mining activities. (Nordregio, 2017)

The problem identified still exist and not much has happened due to a lack of financial resources and personnel. However, more recently, the municipality hired new staff who are specifically responsible for mining issues and sustainability (ESPON, 2023).

The northern part of Scandinavia, from mid-Norway through mid-Sweden across Finnish Lapland and into the Kola Peninsula in Russia, is traditionally the living area of the Sámi people, the only designated indigenous people in the EU. Reindeer herding is seen as central to Sámi livelihoods and is viewed as a fundamental part of Sámi culture. Research shows that mineral extraction within the Sápmi, the traditional territory of the Sámi people, has long-standing and grave effects on the Sámi people and their economy, community and culture (Eriksson, 2021).

Findings of an empirical analysis of mining impacts on Sámi reindeer herding in two cases from Sweden show how two mines, of which one was closed in 1988 and has undergone extensive rehabilitation, have caused similar impacts on the Sámi land, reindeer, economy, culture, health and well-being. The researchers suggest that these significant similarities in impacts indicate important generic patterns relevant to policy, which could provide a template for appraising future mining proposals. Concluding key points are that mining has extreme impacts on Sámi reindeer herding, including on culture and rights. According to this research, the Swedish legislation ignores impacts on Sámi land use and enables land dispossession. Significant governance changes are needed to take into account the full scale of the impacts.

The exploitation of Sápmi land and resources has been going on for centuries and has become even more aggressive over recent years due to escalating resource demands and quicker procedures for dispossession (Kløcker Larsen et.al., 2022).

'The Sami as indigenous people and reindeer-herding Sami in particular have special rights that must be taken into account in planning and decision-making processes' (Allard, 2022). However, the Swedish planning system has difficulty dealing with large-scale land conflicts and focuses primarily on the urban environment (Allard, 2022). The Scaling Up project is a new research project aiming to explore how strategic and collaborative planning in rural areas can help handle land use conflicts related to natural resources in ways that are perceived as fair and legitimate. The project will apply a comparative and transdisciplinary approach to developing new knowledge and planning solutions to resolve mineral-related land use conflicts in Swedish Sápmi. While the empirical focus of this project is on mineral extractions in Northern Sweden, the conceptual approach and planning solutions can be applied to other contexts and support the transition to a sustainable society (Luleå Technical University, 2022).

3.4 Territorial governance – how to obtain tangible local benefits

As the previous sections have shown, there are multiple potential gains for rural regions if they engage in a green industrialisation process. Municipalities seem to be the right governance level for making sure that citizens' needs and potential local development obstacles are taken into account. However, many municipalities and regions do not have the capacity to deal with the related development challenges by themselves. In particular, small municipalities often struggle with a shortage of staff, while they need to fulfil the same tasks as big municipalities (ESPON, 2023). The case of Santo Stefano di Sessanio (see Section 3.1) showcased how the limited resources of local authorities can get in the way of delivering innovative policy measures. Similar problems exist in other rural regions; that is, public authorities struggle with a shortage and/or lack of skilled human resources and financial resources, but both types of resource are needed to plan and manage the redevelopment of any place (ESPON, 2022c). Therefore, municipalities need the support of their regional or national government. Such support can, for instance, come in the form of taxes from locally based industries or wind parks, which remain in the municipality for further investment in the local restructuring instead of going to other parts of the country or abroad, where the companies' headquarters might be located. Another possible form of support is the provision of specifically trained staff, for example professional moderators who can come in to resolve land use conflicts (ESPON, 2023).

A key challenge for rural regions in relation to governing green industrialisation is to strike a good balance between the provision of specific territorial resources for economic exploitation (e.g. land for clean energy generation and the settlement of green industries) and reaping the benefits arising from economic restructuring (e.g. jobs, population growth, taxes, higher attractiveness) in the regions. The OECD sees development opportunities for rural regions in the deployment of the renewable energy sources that can often be found there, but also points out that 'development benefits are not automatic' and 'local economic growth will require more coherent strategies, the right set of local conditions, and a place-based approach to deployment' (OECD, 2012). By the same token, a recent research project for the Nordic Council of Ministers found that 'it is still uncertain whether renewable energy projects support local job creation and local procurement and to what extent locally sourced labour boosts long-term development in these areas' (Karlsdóttir et al., 2022). Again, the coordination of policies and capacity building at local level are mentioned as key factors in managing the transition impacts in rural regions.

If natural resources are being used for the greater good – for instance to boost the national economy – rather than resulting in tangible local benefits, their use could cause geographies of discontent to arise. To avoid this, the coordination of policies across sectors and governance levels is vital. Deciding which level of governance needs to deal with a certain issue is a tricky task, and countries address this in different ways. In the Netherlands, for example, when major system choices need to be made related to issues such as water safety, nature and agriculture, electricity and gas networks, it is the national government that takes responsibility. However, even in these instances, there needs to be public consultation and involvement. In Hungary, by contrast, several battery factories are being built at the moment. These factories need a lot of water and land, which raises environmental concerns. Their locations were decided at national level without any citizen involvement, which led to protests organised by local communities (ESPON, 2023).

Furthermore, planning within functional regions helps to address the reality of environmental, commuting, economic and other flows across administrative borders, and usually coincides with new territorial governance arrangements (ESPON, 2018c). In addition, when it comes to the attraction of skilled workers from other countries, transnational coordination is needed with stakeholders from the countries potentially sending workers. Essentially, the required overhaul in the production, transport, storage and consumption of products and services (see Chapter 2) needs to go hand in hand with modes of territorial development and governance that bridge sectoral policies and scales (i.e. an integrated planning and territorial governance approach). Territorial governance, as defined by the ESPON TANGO (Territorial approaches for new governance) project, involves (ESPON, 2014):

the formulation and implementation of public policies, programmes and projects for the development of a place/territory by

1. co-ordinating actions of actors and institutions,
2. integrating policy sectors,
3. mobilising stakeholder participation,
4. being adaptive to changing contexts,
5. realising place-based/territorial specificities and impacts.

The numbered points are considered the five dimensions of territorial governance (ESPON, 2014). Responsible leadership and governance capacity are key rules that help improve territorial governance, which underpins rural municipalities' and regions' need for support in managing the transition to green industrialisation. In this context, Box 9 can serve as a reference for stakeholders to use in their efforts to promote good territorial governance.

BOX 9**Territorial governance checklist**

- 1. Coordinate the actions of actors and institutions to set up flexible coordination based on subsidiarity.**
 - Which actors at all levels are needed to organise and deliver the territorial goal at stake?
 - What types of existing platforms or forums are available to facilitate coordination?
 - Do existing platforms/forums have the capacity and legitimacy among actors and institutions to achieve the territorial goal at stake?
 - What is the formal and informal distribution of power/room for manoeuvre?
 - What types of territorial knowledge do actors and institutions have?
- 2. Integrate policy sectors to create a rationale for policy integration.**
 - Which policy sectors are needed to be able to solve the issue at hand?
 - What are the potential or real sectoral conflicts?
 - Who is able to discuss the topic? Who has a stake in this?
 - What are the potential synergies that could be realised by inter-sectoral cooperation?
- 3. Mobilise stakeholder participation to involve the appropriate actors.**
 - Have all relevant groups been considered (e.g. inhabitants, policymakers, interest groups)?
 - How can new or previously excluded groups be included in participation processes?
 - How could stakeholders be encouraged to participate?
 - How are stakeholders given insight into territorial governance processes?
 - Are there processes or mechanisms in place to use the territorial knowledge gained through stakeholder participation?
- 4. Be adaptable to changing contexts to pursue a shared understanding of the changing context.**
 - How can individual and institutional learning be encouraged?
 - How can forward-looking and/or experimental decisions be made?
 - In which ways can new territorial knowledge be integrated into the process?
 - Have contingency plans been made, and what is the scope of flexibility?
- 5. Realise place-based/territorial specificities and impacts to adopt a multiscale vision.**
 - What are the place-based specificities that are most relevant for the issue?
 - How has the area of intervention been defined? Are the boundaries 'soft' or hard?
 - How can territorial knowledge (expert or tacit) be utilised in achieving the goal?
 - How are the territorial impacts of policies, programmes and projects evaluated?

Source: ESPON, 2014

The role of companies and industries within the green industrialisation process should not be forgotten, though. As employers, companies have considerable influence on governmental decisions at all levels of governance. Private businesses may drive green industrialisation, but their economic interests do not always align with the green transition (ESPON, 2023).

One concrete example of a strategic planning tool that supports local authorities facing unique development challenges related to large-scale industrial developments is the Local Benefit Analysis Toolbox (LBAT) developed within the REGINA ('Regional innovation in the Nordic Arctic and Scotland with a special focus on regions with large-scale projects') project (Nordregio, 2017). The REGINA factsheet explains that the 'objective of LBAT is to support the development of robust and comprehensive policies that allow local communities to prosper from their natural advantages' (Nordregio, 2017). The toolbox helps to produce a location-based assessment of business development opportunities so that local economic benefits from

large-scale, resource-based industries can be maximised and as a consequence local communities can better prosper based on their natural advantages (Nordregio, 2017).

BOX 10

Practical use of the LBAT in Scotland, the United Kingdom

The Dounreay nuclear power complex was an important driver of the local economy in Scotland. The complex, however, is closing down. Magnus Davidson of the Environmental Research Institute at the University of the Highlands and Islands explains that 'Using the REGINA LBAT has allowed us to address this challenging predicament armed with the best available data and the best available tools' (Nordregio, 2017). In response to the ongoing closure, the Pentland Firth and Orkney Waters area has shifted its focus towards marine renewables to replace some of the jobs lost in the nuclear power industry. Now, the area has become 'world leading in the development of marine energy and is host to the European Marine Energy Centre, an advanced test centre for wave and tidal energy technology' (Nordregio, 2017).

Striking a good balance between resource exploitation and benefit creation is also important for national authorities when developing policies and strategies in relation to green industrialisation (and other topics). New policies and strategies can explicitly focus on specific territories or can have an asymmetrical territorial impact. By taking into account potential asymmetrical impacts, they can increase not only the effectiveness and efficiency of the policy but also its political support, which boosts its benefits. Territorial impact assessment (TIA) can support, in a quantitative or qualitative manner, the identification of those areas or regions that may face the greatest impacts as a result of a particular development, the nature of those impacts and their intensity. The ESPON TIA web tool (ESPON, 2021a) offers a user-friendly approach to combining quantitative data on regional sensitivity with expert judgements on the type and strength of policy impacts. These judgements are gathered in a workshop setting, facilitating discussions among policymakers and experts on possible asymmetrical effects of a specific policy or strategy, encouraging stakeholders to find solutions to avoid unwanted impacts.

Within the framework of the Territorial Agenda 2030, a pilot action has been launched to better understand how different sectoral policies can shape spatial imbalances (Territorial Agenda 2030, n.d.). The partners cooperating on this pilot action have been working on a manual to familiarise public administration representatives with the TIA methodology to assess the territorial impacts of public policies, strategies, programmes and legislative proposals. TIA can take into account policies' economic, social and environmental impacts, but its focus remains on territorial variation. The manual discusses the main methods used for TIA in Europe and introduces a new participatory method that can take into account diffusion effects between areas subject to policy intervention and other areas (forthcoming at Territorial Agenda 2030, n.d.).

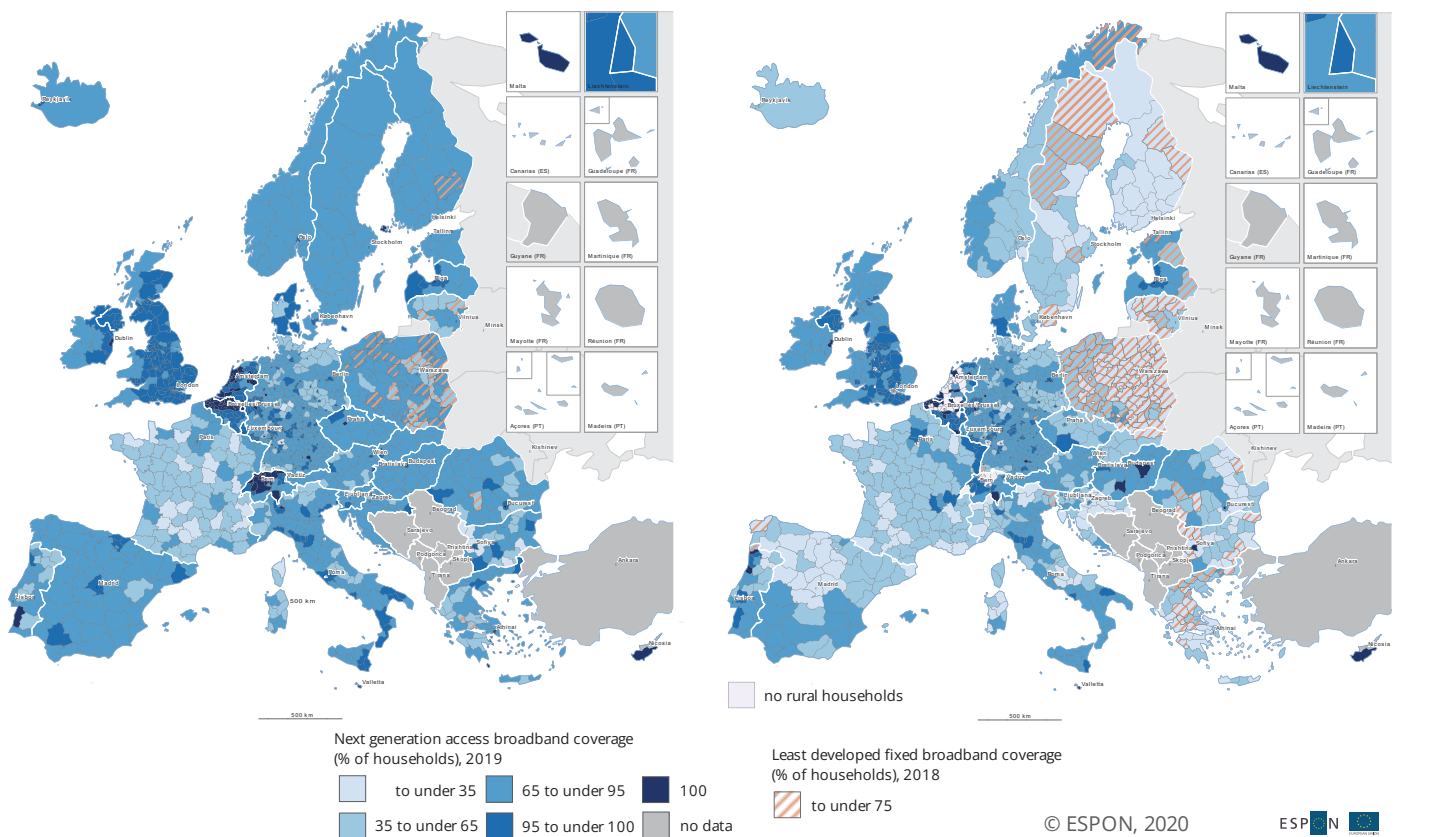
3.5 Digitalisation in public service provision and planning – the need for good connectivity

Digitalisation is often mentioned as part of a potential solution to the challenges identified, such as attracting skilled labour to a region for the industrial and public sectors. By making use of digital solutions in, for instance, education and the health sector, but also in planning

and stakeholder involvement, the quality, efficiency and accessibility of services can be improved. Although digitalisation offers opportunities for rural areas, increased use of digital solutions leads to a larger energy footprint, and thus only contributes to mitigating the climate crisis if the increased energy need is counterbalanced by, for example, decreased need for physical transportation (ESPON, 2023).

A prerequisite for making use of public e-services, participating in online interaction opportunities and encouraging digital innovation is access to the internet via good broadband connections. In Northern Sweden, digital connectivity is good, but in other rural regions in Europe this does not appear to be the case. Providing broadband coverage to rural areas remains challenging, as 14 % of households are not covered by any fixed network and 42 % are not covered by any next-generation access technology (see Map 3.4). While the coverage of fixed networks in rural regions increased marginally from 84 % in 2013 to 86 % in 2018, the upgrade to next-generation access technology in general happened very fast, growing from 18 % in 2013 to 50 % in 2018, covering 15 million homes (BBSR and ESPON, 2021).

Map 3.4
Broadband coverage: overall (left) and rural (right)



Regions: NUTS 3 (2010)

Data origin: European Commission, 2019, 2020; EuroGeographic for administrative boundaries

The gap between rural and non-rural regions in relation to fast broadband coverage has also been recognised by the EU and, in its rural vision, the EU sets the goal of reaching 100 % fast broadband coverage in rural areas by 2025 (European Commission, 2021a). The Commission supports this development through funding from the European Agricultural Fund for Regional Development, the European Regional Development Fund, etc., and stresses that these funds, together with national and private funding, should be combined to invest in infrastructure, technology and people.

Smart Villages, one of the EU's flagship initiatives, also stressed the need to 'help overcome the digital gap by recognising the different starting points of rural areas and villages and co-designing digital pathways from the bottom-up while at the same time building bridges with the essential top-down strategies' (ENRD, 2020). Smart villages can be seen as laboratories, where rural communities develop innovative solutions to meet their most pressing challenges (Wojciechowski, 2023). The Smart Villages Portal provides short descriptions of numerous examples of networks and initiatives across Europe (ENRD, n.d.). The European Startup Village Forum, which facilitates the exchange of knowledge and expertise on how to promote start-up-driven innovation in rural areas, can build upon this work by putting a stronger focus on entrepreneurship. Coordination and cooperation between these initiatives should support rural areas to become digital innovators and creators of economic, social and environmental value. (Wojciechowski, 2023)

Enhanced broadband connections enable rural regions to increase the use of digitalisation in public service provision and spatial planning. For example, delivering healthcare using electronic communication (e-health) has the potential to increase both the quality of services and access to health information for users. It can also save time and reduce the workload and associated costs for health service providers in the longer term. However, inequality has to be avoided by ensuring inclusiveness; that is, people with fewer digital skills have to be brought on board and they need to be given opportunities to learn how to work with digital tools so that everybody is well integrated into the digital society (ESPON, 2023).

Research on the regional development effects of, the potential for and the obstacles faced by digitalisation in health and social care across the Nordic countries has shown that it has boosted regional development and contributed to economic sustainability (including by creating jobs), social sustainability (e.g. spatial justice) and environmental sustainability (e.g. reduced transportation). In addition, significant potential for enhancing health and well-being across the Nordic region was found (Lundgren et al., 2020b; ESPON, 2023). Some of the regional development effects of implementing digital solutions in healthcare and social care that were found were (ESPON, 2023):

- increased safety and quality of life and increased quality in the provision of healthcare through the possibility of spatially distanced medical consultations;
- improved efficiency through shared information and data among healthcare staff, adaptation to individual needs, cost-saving potentials, improved flexibility and improved ability to recruit;
- better inclusion through patients' increased involvement in their own treatments and better facilitated dialogue;
- increased accessibility for inhabitants and professionals through remote video consultations.

The implementation of digitalisation in healthcare and social care is, to a large extent, an issue of leadership and management. Important obstacles found to implementing digitalisation in healthcare and social care were lack of change management, lack of economic resources, lack of user-friendly solutions, poor data security, too slow accommodation of laws related to digital tools, lack of interest and incentives among doctors, and issues relating to healthcare ethics. Since the pandemic, digital healthcare has been used increasingly with a focus on the social benefits (e.g. combating loneliness) and, although the pandemic was not a huge driver of these developments, this period proved that digital health and social care could work (ESPON, 2023).

BOX 11**The Virtual Hospital in Finland**

The Virtual Hospital in Finland, launched in 2018, is an e-health platform covering several diseases, one of which is diabetes. The Diabetes House at the Virtual Hospital offers a wide range of services including e-appointments; taking orders for self-monitoring devices and materials; advice and support; nutritional therapy; physiotherapy; mouth, foot and eye health; mental health support and psychotherapy; and intoxicant services. Most of these services are available via e-health applications, and those requiring traditional appointments, examinations or treatments are managed through the e-health platform.

Introduction of e-health in Finland led to improved access to and quality of health services and facilitated more personalised healthcare. In addition, the provision of healthcare services to remote regions is among the benefits that drive e-health development. Another benefit is the improvements in time- and cost-efficiency due to digital solutions streamlining healthcare processes. For example, the e-prescription system detects misuse of pharmaceuticals and monitors overall pharmaceutical use. This allows the system to determine potential problems arising from combinations of pharmaceuticals and leads to increased patient safety while minimising spending on pharmaceuticals. E-consultations have been found to improve time-efficiency by allowing patients to receive medical consultations despite potentially long distances between patients and healthcare providers. This results in faster consultations for a higher number of patients. The main obstacle is the lack of monitoring of the actual economic and social impacts of the digitised healthcare services. The focus has largely been on monitoring the introduction, distribution and use of e-health services, rather than on effectively measuring and conceptualising their impact (ESPON, 2019b).

When developing green industrialisation initiatives in a region, it is necessary to investigate the possibility of integrating an industrial symbiosis approach to reuse waste and by-products through mutually beneficial transactions. This involves finding innovative solutions to identifying business opportunities that capture the value of underutilised resources. To bridge the cooperation and coordination deficits between the suppliers of the production residuals, the potential users of these residuals and the providers of know-how and technology, digital cooperation platforms could be established. These platforms could help provide potential markets with the minimum scale and scope required and the knowledge needed to create industrial symbiosis arrangements. The services provided by digital cooperation platforms might include support with material scans and matchmaking for SMEs, industrial symbiosis-related technical training on the valorisation of material streams and support with securing funding mechanisms (ESPON, 2019c).

BOX 12**Industrial symbiosis in Sicily, Italy**

Industrial production in Sicily is characterised by a few important industrial centres. Agriculture and manufacturing are the main economic sectors with potential for waste recycling and reuse. In 2011, a three-year project was set up to unlock the potential of industrial symbiosis in Sicily. Its main objective was to provide the information necessary to launch industrial symbiosis at local level by supporting a cost-benefit analysis for selected potential matches of production inputs and outputs, processes and companies.

The project collected data, engaged with local stakeholders, identified companies that could benefit from the approach and developed an online platform to analyse material and waste flows and identify potential matches for waste reuse. It also created guiding documents to operationalise these matches. As a result, more than 690 potential matches were found between the participating enterprises, which led to more than 80 SMEs being matched for potential collaborations to reuse waste.

The ESPON CIRCTER project identified several measures leading to the successful establishment of industrial symbiosis in Sicily (ESPON, 2019c), which included:

- a background assessment of local industries, related material flows and waste generation and costs;
- an online platform to analyse material and waste flows, assess proximity and identify potential matches for waste reuse;
- guiding documents to implement the matches;
- a network of local stakeholders and companies that led to a collaborative environment based on reciprocal trust.

The online platform is still in use and the replication of the project in other regions is ongoing (ESPON, 2023).

Green industrialisation processes involve planning, and parts of these planning processes can be digitalised to improve efficiency, enable innovation, increase transparency and involve citizens in planning matters. For this to take place, planning authorities and planning consultancies need new skills, new technology and new digital routines for planning processes (ESPON, 2021c).

A first step in digitalising a planning process is to digitalise planning data, representing planning intentions and regulations. The most common purpose of digital planning data is to provide everyone with easy access to planning data and planning documents and ensure there is a high level of transparency. A second step would be to develop a digital plan portal: a central entry point to find plans, visualise them, combine them and even support hearing processes and increase participation. To facilitate accessibility for everyone, it is necessary to build digital plan portals with a user-friendly interface featuring intuitive commands and graphic visualisation.

BOX 13

Empowering the public through participation in Hamburg, Germany

In Hamburg, a digital participatory system (DIPAS) has been implemented through which the public can be involved in the design of land use plans. The four most important elements of DIPAS are online participation, digital participation on site via a touch table, urban geodata, and data evaluation and administration. The public can contribute their ideas, questions, criticism and opinions, and they can comment on others' ideas and take part in polls. The system has been used in over 30 participation processes. DIPAS is available as open-source software for other cities to use. The effects of digitisation on participatory processes and planning are difficult to determine, but criticism due to a lack of transparency in the preparation of planning data has decreased (ESPON, 2021c).

4 Conclusions and policy advice

As discussed in the previous chapters, green industrialisation requires far-reaching socioeconomic changes not only in the ways industries produce and businesses are run. But as industries and businesses need people to work for them, often in regions that are short of workforce, green industrialisation is set to bring about large-scale structural changes in these places. That being the case, green industrialisation forms one building block of the more comprehensive green transition process that is needed to enable Europe to withstand the manifold consequences of the unfolding climate crises.

The territorial diversity of Europe means that territories have different opportunities and face different challenges in bringing about the changes required. Place-specific policy responses are therefore needed to support European cities and regions in this transition process to ensure that they can cope with disruptive changes and adapt to the transformation required to be more resilient to future crises. As local administrations have planning authority over their territories, they can make use of several means within planning to facilitate such transition processes. However, especially in rural areas, they struggle with limited resources, both human and financial, which is why local administrations need support from higher levels of governance.

Various financial instruments are available in the context of EU cohesion policy that can assist European municipalities in the transition process towards green industrialisation. The European Urban Initiative provides support to build cities' capacities for designing sustainable urban development strategies, policies and practices in an integrated and participative way, as well as for improving strategies' design quality and overall implementation (Haapakka, 2023). This support can take different forms, for instance city-to-city exchanges that give an applicant city an opportunity to learn about new working methods and innovative approaches to specific implementation challenges from one or two peer cities. Another option is peer reviews in the form of workshops, where cities can learn about ways to improve 'their capacities to design and implement sustainable urban development strategies and practices in an integrated and participative way' (European Urban Initiative, 2023).

The New European Bauhaus is another initiative that supports towns and cities 'to imagine and build together a sustainable and inclusive future that is beautiful for our eyes, minds, and souls', all of which was strongly advocated by speakers and participants at the ESPON seminar in Luleå (European Union, New European Bauhaus, 2023). There are dedicated calls open to municipal authorities for funding, for example, to transform their built environments and the associated lifestyles, to green cities, to develop sustainable tourism or to harness talent in shrinking cities (European Union, New European Bauhaus, 2023; Haapakka, 2023).

The European Commission also offers targeted support for rural areas, for example as part of its long-term vision for rural areas up to 2040. Within that, the Rural Pact provides a framework for cooperation between public authorities, and stakeholders, at European, national, regional and local levels (European Commission, 2021a). The Rural Pact can be used for networking, collaborating and mutual learning. In addition, the Joint Research Centre *Handbook of Territorial and Local Development Strategies* provides concrete guidance to interested stakeholders on funding opportunities for rural strategies or projects (Pertoldi et al., 2022). It provides suggestions on how to reduce the administrative burden and an overview of all types of EU funding for non-urban strategies and how they can be combined.

Territorial governance, as advocated by ESPON (see Section 3.4), is key to planning and moving through the systemic changes that are triggered by green industrialisation. The territorial

governance checklist presented in Box 7 can be a useful tool to help stakeholders engaged in these transition processes to remember the various elements that should be considered throughout the transition process. The capacity to connect and interact between actors as well as the development of strategic institutional capacity is necessary to improve local policymaking, and can help smaller municipalities achieving a more equal standing in regional and national contexts (ESPON, 2017). This also means, for instance in the case of Northern Sweden, that planning should not stop at the borders of the municipalities where most green industrialisation development takes place. Stakeholders and citizens of neighbouring municipalities and geographically more remote parts of these municipalities need to be involved and consulted to make sure that they can benefit from the developments taking place.

Planning across all levels of governance is key, for instance, to setting up new infrastructure and offering additional services of general interest – in other words, to making the places people live, work and play in more attractive. If places are not sufficiently attractive, people will not want to live and/or move there. A very important element of attractive places that was brought up repeatedly during discussions at the ESPON seminar in Luleå is the sense of community, the existing social ties in a place that make life easier and richer. With this in mind, smaller towns could be seen from a new perspective compared with bigger cities; that is, they could be perceived as gems where people have a good quality of life (ESPON, 2023). This issue of perception could be the target of a rebranding strategy, particularly for places that have an unflattering reputation, such as Northern Sweden. The narrative around these places needs to be rewritten to change people's mindsets and to tell them about the qualities of such places.

At the same time, the local population needs to be taken on board for any growth development or change that will have an impact on their lives. 'We need to care for those who are already there to make them stay and feel safe before attracting new people' (ESPON, 2023). In the case of Northern Sweden, taking care of those who are already there could translate into specific measures to educate newcomers to the region about the Sámi culture, heritage and way of life, and the importance of the Sámi people for the region, for example.

Given the urgent need for policymakers to act to adapt to and mitigate the impacts of climate change, it will be even more crucial in the future to do more than just allow public participation in planning processes. Instead, education efforts are needed to explain to people clearly why the different transition processes are needed and what the effects might be of certain choices compared with others and, through this, to get the highest possible levels of support from and ownership by civic society. Sometimes, tough decisions might need to be made, for instance in relation to how natural resources are being used. There can be a 'not in my backyard' mentality in relation to the location of wind turbines, but green industrialisation is predicated on using clean energy sources, so wind turbines, for example, must be erected somewhere. This dilemma needs to be transparently communicated to concerned citizens and other interest groups and the possibility of obtaining local tangible benefits should be utilised to avoid (to the degree possible) public discontent.

Finally, and as the ESPON seminar in Luleå underlined, what is probably needed most is imagination and the capacity to develop positive visions for the future. We face new realities where maybe resources aren't always readily available. Therefore, we need to be much more imaginative to dare and come up with new solutions for the future to create new realities (ESPON, 2023). The transformation of Genalguacil from a desolate mountain village in Andalusia to an internationally renowned cultural destination exemplifies the type of change that can be brought about by a visionary and courageous leader who dares to think beyond his or her own term in office. The active engagement of civic society there additionally contributed to the increased attractiveness of the village.

Greater attractiveness, then, comes from everyone (citizens, interest groups, business representatives, etc.) backing a development strategy and being committed to actively playing a role in (re)creating their living environment. Such involvement can create a sense of empowerment, as it allows people to develop a collective belief in a better future that they can actively shape. That is why it is key for any transition process to 'start a process of cultivating longing', to create ideas and visions for the future (Hopkins, 2023). The sense of despondency that is often prevalent today in the face of multiple crises needs to be replaced by confident, forward-looking planners/decision-makers who dare to put forward ideas for change and who are audacious, brave and bold, along with like-minded, committed citizens who are willing to play a role.

A lot of solutions to the development challenges of municipalities and regions in the wake of green industrialisation and the green transition in general already exist, be it closing down streets for cars and planting trees there to make neighbourhoods more liveable; introducing (more) bicycle lanes to reduce carbon emissions, foster physical activity and improve public health; or introducing local farming to enable places to become more self-sufficient in feeding their inhabitants. Such innovative projects can be implemented at scale and citizen movements are key in telling the stories of these solutions in other places to instil new ideas in planning and start the development process.

Likewise, more stringent, science-based development targets should be set by policymakers, as strict limits make people more imaginative and allow new approaches to tackling development challenges to emerge. Setting limits should ideally be accompanied by facilitated consultation processes that allow the development of solutions that can be backed and supported by as many people as possible (Hopkins, 2023).

Bibliography

- Allard, C. (2022), 'New planning tool to mitigate land use conflicts in Sápmi', Luleå University of Technology, 6 October 2022 (<https://www.ltu.se/research/subjects/Rattsvetenskap/Nyheter-och-aktuellt/Nytt-planeringsverktyg-ska-mildra-markanvandningskonflikter-i-Sapmi-1.222558?l=en>).
- Altenburg, T. and Assmann, C. (2017), *Green Industrial Policy: Concept, policies, country experiences*, Geneva, Bonn: UN Environment and German Development Institute (https://www.idos-research.de/uploads/media/GREEN_INDUSTRIAL_POLICY.Endf.pdf#page=17).
- Assmann, C. and Hastings, C. (2020), 'Will 2020 be the year of the green industrial revolution?', Winnipeg: International Institute for Sustainable Development, SDG Knowledge Hub, 30 June 2020 (<https://sdg.iisd.org/commentary/guest-articles/will-2020-be-the-year-of-the-green-industrial-revolution/>).
- BBSR and ESPON (2021), *Atlas for the Territorial Agenda 2030*, Berlin: Federal Ministry of the Interior, Building and Community (<https://www.atlasta2030.eu>)
- Bailey, A., Carney, M., Villeroy de Galhau, F. and Elderson, F. (2020), 'The world must seize this opportunity to meet the climate challenge', *The Guardian*, 5 June 2020 (<https://www.theguardian.com/commentisfree/2020/jun/05/world-climate-breakdown-pandemic>).
- Berlina, A. and Lundgren, A. (2020), 'The organisation of social services and care in sparsely populated areas in the Nordics' (<https://nordregio.org/research/the-organisation-of-social-services-and-care-in-sparsely-populated-areas-in-the-nordics/>).
- Bowen, A., Kuralbayeva, K. and Tipoe, E. L. (2018), 'Characterising green employment: The impacts of "greening" on workforce composition', *Energy Economics*, 72: 263–275.
- Carbon Brief (2020), 'Demands grow for "green industrial revolution"', daily briefing, 4 June 2020 (<https://www.carbonbrief.org/daily-brief/demands-grow-for-green-industrial-revolution/>).
- Cedergren, E., Tapia, C., Sánchez Gassen, N. and Lundgren, A. (2022), *Just Green Transition – Key concepts and implications in the Nordic region*, Nordregio Discussion Paper 2022:2, Stockholm: Nordregio (<https://pub.nordregio.org/wp-2022-2-just-green-transition-key-concepts-and-implications-in-the-nordics/just-green-transition-key-concepts.pdf>).
- Clark, W. W., II (2014), *Global Sustainable Communities Handbook: Green design technologies and economics*, Oxford: Butterworth-Heinemann.
- Dennison, S. (2022), 'Green peace: How Europe's climate policy can survive the war in Ukraine', policy brief, Berlin: European Council on Foreign Relations (<https://ecfr.eu/publication/green-peace-how-europes-climate-policy-can-survive-the-war-in-ukraine/>).
- EEA (European Environment Agency) (2016), *Climate Change, Impacts and Vulnerability in Europe 2016: An indicator-based report*, EEA Report No 1/2017, Luxembourg: Publications Office of the European Union (<https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016>).
- Engels, A., Marotzke, J., Gresse, E. G., López-Rivera, A., Pagnone, A. and Wilkens, J. (eds) (2023), *Hamburg Climate Futures Outlook 2023*, Hamburg: Cluster of Excellence Climate,

Climatic Change, and Society (www.cliccs.uni-hamburg.de/results/hamburg-climate-futures-outlook.html).

ENRD (European Network for Regional Development) (2020), *Smart Villages and Rural Digital Transformation, working document*, Brussels: ENRD (https://ec.europa.eu/enrd/smart-and-competitive-rural-areas/smart-villages/smart-villages-portal/smart-villages-toolkit_en.html).

ENRD (n.d.), 'Smart Villages Portal' (https://ec.europa.eu/enrd/smart-and-competitive-rural-areas/smart-villages/smart-villages-portal_en.html).

Eriksson, A. V. B. (2021), 'No green future without securing indigenous peoples' rights', Stockholm Environment Institute, 30 July 2021 (<https://www.sei.org/featured/no-green-future-without-securing-indigenous-peoples-rights/>).

ESPN (2011), 'EDORA – European development opportunities in rural areas', Final report, Luxembourg: ESPON (<https://www.espon.eu/programme/projects/espon-2013/applied-research/edora-european-development-opportunities-rural-areas>).

ESPN (2011), 'ESPN CLIMATE – Climate change and territorial effects on regions and local economies in Europe', Final report, Luxembourg: ESPON (<https://www.espon.eu/climate>).

ESPN (2012), 'ATTREG – The attractiveness of European regions and cities for residents and visitors', Final report, Luxembourg: ESPON (<https://archive.espon.eu/programme/projects/espon-2013/applied-research/attreg-attractiveness-european-regions-and-cities>).

ESPN (2014), 'TANGO – Territorial approaches for new governance', Final report, Luxembourg: ESPON (<https://archive.espon.eu/programme/projects/espon-2013/applied-research/tango-territorial-approaches-new-governance>).

ESPN (2017), 'PROFECY – Inner peripheries: National territories facing challenges of access to basic services of general interest', Final report, Luxembourg: ESPON (<https://archive.espon.eu/inner-peripheries>).

ESPN (2018a), 'LOCATE – Territories and low-carbon economy', Final report, Luxembourg: ESPON (<https://archive.espon.eu/low-carbon-economy>).

ESPN (2018b), EMPLOY – 'Geography of new employment dynamics in Europe' – Final report, Luxembourg: ESPON (<https://www.espon.eu/employment>).

ESPN (2018c), COMPASS – 'Comparative analysis of territorial governance and spatial planning systems in Europe', Final report, Luxembourg: ESPON (<https://archive.espon.eu/planning-systems>).

ESPN (2019a), 'GRETA – Green infrastructure: Enhancing biodiversity and ecosystem services for territorial development', Final report, Luxembourg: ESPON (<https://www.espon.eu/green-infrastructure>).

ESPN (2019b), 'eHEALTH – Future digital health in the EU', Final report, Luxembourg: ESPON (<https://www.espon.eu/eHealth>).

ESPN (2019c), 'CIRCTER – Circular economy and territorial consequences', Final report, Luxembourg: ESPON (<https://www.espon.eu/circular-economy>).

ESPN (2020a), 'ESCAPE – European Shrinking Rural Areas Challenges, Actions and Perspectives for Territorial Governance', Final report, Luxembourg: ESPON (<https://www.espon.eu/escape>).

ESPON (2020b), 'ESPON QoL – Quality of life measurements and methodology', Final report, Luxembourg: ESPON (<https://archive.espon.eu/programme/projects/espon-2020/applied-research/quality-of-life>).

ESPON (2020c), 'ENSURE – European sustainable urbanisation through port city regeneration', Final report, Luxembourg: ESPON (<https://www.espon.eu/ensure>).

ESPON (2020d), 'SUPER – Sustainable urbanization and land-use practices in European regions', Final report, Luxembourg: ESPON (<https://www.espon.eu/super>).

ESPON (2021a), 'ESPON TIA tool' (<https://www.espon.eu/tools-maps/espon-tia-tool>).

ESPON (2021b), 'MISTA – Metropolitan industrial spatial strategies & economic sprawl', Final report, Luxembourg: ESPON (<https://www.espon.eu/mista>).

ESPON (2021c), 'DIGIPLAN – Evaluating spatial planning practices with digital plan data', Final report, Luxembourg: ESPON (<https://www.espon.eu/digiplan>).

ESPON (2022a), 'ESPON CLIMATE update – Data and maps update', Final report, Luxembourg: ESPON (<https://www.espon.eu/projects/espon-2020/monitoring-and-tools/climate-data-and-maps-update>).

ESPON (2022b), 'LOCATE – Data and maps update', Final report, Luxembourg: ESPON (<https://archive.espon.eu/projects/espon-2020/monitoring-and-tools/locate-data-and-maps-update>).

ESPON (2022c), 'MSP-LSI – On-demand service for Luxembourg', Final report, Luxembourg: ESPON (<https://www.espon.eu/msp-lsi-on-demand-service-luxembourg>).

ESPON (2022d), 'EMPLOY – Data and maps update', Final report, Luxembourg: ESPON (<https://www.espon.eu/projects/espon-2020/monitoring-and-tools/employ-data-and-maps-update>).

ESPON (2022e), *Sustainable Regeneration of Brownfield Sites: Step-by-step guide for local authorities*, Luxembourg: ESPON (https://www.espon.eu/sites/default/files/attachments/2%20Brownfields%20regeneration-step-by-step-guide_20220603.pdf).

ESPON (2023), *Territorial Perspective of Green Industrialisation*, ESPON seminar, 14–15 June 2023, Luleå, Sweden (<https://www.espon.eu/news-events/events/seminars/territorial-perspective-green-industrialisation> and <https://www.youtube.com/playlist?list=PLsirARF1WeQifULtIthYYCHM7aYZr3S-o>).

European Commission (2021a), Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions – A long-term vision for the EU's rural areas – Towards stronger, connected, resilient and prosperous rural areas by 2040, COM(2021) 345 final (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0345&from=EN>).

European Commission (2021b), Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions – Forging a climate-resilient Europe – The new EU strategy on adaptation to climate change, COM(2021) 82 final (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0082&from=EN>).

European Commission (2023a), Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions – A Green Deal industrial plan for the net-zero

age, COM(2023) 62 final (https://commission.europa.eu/system/files/2023-02/COM_2023_62_2_EN_ACT_A_Green_Deal_Industrial_Plan_for_the_Net-Zero_Age.pdf).

European Commission (2023b), Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions – Harnessing talent in Europe’s regions, COM(2023) 32 final (https://ec.europa.eu/commission/presscorner/detail/en/ip_23_145) and (https://ec.europa.eu/regional_policy/sources/communication/harnessing-talents/harnessing-talents-regions_en.pdf).

European Commission, Directorate-General for Taxation and Customs Union (2020), *Taxation in Support of Green Transition: An overview and assessment of existing tax practices to reduce greenhouse gas emissions*, final report, Brussels: European Commission (<https://op.europa.eu/en/publication-detail/-/publication/1840d9df-5162-11eb-b59f-01aa75ed71a1>).

European Commission, Joint Research Centre (2023), ‘Facing increasing river flood risk in Europe: Adaptation measures can save lives and billions of euro’, 6 February 2023 (https://joint-research-centre.ec.europa.eu/jrc-news/facing-increasing-river-flood-risk-europe-adaptation-measures-can-save-lives-and-billions-euro-2023-02-06_en).

European Council (2019), ‘European Green Deal’ (<https://www.consilium.europa.eu/en/policies/green-deal/>).

European Council (2023), ‘Energy prices and security of supply’ (<https://www.consilium.europa.eu/en/policies/energy-prices-and-security-of-supply/>).

European Union, New European Bauhaus (2023), ‘Beautiful | Sustainable | Together’ (https://new-european-bauhaus.europa.eu/index_en).

European Urban Initiative (2023), ‘Capacity-building for cities’ (<https://www.urban-initiative.eu/capacity-building>).

Eurostat (2017), ‘Glossary: Domestic material consumption (DMC)’, Luxembourg: Eurostat ([https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Domestic_material_consumption_\(DMC\)](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Domestic_material_consumption_(DMC)))

Eurostat (2022a), ‘Emissions of greenhouse gases and air pollutants from final use of CPA08 products – Input-output analysis’, ESA 2010, Luxembourg: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/env_ac_io10/default/table?lang=en).

Eurostat (2022b), ‘Private investments and gross added value related to circular economy sectors’, Luxembourg: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/cei_cie012/default/table?lang=en).

Eurostat (2022c), ‘Material flow accounts’, Luxembourg: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/env_ac_mfa/default/table?lang=en).

Eurostat (2023a), ‘Greenhouse gas emissions by source sector (source: EEA)’, Luxembourg: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/env_air_gge/default/table?lang=en).

Eurostat (2023b), ‘Air emissions accounts by NACE Rev. 2 activity’, Luxembourg: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/env_ac_ainah_r2/default/table?lang=en).

Eurostat (2023c), ‘Share of energy from renewable sources’, Luxembourg: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/nrg_ind_ren/default/table?lang=en).

- Eurostat (2023d), 'Gross value added in environmental goods and services sector', Luxembourg: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/SDG_12_61_custom_4607235/default/table?lang=en).
- Forsberg Johansson, S. (2023), 'How to improve local attractiveness?', presentation, *Territorial Perspective of Green Industrialisation*, ESPON seminar, 14–15 June 2023, Luleå, Sweden (<https://www.espon.eu/sites/default/files/attachments/C2-Sophie%20Forsberg.pdf>).
- Fücks, R. (2019), 'A green industrial revolution', *Berlin Policy Journal*, 29 August 2019 (<https://berlinpolicyjournal.com/a-green-industrial-revolution/>).
- Giacometti, A. and Salonen, H. (2022), 'BSRWood – Accelerating wood construction across the Baltic Sea Region', Nordregio (<https://nordregio.org/research/bsrwood/>).
- Grow Remote (2023), 'Grow Remote 2021–2023 Strategy', Google Slides presentation (https://docs.google.com/presentation/d/1YGfILR0N9dColCmbudtlyg72jaM6EiNz63rtvhr9AeE/edit#slide=id.gf326326fe2_0_7).
- Haapakka, Merja (2023), 'Cohesion policy: Opportunities for territorial development', presentation, *Territorial Perspective of Green Industrialisation*, ESPON seminar, 14–15 June 2023, Luleå, Sweden (<https://www.espon.eu/sites/default/files/attachments/D3-Merja%20Haapakka.pdf>).
- Hopkins, Rob (2023), 'A vision of a climate neutral future', presentation, *Territorial Perspective of Green Industrialisation*, ESPON seminar, 14–15 June 2023, Luleå, Sweden (<https://www.youtube.com/watch?v=x45LKKacdQQ&list=PLsirARF1WeQifULTiThYYCHM7aYZr3S-o&index=15>).
- IEA (International Energy Agency) (2022), 'Global EV data explorer', Paris: International Energy Agency (<https://www.iea.org/data-and-statistics/data-tools/global-ev-data-explorer>).
- Ingeberg, K. (2019), 'Grid capacity challenges in Sweden', AFRY, 9 December 2019 (<https://afry.com/en/insight/grid-capacity-challenges-in-sweden>).
- Karlsdóttir, A. (ed.), Cedergren, E., Cuadrado, A., Salolammi, P., Salonen, H., Guðmundsdóttir, H. and Åberg, H.A. (2022), *Discussion Paper: A 'just green transition' for rural areas in the Nordic region: Key concepts and implications*, Stockholm: Nordregio (<http://nordregio.org/wp-content/uploads/2022/10/TGB-discussion-paper-in-a-template.pdf>).
- Kløcker Larsen, R., Boström, M., Muonio Reindeer Herding District, Vilhelmina Södra Reindeer Herding District, Voernese Reindeer Herding District and Wik-Karlsson, J. (2022), 'The impacts of mining on Sámi lands: A knowledge synthesis from three reindeer herding districts', *The Extractive Industries and Society*, 9: 101051 (<http://doi.org/10.1016/j.exis.2022.101051>).
- Kreisel, T. (2023), 'Attraction through strategy for development, aiming for a human architectural scale and value in urban planning', presentation, *Territorial Perspective of Green Industrialisation*, ESPON seminar, 14–15 June 2023, Luleå, Sweden (<https://www.espon.eu/sites/default/files/attachments/04.%20Therese%20Kreisel.pdf> and <https://www.youtube.com/watch?v=GcDwLY8WNDw&list=PLsirARF1WeQifULTiThYYCHM7aYZr3S-o&index=7>).
- Liljas, P. (2022), 'The green revolution sweeping Sweden', *The Washington Post*, 29 June 2022 (<https://www.washingtonpost.com/climate-solutions/interactive/2022/sweden-green-revolution-steel-climate-change/>).

LKAB (Luossavaara-Kiirunavaara Aktiebolag) (2023), 'Europe's largest deposit of rare earth metals is located in the Kiruna area', LKAB, 12 January 2023 (<https://lkab.com/en/press/europes-largest-deposit-of-rare-earth-metals-is-located-in-the-kiruna-area/>).

Lockwood, J., Ramos, A. and Rueda, J. F. (2023), 'Innovation in rural and remote areas: The Genalguacil experience', video, *Too Early/Too Late*, 14th SAR international conference on artistic research, 20 April 2023, Trondheim, Norway (<https://sar2023.no/node/199>).

Luken, R. A. and Clarence-Smith, E. P. (2019), *Green Industrialization in Sub-Saharan Africa: A reference guide for policy makers*, Dar es Salaam: Uongozi Institute (https://www.researchgate.net/publication/341398989_Green_Industrialization_in_Sub-Saharan_Africa_A_REFERENCE_GUIDE_FOR_POLICY_MAKERS).

Luleå University of Technology (2022), 'Scaling up' (<https://www.ltu.se/research/subjects/Rattsvetenskap/Forskningsprojekt/Scaling-Up?l=en>).

Lundgren, A., Randall, L. and Norlén, G. (eds) (2020a), *State of the Nordic Region 2020: Wellbeing, health and digitalisation edition*, Copenhagen: Nordic Council of Ministers (<http://norden.diva-portal.org/smash/get/diva2:1482486/FULLTEXT01.pdf>).

Lundgren, A., Ormstrup Vestergård, L., Bogason, Á., Penje, O., Jokinen, J. C., Wang, S., Norlen, G., Heleniak, T. and Löfving, L. (2020b), *Digital Health Care and Social Care: Regional development impacts in the Nordic countries*, Stockholm: Nordregio (<https://doi.org/10.6027/R2020:14.1403-2503>).

MindDig (2023), 'Green revolution: Sweden's green industrial supercluster' (<https://www.minddig.com/green-revolution>).

Nordic Council of Ministers (2020), *The Nordic Region – Towards being the most sustainable and integrated region in the world: Action plan for 2021 to 2024*, Copenhagen: Nordic Council of Ministers (<https://pub.norden.org/politiknord2020-728/politiknord2020-728.pdf>).

Nordic Statistics (2023), 'ECOL01: Ecolabel licences in the Nordic countries by eco label and time', database (https://pxweb.nordicstatistics.org/pxweb/en/Nordic_Statistics/Nordic_Statistics_Environment_and_energy_Ecolabel_licenses/ECOL01.px/).

Nordregio (2017), 'REGINA – Regional innovation in the Nordic Arctic' (<https://nordregio.org/research/regina/>).

Northvolt (2023), 'Europe's first homegrown gigafactory' (<https://northvolt.com/manufacturing/ett/>).

NSPA (Northern Sparsely Populated Areas Network) (2022), '*Northern Sparsely Populated Areas*' (NSPA) Views on the European Commission's Initiative on Brain Drain – Mitigating challenges associated with population decline, NSPA Steering Committee, June 2022 (<https://www.nspa-network.eu/media/1ssnz2lv/20220609-nspa-position-paper-on-brain-drain.pdf>).

OECD (2012), *Linking Renewable Energy to Rural Development - Executive Summary*, OECD Green Growth Studies, Paris: OECD Publishing (<https://www.oecd.org/cfe/regionaldevelopment/Renewable-rural-energy-summary.pdf>).

OECD (2021), *Mining Regions and Cities Case of Västerbotten and Norrbotten, Sweden*, OECD Rural Studies, Paris: OECD Publishing (<https://www.oecd-ilibrary.org/sites/0926da91-en/index.html?itemId=/content/component/0926da91-en>).

OECD (2023a), 'Patents by technology', database, OECD.Stat (https://stats.oecd.org/viewhtml.aspx?datasetcode=PATS_IPC&lang=en).

- OECD (2023b), *OECD Economic Surveys: Sweden 2023*, Paris: OECD Publishing (https://www.oecd-ilibrary.org/economics/oecd-economic-surveys-sweden-2023_ceed5fd4-en).
- OECD (2023c), *What is the Best Country for Global Talents in the OECD?*, Migration Policy Debates, No 29, March 2023 (<https://www.oecd.org/migration/mig/What-is-the-best-country-for-global-talents-in-the-OECD-Migration-Policy-Debates-March-2023.pdf>).
- Pueblo Museum (n.d.), 'Genalguacil Pueblo Museo' (<https://pueblomuseo.com/>).
- Papapetrou, M. and Kosmadakis, G. (2022), 'Resource, environmental, and economic aspects of SGHE', in Tamburini, A., Cipollina, A. and Micale, G. (eds), *Salinity Gradient Heat Engines*, Woodhead Publishing Series in Energy, Sawston: Woodhead Publishing, pp. 1–32 (<https://www.sciencedirect.com/topics/engineering/levelized-cost-of-electricity>).
- Pasi, E., HakkinenJussi, T., Pokki, J., Törmänen, T., Keiding, J. K., Rosa, D., Stendal, H., Robertsdotir, B. G., Franzson, H., Bjerkgård, T., Gautneb, H., Raaness, A. M., Sandstad, J. S., Þórhallsson, E. R., Jonsson, E., Reginiussen, H. and Sadeghi, M. (2021), *The Nordic Supply Potential of Critical Metals and Minerals for a Green Energy Transition*, Nordic Innovation Report, Oslo: Nordic Innovation (https://www.researchgate.net/publication/354666456_The_Nordic_supply_potential_of_critical_metals_and_minerals_for_a_Green_Energy_Transition).
- Penje, O. and Berlina, A. (2021), *Recruitment and Retention in the Welfare Sector: Nordic good practice*, Policy Brief 2021:1, Stockholm: Nordregio. (<http://pub.nordregio.org/pb-2021-1-recruitment-and-retention-in-welfare-sector/>).
- Pertoldi, M., Fioretti, C., Guzzo, F., Testori, G., De Bruijn, M., Ferry, M., Kah, S., Servillo, L.A. and Windisch, S. (2022), *Handbook of Territorial and Local Development Strategies*, Pertoldi, M., Fioretti, C., Guzzo, F. and Testori, G. (editors), Publications Office of the European Union, Luxembourg, doi:10.2760/57919, JRC130788.
- Schreiber, A. (2023), 'Talente managen', WILA Arbeitsmarkt, 27 February 2023, (https://www.wila-arbeitsmarkt.de/blog/2023/02/27/herausforderung-talentmanagement/?utm_source=newsletter&utm_medium=E-Mail&utm_campaign=Newsletter-Ausgabe+15.+M%C3%A4rz+2023).
- SDG Knowledge Hub (2020), 'Will 2020 be the year of the green industrial revolution?' , 30 June 2020 (<https://sdg.iisd.org/commentary/guest-articles/will-2020-be-the-year-of-the-green-industrial-revolution/>).
- Skellefteå Kommun (2023), 'Automation operator', job advert (<https://skelleftea.se/invanare/startsidea/forskola-skola-och-utbildning/vuxenutbildning-och-hogre-utbildning/vux/yrkesutbildningar/yrkesutbildningar/vux-utbildningar/2022-10-04-automation-operator>).
- Slätmo, E., Bogason, Á., Vasilevskaya, A. and Salonen, H. (2022), *Essential Rural Services in the Nordic Region – Challenges and opportunities*, Nordregio Report 2022:1, Stockholm: Nordregio (<https://pub.nordregio.org/r-2022-1-essential-rural-services/#101143>).
- Slätmo, E., Bogason, Á., Cedergren, E., Huynh, D. and Salonen, H. (2023), *Service Provision and Access to Services in Nordic Rural Areas*, Nordregio Report 2023:2, Stockholm: Nordregio (<https://pub.nordregio.org/r-2023-2-service-provision-and-access-to-services-in-nordic-rural-areas/service-provision-and-access-to-services.pdf>).
- Smart Rural 21 (n.d.), 'Grow Remote' (<https://www.smartrural21.eu/smart-solution/grow-remote/>).

Statistics Denmark (2023), 'AFTRYK: Climate footprint of Danish consumption (experimental statistics) by types of use (causes of emissions), industries (origin of emissions) and countries/economies (origin of emissions) (discontinued)', database, Statistics Denmark (<https://www.statistikbanken.dk/statbank5a/SelectVarVal/Define.asp?Maintable=AFTRYK&PLanguage=1>).

Statistics Sweden (2023), 'Environmental pressure from consumption by product group SPIN 2007, use and substance. Year 2008 – 2020', database, Statistics Sweden (https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START_MI_MI1301_MI1301F/MI1301MPSPINN/).

Suri, R. (2020), 'It's time for the first green industrial revolution', World Economic Forum, 17 January 2020 (<https://www.weforum.org/agenda/2020/01/its-time-for-the-first-green-industrial-revolution/>).

Swedish Cleantech (2021), '1,100 billion SEK is currently being invested in Northern Sweden', Swedish Cleantech, 28 September 2021 (<https://swedishcleantech.com/partner-news/2929/1100-billion-sek-is-currently-being-invested-in-northern-sweden/>).

Swedish National Board of Housing, Building and Planning (2022), 'The Housing Market Survey 2022' (<https://www.boverket.se/sv/samhallsplanering/bostadsmarknad/bostadsmarknaden/bostadsmarknadsenkaten/>).

Territorial Agenda 2030 (n.d.), 'Actions putting the Territorial Agenda into practice' (<https://territorialagenda.eu/pilot-actions/>).

Terzi, A. (2022), 'A green industrial revolution is coming', VOXEU, 28 June 2022 (<https://cepr.org/voxeu/columns/green-industrial-revolution-coming-0>).

Thiaw, I. and Holsether, S.T. (2022), 'Why businesses must care about sustainable land use – And actions they can take to protect it', World Economic Forum, 12 May 2022 (<https://www.weforum.org/agenda/2022/05/businesses-sustainable-land-use-actions-protect/>).

Tieso, I. (2023), 'Distribution of carbon dioxide emissions in the European Union (EU-27) in 2020, by sector', Statista, 6 June 2023 (<https://www.statista.com/statistics/1240108/road-transportation-greenhouse-gas-emissions-eu/>).

UN (2015), *Paris Agreement* (https://unfccc.int/sites/default/files/english_paris_agreement.pdf).

UN (2023), 'SDG indicators database: SDG indicator 9.4.1', New York City: UN Department of Economic and Social Affairs (<https://unstats.un.org/sdgs/dataportal/database>).

UN Environment Programme (2023), 'Green economy' (<https://www.unep.org/regions/asia-and-pacific/regional-initiatives/supporting-resource-efficiency/green-economy>).

UNIDO (2011a), *UNIDO Green Industry: Policies for supporting green industry*, Vienna: UNIDO (https://www.unido.org/sites/default/files/2011-05/web_policies_green_industry_0.pdf).

UNIDO (2011b), *UNIDO Green Industry Initiative for Sustainable Industrial Development*, Vienna: UNIDO (https://www.greenindustryplatform.org/sites/default/files/downloads/resource/Green_Industry_Initiative_for_Sustainable_Development_UNIDO.pdf).

Vasilevskaya, A., Cedergren, E., Bogason, A., Salolammi, P. and Slätmo, E. (2021), 'Service provision and access to services in Nordic rural areas – Secure, trusted and for all ages'

(<https://nordregio.org/research/service-provision-and-access-to-services-in-nordic-rural-areas-secure-trusted-and-for-all-ages/>).

Wang, X., Xu, Z., Qin, Y. and Skare, M. (2022), 'Innovation, the knowledge economy, and green growth: Is knowledge-intensive growth really environmentally friendly?', *Energy Economics*, 115: 106331 (<https://doi.org/10.1016/j.eneco.2022.106331>).

Wojciechowski, J. (2023), 'Address by Mr Janusz Wojciechowski at the 2023 edition of the European Startup Village Forum' Speech/23/1284, Brussels, 28 February 2023 (https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_23_1284).

Zoppi, M. (2023), 'Making inner areas attractive again? Local policy strategies to counter depopulation and economic decline in Abruzzo, Italy', *Scienze Regionali – Italian Journal of Regional Science*. (<https://www.rivisteweb-it.ezproxy.unibo.it/doi/10.14650/108250>)

ESPON



Co-funded by
the European Union
Interreg

espon.eu



ESPON 2030

ESPON EGTC

11 Avenue John F. Kennedy

L-1855 Luxembourg

Grand Duchy of Luxembourg

Phone: +352 20 600 280

Email: info@espon.eu

www.espon.eu

The ESPON EGTC is the Single Beneficiary of the ESPON 2030 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway, Switzerland and the United Kingdom.

Disclaimer

This delivery does not necessarily reflect the opinion of the members of the ESPON 2030 Monitoring Committee.

