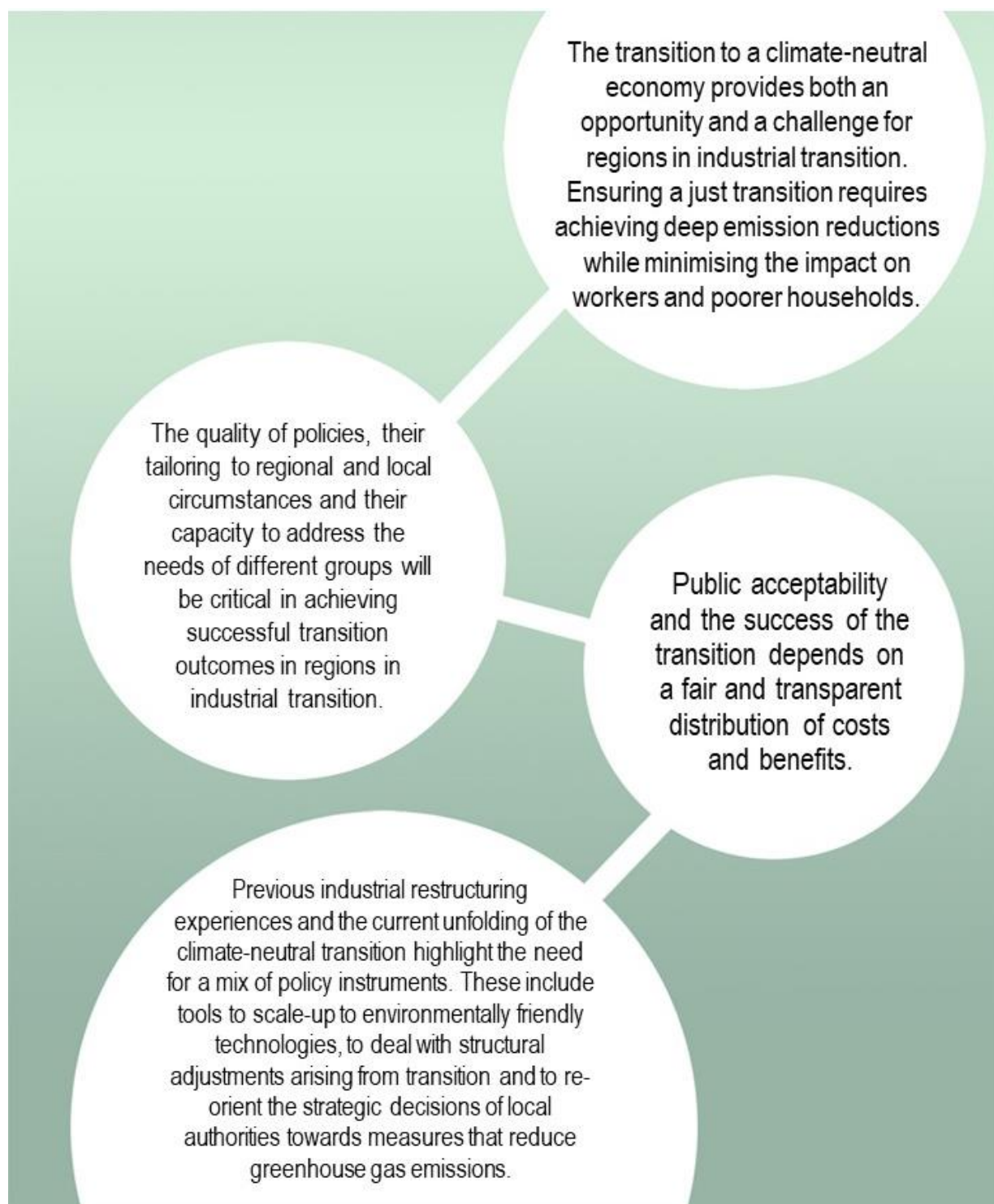


5 Transition towards a climate-neutral economy

This chapter discusses how regions in industrial transition can successfully manage the transition towards a climate-neutral economy. While the transition can generate jobs and is crucial to ensure well-being in the long term, it also comes with short-term concerns of job and income losses. The chapter outlines the specific barriers that regions in industrial transition face in such a shift and presents a range of policy measures to overcome these. The chapter highlights that many of the choices made by regions in industrial transition in their ambitions towards a climate-neutral economy have the potential to generate profound changes to infrastructure, technology and behaviours. Changing the current allocation of investment will require a “managed” transition towards low-carbon activities and adequate levels of public support.

Infographic 4. Key messages: Transition towards a climate-neutral economy

The climate-neutral transition can foster sustainable investment, growth and jobs

In the Paris Agreement, parties have agreed to a long-term goal to limit climate change to well below 2°C and make efforts towards 1.5°C. There is growing recognition that reaching a climate-neutral and more circular economy will require a paradigm shift. In other words, deep innovations in societal systems are needed to overcome persistent problems such as climate change and resource scarcity by means of profound changes to dominant structures, practices, technologies, policies and lifestyles.

Achieving a climate-neutral economy by 2050 will require progressively phasing out or profoundly changing carbon-intensive industries. This will be particularly challenging for those regions that are home to carbon-intensive industries, such as iron and steel production, chemical production or industries that extract hydrocarbon. Firms operating in these sectors can account for a significant share of regional employment. While some workers will manage to transition into new jobs, others might not and the transition can be destabilising for communities and families, particularly where production structures are geographically concentrated. To ensure a road that is as smooth as possible, a “managed” transition is needed – one that deals with the cost of structural adjustment and addresses concerns of short-term trade-offs, for example with regard to jobs lost with transition, while working towards and communicating on the medium- and longer-term gains. It is important that the distribution of the costs and benefits are fully taken into account to ensure a “just” transition.

The transition to a climate-neutral economy presents an important opportunity for regions in industrial transition to reorient investments from carbon-intensive to clean and modern industries. Regional and local policymakers can play a role in advancing the transition and through it inducing profound changes to infrastructure, technology and behaviours in their territories.

Ensuring a just transition is fundamental to growth and well-being

Investing in a climate agenda and transitioning to a climate-neutral economy can have a positive impact on economic growth (OECD, 2017a). The climate agenda also highlights the opportunities offered by the transition to a climate-neutral economy for national and subnational governments and the potential structural effects of such a transition. Climate-neutral development pathways will differ, as every country and region are at a different starting point with respect to meeting the transition challenge. The variation in starting points can depend on the carbon intensity of a region’s energy supply, the energy intensity of gross domestic product (GDP) and the local and national energy mix, as well as on the resource endowment and model of development. To achieve the goals set for greenhouse gas emissions as established in the Paris climate agreement, a steep decline in emissions after 2020 is needed.

Considering the economic and environmental potential of the transition to a climate-neutral economy, while also taking into account the short-term structural changes that may affect already vulnerable populations, it is clear that carefully designed policies are imperative to harness transition benefits and limit its downsides. Several core climate-policy characteristics necessary in order to achieve climate goals include:

- stable and predictable climate policies
- a sufficiently high price on carbon in order to make climate-neutral investment competitive
- strong regulatory support
- targeted policies for low-carbon innovation – for example, higher research and development (R&D) investment and aligning innovation frameworks with the emergence of low-carbon technology.

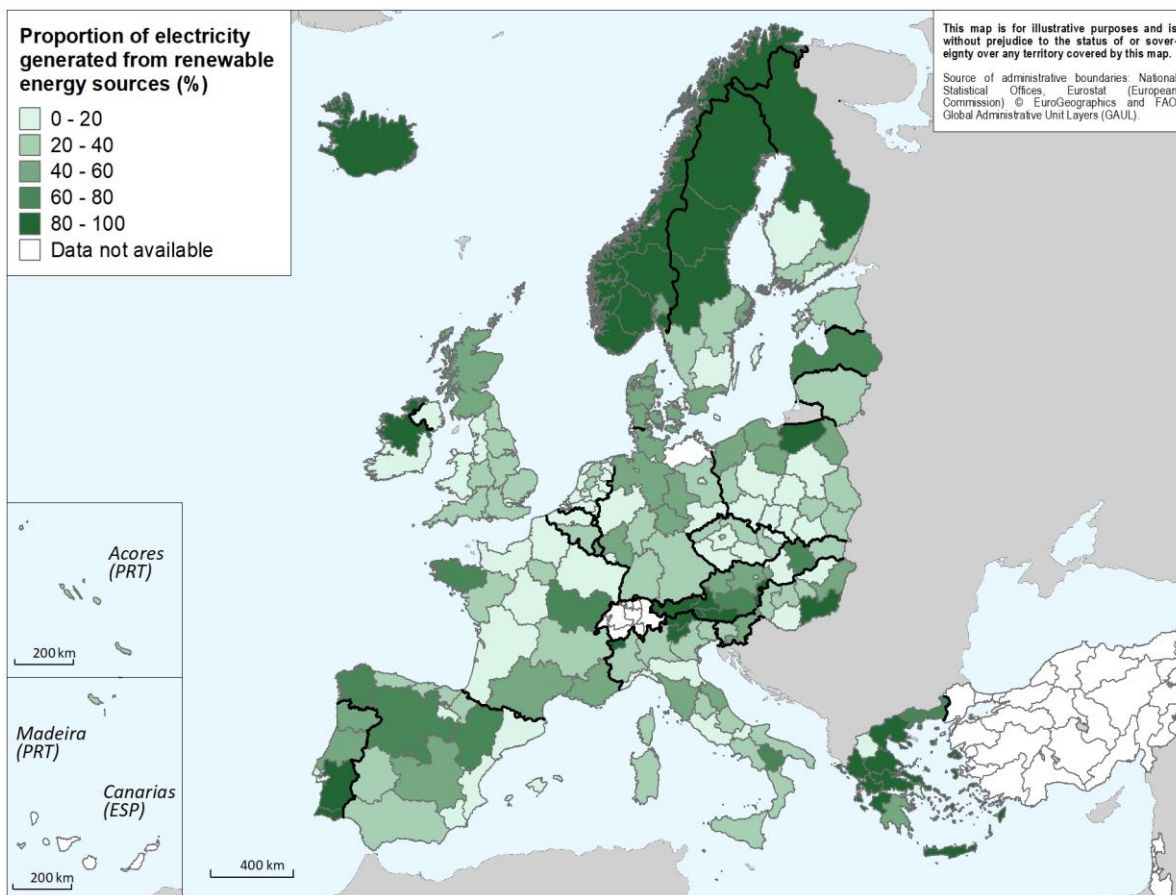
Such policies need to be accompanied by measures to support adjustment and ensure that opportunities are created for workers and communities most affected by the transition.

Large differences persist across regions when it comes to energy transition

Across European and OECD regions, efforts are being made to decarbonise electricity generation through investments in renewables, including hydropower, and in nuclear power. In 2016, 30% of gross electricity consumption in the European Union came from electricity generated from renewable sources (Eurostat, 2019). However, the proportion of electricity generated from renewable sources differs both across and within countries (Figure 5.1). While former coal and mining regions, such as the province of Limburg in the Netherlands or the Silesia region in Poland, generate less than 5% of their electricity from renewable sources, there are places, such as Border, Midwest and Western Ireland or Central Norrland in Sweden, that generate 100% of their electricity from renewable sources. Large in-country differences persist, too. For instance, in France, renewable energy sources make up around 3 percentage points of electricity generation in Normandy and Centre-Val de Loire and more than 75 percentage points in Bourgogne-Franche-Comté and Brittany.

Figure 5.1. Proportion of electricity generated from renewable energy sources at TL2 level

2015 or most recent year available



Notes: Proportion of electricity generated from renewable energy sources, calculated from the electricity produced (in GWh) from renewable energy sources divided by the total electricity produced (in GWh) at the regional level. The input data come from different national sources and from the Joint Research Centre (European Commission). The data collected either correspond to the amount of electricity generated for each fuel, energy source or sector (national sources) or to the share of renewables in the electricity generation mix (Joint Research Centre). Renewable energy sources include solar power, wind power, hydropower, geothermal power, tidal power and biomass.

Reference years: 2015, except Portugal, 2013; France, Iceland, Norway, 2017; Denmark, Luxembourg, Poland 2018.

Source: Data compiled from National Sources and Joint Research Centre, European Commission.

Regions in industrial transition need to carefully balance short-term interests and long-term gains

For regions in industrial transition, it is important to be aware of the economic and new business opportunities that can be generated through the transition to a climate-neutral economy and to act upon them. This can include supporting existing enterprises to fulfil their potential as internationally competitive players or to work with small- and medium-sized enterprises (SMEs) to tap into clean energy business opportunities. Furthermore, clearly and regularly communicating business opportunities associated with the transition to a climate-neutral economy can help build and ensure collaboration and commitment among a broad range of actors.

In the short-term, economic and environmental interests may not align but in the long term, the transition to a climate-neutral economy can go hand-in-hand with growth. The experience in North-Rhine Westphalia illustrates this tension and highlights the balance between the economic and environmental considerations behind climate-neutral transitions (Box 5.1). In some cases, economic and environmental drivers may align to drive the transition in regions, necessitating careful policymaking in order to facilitate the process for workers. In other cases, trade-offs between environmental goals and economic opportunities may arrive, which could lead to uncertainty concerning the timing and outcome of a climate-neutral transition.

Box 5.1. Keys to a successful climate-neutral transition: North-Rhine Westphalia

North-Rhine Westphalia is one of Germany's most populous states (population approximately 18 million; GDP of EUR 670 billion). Highly industrialised and with a historical dependence on lignite and hard coal mining, it is home to the Ruhr Valley, where the phase-out of hard coal mining is considered a generally successful example of a low-carbon transition.

North-Rhine Westphalia's experience reflects the interplay between economic and environmental considerations, two drivers of the low-carbon transition. The driver behind the phasing out of hard coal mining in the Ruhr area was economic, as low global coal prices made its extraction unprofitable. For years, subsidies were used to support the lack of competitiveness, as hard coal mining was a traditional activity with strong policy support. However, the last five decades have seen a conscious restructuring from coal and steel-based specialisation to a more diversified service economy. Measures to ensure a smooth transition for workers included social protection, retraining, early retirement and other long-term strategies negotiated with key stakeholders. There have also been initiatives to regenerate the physical landscape of the energy-intensive mining sector, with industrial sites being preserved and converted into tourist attractions for those who want to experience the Ruhr industrial culture. One of the largest industrial coal facilities, the "Zollverein", was named a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site. The current debate centres on lignite mining in the Rhine area. Since at current low-carbon prices lignite mining remains profitable, environmental ambitions (i.e. meeting climate goals) would be the primary driver for phasing out lignite mining.

Sources: Freistaat Sachsen (2018a), "Climate-neutral Energy Transition: A Saxon Perspective", PowerPoint Presentation for the Peer Learning in Regions in Industrial Transition Workshop "Climate-Neutral Energy Transition", 14-15 May 2018, Brussels, Belgium, Unpublished; Marchal, V. (2018), "For a Successful Low-Carbon Energy Transition", Scoping Paper for Peer Learning Workshop, 14-15 May 2018, OECD, Paris, Unpublished.

The structural impact: Jobs and inequalities

It is estimated that the low-carbon transition will have a relatively limited impact on labour markets overall, with 0.3% of jobs affected in OECD countries and 0.8% of jobs affected in non-OECD countries (Botta, 2018). Yet, these numbers depend on the sectors and regions in which the transition takes place. For example, the mining and fossil fuel electricity sectors could see an estimated 8% job reduction and this will affect men more than women¹ (Botta, 2018). Older workers are also more likely to feel the impact of a low-carbon transition. In light of this, policies should target the workers most affected in order to minimise transition costs. Ensuring a just transition is imperative in this context (Box 5.2).

Box 5.2. An OECD checklist for a just transition

In order to ensure a just (fair) low-carbon transition, all levels of government need the proper tools to develop integrated and coherent policies. Particularly crucial for success is consistency between climate, social and economic goals. The OECD has identified a series of actions to help guide a just transition, including:

- *Political and corporate commitment*: Obtain a clear commitment from the public and private sector to achieve a common vision and objective and provide funding for the transition.

- *Develop long-term strategies:* Develop a long-term strategy to implement low-emission pathways that goes beyond electoral cycles. A long-term strategy can also identify the communities and assets put at risk due to the transition before adverse effects occur and ideally identify mechanisms to mitigate the impact.
- *Look at policy effects:* Identify the impact of policies on the population and on the private sector in the short and long term, and across administrative boundaries. The effects of low-carbon policies go beyond city and regional limits, so the implementation of a functional approach to territory is important.
- *Integrate approaches to implementation:* Ensure policy alignment between sectoral policies (e.g. energy and environment).
- *Align policies between levels of government:* Clearly define implementation responsibilities and actions, in accordance with competencies.
- *Stakeholder participation:* Develop vision documents and long-term strategies with the participation of key stakeholders, including trade unions, individual communities, the private sector, other government levels and entities, etc. There should be an active social dialogue regarding the transition.
- *Monitoring and reporting:* Report on and measure the impact of the strategy, and review it accordingly.

Source: Adapted from OECD (2017e), "Building blocks for coherent implementation of the Sustainable Development Goals", <https://doi.org/10.1787/9789264272576-4-en>.

There is also a geographic dimension to consider. The decentralisation of renewable energy production compared to centralised and clustered fossil fuel and mining industries can lead to a disparity between the jobs lost and those created. This contributes to inter- and intra-regional inequalities, certainly in terms of GDP and income, but also in terms of services and access to these. The structural changes that will affect the labour market make clear the need to understand who will be affected by the low-carbon transition and where the alternative jobs are located. When confronted with these inequalities, governments in regions in industrial transition must ask themselves how skill gaps can be filled and who can fund retraining programmes or other policies relating to job transitions. They also need to identify mechanisms to create or sustain diversified economies, as these are more resilient in the face of change.

The policy mix required to support the transition will vary from one industrial transition region to another

The specific policies that can support a just carbon-neutral transition may vary from one region to another, as there is no "one-size-fits-all" pathway. However, it is fundamental to formulate long-term industrial transition strategies towards a climate-neutral economy. While the climate-neutral challenge confronts both national and subnational governments, particular consideration should be given to the role of the regional and local levels, where international agreements and national level policies are often implemented. It is also where a significant amount of public investment takes place. Preliminary estimates indicate that in 30 OECD countries between 2000 and 2016, regions and cities were responsible for 64% of public investment in selected sectors with a direct implication on climate change (OECD, 2018a).

Ensuring that policies are co-ordinated and aligned is critical, particularly in countries characterised by higher degrees of regional (and local) autonomy. In these cases, "transition" policies and programming might be designed and/or implemented by different levels of government, and care should be taken that

they do not work against each other. Thus, adequate mechanisms (e.g. mapping of all activities undertaken by different levels of government) should be introduced and employed to ensure horizontal (across the different policy areas) and vertical (among the various levels of government) co-ordination.

What challenges and opportunities do regions in industrial transition face in achieving a climate-neutral economy?

Regions in industrial transition face a range of challenges in dealing with the expected structural changes brought by a low-carbon transition but can also tap into the potential brought about by green growth opportunities. Advancing the transition to a climate-neutral economy requires decarbonising traditional manufacturing and/or carbon-intensive industries, which means effective investment in energy efficiency and in renewable energy. In this context, some regions in transition are concerned about job losses in industries that are phasing out. In addition, firms in traditional industries may not be aware of the competitive advantages that green technologies can offer, or may not be well-positioned to take advantage of green technologies if they face barriers to its use (e.g. financial or human resource barriers). Transitioning to a climate-neutral economy also requires effective multi-level governance practices, especially with respect to alignment among levels of government and stakeholder engagement.

It is not always clear how to best prepare workers for industrial transition

Policymakers in regions in industrial transition are necessarily concerned about the potential impact that a low-carbon transition can have on workers. The impact may be particularly strong in traditional industrial regions that are home to coal-mining activities and “brown” industries. These tend to be geographically concentrated, and restructuring may lead to mass lay-offs in the absence of a smooth adjustment process. While such lay-offs typically account only for a small share of total dismissals, their geographic concentration poses restructuring challenges. This might be particularly acute in small or undiversified regional economies where subnational revenues often depend on the local corporate and personal income tax base and can affect local public service delivery (Botta, 2018).

Concerns about effective labour transition strategies are often related to the broader question of skills transferability. For regions in industrial transition, it is often unclear to what extent new jobs will require the same skills as those being phased out and whether the skill sets of jobs in “brown” industries are transferable and adaptable to low-carbon sectors. Studies undertaking an assessment of how the low-carbon transition affects individual sectors remain scarce. Furthermore, regions in industrial transition struggle to provide the right training packages. The training needs of workers might vary significantly according to past work experience and the next sector in which they seek employment, making it difficult to design training packages that are appropriate for a large number of workers. The importance of engaging employers in the process of skills development is widely acknowledged. Yet, convincing regional employers to invest in training and skills upgrading can be difficult (see Chapter 2).

Growing clean industries can promote successful industrial transition

Managing a successful industrial transition means investing more in clean energy transition-related technologies, as well as shifting towards more sustainable modes of production and consumption. One of the key challenges for the climate-neutral transition is to reallocate capital from carbon-intensive to climate-neutral assets and infrastructure. Regions in industrial transition are traditionally home to manufacturing industries with high environmental impact. Successful industrial modernisation requires stimulating local economic diversification towards clean energy industries through decarbonisation, innovation and digitalisation. Many regions undergoing industrial transition recognise the societal and business value of

environmental objectives and the low-carbon transition is often part of local transition ambitions. However, because such transitions are complex, obstacles arise.

Regions in industrial transition often face difficulties in stimulating investment in green innovation, particularly among local firms. Common barriers for SMEs are size-related resource constraints, skill deficits and knowledge limitations. SMEs are often unaware of many financially attractive opportunities for environmental improvement. A widespread misperception is that transitioning to the climate-neutral economy is associated with technical complexity, administrative burden and high costs. Even when firms are aware that better environmental performance can improve competitiveness, a lack of appropriate skills and expertise might prevent them from acting upon profitable opportunities. At the same time, SMEs often have fewer resources and are more risk-averse than large firms. This can render them less willing to invest in new and green technologies, partly because of the uncertainty about the return on investment.

Vested interests can be an additional barrier in regions in industrial transition, particularly in those with long-established industries that can hamper the development of new industrial growth paths. However, without the active commitment of leading industry to transition to clean energy production, public authorities might not have the financial means and capacity to facilitate investment in the infrastructure necessary to modernise production and speed-up technology diffusion among consumers (e.g. providing charging stations for e-vehicles). In addition, a large range of stakeholders needs to be involved in transition planning in order to make the transition successful. Historically, transition strategies that showed greater political resilience and a more coherent and comprehensive approach were those where a relative consensus was reached on the need to phase out certain industries (Campbell and Coenen, 2017).

A range of governance challenges can hamper transition co-ordination and speed

Transitioning to a climate-neutral economy presents a set of complex governance challenges for policymakers. One of these is balancing the long-term strategic dimension of transition with the need for short-term action. While the transition needs long-term strategic thinking and policymaking, it also requires an ability to accommodate electoral cycles and the associated desire of governments and other stakeholders to see the results of implemented projects.

A further related challenge is ensuring that multi-level governance structures and practices can support regional ambitions for a climate-neutral transition. These can include taking action at a proper scale, balancing long-term strategies and shorter-term priorities, fostering an enabling environment for change despite some framework conditions being outside of regional control, having access to appropriate and adequate financing, and building stakeholder engagement.

Acting and investing at the relevant territorial scale often requires co-ordination across levels of government. Large projects, such as testing electric highways, for example, are often the responsibility of national governments. They may also need support from the region where they are implemented. Instead of being a barrier, action at a smaller scale can also be an opportunity to support small and/or remote public administrations, which may face similar issues as SMEs in the climate-neutral transition – i.e. limited resources, limited access to credit and limited attractiveness to the private sector as investment partners. The exact nature and scope of each of these challenges will likely vary by region, highlighting the importance of a targeted, regional approach.

Financing remains a challenge

Sufficient investment in infrastructure and green innovation are often constrained by limited public budgets, despite the fundamental role that financing plays in advancing a climate-neutral transition. Compounding this challenge are the barriers that local governments often face in leveraging private capital for green

infrastructure or innovation financing. In addition, local policymakers can lack the capacity to leverage alternative sources of finance for green investments, such as green bonds. Furthermore, given the negative implications that transitioning to climate-neutral economies can have on jobs and income in some regional labour markets, investment in retraining and upskilling programmes are also generally required. As public funds for relevant training might be insufficient, regional governments may need to work with other partners – including the private and third sectors – to ensure that training needs are met.

How can policy (better) support the transition to a climate-neutral economy?

For regions in industrial transition, the policy challenge of ensuring a just transition is to achieve deep emission reductions in a context often already shaped by higher-than-average unemployment and prominent skills gaps. It is, therefore, important for these regions to seize the opportunities of transition while minimising the impact on workers and poorer households. To this end, previous industrial restructuring experiences and the current unfolding of the low-carbon transition highlight the need for a mix of policy instruments. These include instruments that support scaling up to environmentally friendly technologies, dealing with structural adjustments arising from transition and re-orienting the strategic decisions of local authorities towards measures that reduce greenhouse gas emissions.

Providing labour transition strategies for a climate-neutral economy

Public policy can help support displaced workers during a transition to a climate-neutral economy, particularly when workers perceive job loss as an exogenous event that is not related to their actions or performance. A range of labour market measures is available to support displaced workers that have lost their jobs in the transition from traditional to modern and green industries. These include training and upskilling offers, job-search training and support measures to ensure a just transition (Table 5.1).

Table 5.1. Supporting labour transitions: Policy Issues, instruments and rationales

Policy issue	Policy response	Potential suite of implementation mechanism	Rationale/additional benefits
Creating job opportunities for the transition to a climate-neutral economy	Support green skills and jobs through training and upskilling	<ul style="list-style-type: none"> • Upskilling and retraining for displaced workers aligned with local labour market needs • Training on environmentally friendly production methods for existing workers 	<ul style="list-style-type: none"> • Expansion of skillset to move from declining to emerging industries • Progressive greening of existing industries
	Support workers in transition	<ul style="list-style-type: none"> • Dedicated job-search training for displaced workers • Flexicurity in labour markets 	Ensures the transition to high-quality jobs
	Support measures to a just transition	<ul style="list-style-type: none"> • Age- and gender-tailored measures • Social housing 	Ensures a fair transition

Support green skills and jobs through training and upskilling

Effective skills policies are a key ingredient for successfully transitioning to a climate-neutral economy in regions in industrial transition. If workers leave a declining sector, they will probably need to add new competencies to their skillset. In addition, the progressive greening of existing industries in transition regions will also require that workers remaining within a certain sector update their competencies in order to master more environmentally friendly production methods. Within this context, some skills policies will need to focus on displaced workers requiring green skills while others should target employed workers

who may need additional (not always green) skills. Importantly, in order to identify the most relevant training needs such policies should also keep in mind other megatrends (e.g. ageing, automation) that affect the regional potential for industrial modernisation (see Chapter 2).

Existing evidence suggests that most green jobs will simply require a “topping up” of existing skillsets (Eurofund, 2014). Several instruments exist to promote workforce and management training, including training subsidies and vouchers, training leave allowances, tax incentives and personal training accounts (see Chapter 2). Regions in industrial transition could profit from carrying out a review of available training options to ensure that courses offered cover the specific needs of workers displaced by the transition to a climate-neutral economy. Training programmes could also include specific green skills, such as the ability to evaluate the environmental impact of energy systems or the ability to apply methodologies for environmental and strategic impact assessments (OECD, 2017a).

Training programmes yield the most successful outcomes when they are closely tied to the needs of the labour market. Engaging local employers in regional skills anticipation and development initiatives is critical to ensure that training programmes are well aligned to the needs of industry. Several regions in industrial transition have systems in place for assessing and anticipating skills need. Where needed, these systems should also aim to identify opportunities for workers to move from shrinking industries towards emerging or expanding sectors, including those linked to the climate-neutral economy. A sophisticated system to identify opportunities for workers was introduced in the former region of Alsace, France (now part of Grand Est) (Box 5.3). Even where workers do not face redundancy, investing in training can help them adapt to changing technologies more broadly.

Box 5.3. Assessing skill needs for displaced workers: TransverS'AL

The region of Alsace lost 8 000 jobs between 2003 and 2011 in the automobile, chemical, food processing and machine construction/electronics industries. In response to the decline of manufacturing jobs, the local Employment and Training Centre of Mulhouse (*Maison de l'Emploi, MEF Mulhouse*) worked with partners to better support the transition of workers to more stable career paths within emerging sectors. Based on an initial 4-month consultation period with relevant local and regional actors, 15 objectives were developed around 4 themes: i) research and analysis; ii) co-operation with companies; iii) training; and iv) communication. As the project progressed, its focus was extended to new and emerging occupations, such as those created by the emerging “low-carbon” sustainable construction cluster. A series of sector studies were carried out in areas such as metalworking, textiles, buildings and public works, personal services, chemicals, plastics, pharmaceuticals, temporary work, local shopping, logistics and transport, and automobiles. These focused on assessing firm needs in terms of technology and skills, prospects of labour mobility and future industry orientation. An additional, dedicated study on labour mobility offered insight into job creation and destruction potential. The creation of a website enabled workers and businesses to better understand the horizontal career paths and training options that could support mobility from declining to emerging sectors.

Source: OECD (2014), *Job Creation and Local Economic Development 2018: Preparing for the Future of Work*, <https://doi.org/10.1787/9789264305342-en>.

Supporting displaced workers in transition periods

Displaced workers in a region undergoing industrial and energy transitions may have valuable and relevant skills for other industries, but they may find it difficult to navigate the job market or identify suitable opportunities in other sectors. Regions can facilitate the transition of such workers by supporting job-search

training, including advice on trainings and future career options, as well as job-search strategies. Such schemes have proven useful in regions that have undergone a transition (e.g. the Ruhr Valley) and can be provided by external actors or by the (former) employer. Self-employment schemes are another policy lever that can support workers after displacement and stimulate business creation in regions in industrial transition. Yet, only between 2% and 5% of displaced workers start their own business after having lost their jobs (OECD/EU, 2017).

Ensuring a just transition

Public policy in regions in industrial transition can also help address the impact of climate change on businesses in rural areas and on low-income families. Remote, low-income or poorer households are disproportionately affected by carbon pricing, as energy and transport tend to make up a higher proportion of their spending (McInnes, 2017). Carefully designed social policies can counteract this. For example, recycling carbon tax revenues could become a powerful tool to invest in programmes that address the roots of poverty and inequality. Low-income populations often do not have access to schemes associated with increasing energy efficiency, such as building retrofits. Local or regional government programmes that facilitate access for tenants and low-income households to retrofitting schemes can help make entire urban areas more energy-efficient and resilient, thus reducing energy expenditure. In Greater Manchester, a demonstrator project sought to tackle energy use in social housing by creating a local market (Box 5.4).

Box 5.4. The Greater Manchester Sustainable Communities Project

The demonstrator project in social housing in Greater Manchester replaced old and inefficient heating systems in 550 social housing properties across Wigan, Bury and Manchester with a range of cutting-edge electrical and hybrid air-source heat pumps (HPs). In addition, an energy aggregation system and an information and communication technology (ICT) platform were installed to control and co-ordinate the electricity usage of the HPs collectively, reducing energy usage during peak periods and testing the effectiveness of this reduction as a system to potentially trade in the electricity market.

Despite participation incentives, tenant sign-up to the project was challenging and uptake slower than anticipated. An unforeseen obstacle arose in maintaining the connectivity of the equipment components in the properties. There was a higher than expected number of ICT broadband disconnections with the cloud based aggregation system, with a review finding that these were largely due to “user” disconnection. Several tenants simply unplugged boxes, removed cables and in several cases changed the provider during the project, thus losing the established connection.

However, the project successfully demonstrated that a significant amount of energy demand could be shifted away from peak demand times across a large number of social housing properties. Outcomes surpassed the expectations of the trial but could have been even higher if all installed properties had been fully connected. One lesson learned is to focus more on awareness-raising and information provision for participating tenants. The project now feeds into the wider Greater Manchester carbon reduction plans.

Source: OECD (2018d), “Peer Learning in Regions in Industrial Transition Workshop: Low-Carbon Energy Transition, Responses from Hauts-de-France, North Middle Sweden, Piemonte, Saxony, Slovenia, Wallonia”, Proceedings Paper for Peer Learning Workshop 2-3 July, Manchester, United Kingdom, OECD, Paris, Unpublished.

Enabling businesses to turn environmental challenges into business opportunities

It is widely acknowledged that far-reaching innovation is needed to address climate change and to accelerate the shift to a climate-neutral economy. For regions in industrial transition, this means taking the opportunity to influence the direction of innovation towards more environmentally friendly ends and doing so in a way that generates the greatest net benefit to society. Stimulating green behaviour and production processes in firms and encouraging innovation in environmentally friendly technologies are good ways to contribute to green growth in regions in industrial transition (Table 5.2).

Table 5.2. Encouraging green innovations: Policy issues, instruments and rationales

Policy issue	Policy response	Potential suite of implementation mechanism	Rationale/additional benefits
Lack of business opportunities for green innovations	Stimulate green behaviour in firms	<ul style="list-style-type: none"> • Regulatory simplifications and incentives • Information-based tools (e.g. advice, sector-specific certification, ecolabels) • Economic incentives (grants, low-interest loans, tax incentives) 	<p>Creates an attractive innovation ecosystem for firms</p> <p>Higher awareness for green business opportunities</p>
	Encourage innovation in environmentally friendly technologies	<ul style="list-style-type: none"> • Support for green research and development • Innovation clusters • Environmentally friendly public procurement 	Stimulates investments in green technologies

Stimulating green behaviour in firms

For regions in industrial transition, policies and co-ordinated action for greening SMEs and large firms can contribute to regional development while also meeting climate objectives. Actively steering regional economies towards sustainable green growth helps regions in transition overcome the legacy of traditional manufacturing and/or resource-intensive industries and develop newly productive, carbon-neutral and resource-efficient economies. Regions in industrial transition are using a wide range of strategies and instruments to promote environmental compliance and green business practices. These include regulatory tools, information-based tools, and economic incentives that help businesses move beyond compliance (Table 5.3).

Table 5.3. Policy instruments to promote environmental compliance and green business practices

Type of mechanism	Implementation instrument
Regulatory tools	<p>Simplified regulatory requirements (standardised permits, general binding rules)</p> <p>Regulatory incentives for establishing environmental management systems</p> <p>Sector-specific strategies to ensure compliance</p>
Information-based instruments	<p>Direct business advice</p> <p>Dissemination of guidance in printed form or electronic</p> <p>Sector-specific certifications and ecolabels</p>
Economic incentives	<p>Grants, low-interest loans and tax incentives</p> <p>Encouraging supply chain pressure from larger companies</p> <p>Green public procurement</p>

Sources: Adapted from OECD (2018a), *Environmental Policy Toolkit for SME Greening in EU Eastern Partnership Countries*, <https://doi.org/10.1787/9789264293199-en> and Hoevenagel, R. et al. (2007), *Promoting Environmental Technologies in SMEs: Barriers and Measures*, European Commission, Luxembourg.

When it comes to regulatory and information-based instruments, the benefits of improved environmental performance for businesses, such as increased efficiency and competitiveness, should be the main “selling point” of environmental outreach to firms (OECD, 2018a). Involving public sector organisations and industry associations in programme design and implementation can also be valuable to target support to specific types of businesses.

Governments in regions in industrial transition can introduce a range of economic incentives. For example, public financial institutions might provide favourable loan conditions to businesses willing to invest in green technologies. Direct subsidies and free technical assistance may help increase awareness and secure initial engagement in green practices. However, given the limited availability of public funds, loan-based systems are likely to be more sustainable over the long term. Government authorities should also encourage private banks and insurance companies to provide incentives for good environmental performance among businesses. For example, banks could require an environmental checklist for loan approval. Lastly, regional policymakers can raise awareness and provide information on how businesses can access national and international funds supporting green innovation.

Encouraging innovation in environment-friendly technologies

Governments in regions in industrial transition can contribute to shaping the direction and quality of innovation that affects the environment. Although it is very difficult to anticipate the exact impact of more public R&D on innovation outcomes, research suggests that government spending on R&D for environmentally friendly technologies should be significantly increased (Acemoglu et al., 2016). The conclusion, therefore, is that sensible innovation policy for the transition to a climate-neutral economy should include subsidies for research.

There are numerous ways to design and allocate government-funded R&D support. For example, governments can subsidise private sector innovation through indirect fiscal incentives such as R&D tax credits. These are mostly designed at the national level and often there is a limited possibility for regional-level authorities to influence or adapt the incentives to best support regional innovation priorities. National and regional governments can also provide direct financial support for R&D through grants or loans, and there is growing empirical evidence of their positive impact on firm innovation outcomes measured by citation-weighted patents, finance, revenue and survival (Howell, 2017). Furthermore, undertaking research in government laboratories and research institutes has proven valuable for promoting innovation in clean energy. Government research can help new energy technologies overcome obstacles to commercialisation, such as disproportionately large capital expenses.

Policymakers in regions in industrial transition also play a role in supporting collaborative R&D arrangements. Such collaborations can bring together complementary skills and resources between firms and across the innovation spectrum. A large range of policy instruments exist to support collaborative R&D that can be exploited for green growth, including formal and informal university-industry collaborations, innovation incubators and cluster policies (see also Chapter 3). In Saxony, the energy technology cluster drives the development and commercialisation of clean technologies through partnerships of research institutes with local companies (Box 5.5).

Finally, encouraging more private sector financing of environmentally friendly technologies is particularly important in regions in industrial transition, especially if there is a limited budget for government expenditure to support the transition to a climate-neutral economy. While governments should not provide direct finance to firms to invest in technologies, they can reduce barriers to private investment and facilitate investments, for example, through the provision of patient capital with low-interest loans to businesses.

Box 5.5. The energy cluster in Saxony

The energy technology cluster Energy Saxony includes 68 actors from industry, research and government. It combines their competencies and expertise to drive the sustainable development and commercialisation of new technologies in the energy, electro-mobility and digitalisation sectors. Financed in equal parts by the state of Saxony and industry, the cluster seeks to answer diverse issues arising from the low-carbon transition. These include the sourcing of hydrogen, building value chains from wind and solar energy to green hydrogen, as well as technical questions such as planning train lines that run on green hydrogen and how to replace fossil fuels in the agricultural sector. Currently, one of Saxony's largest projects concerning the low-carbon transition is the shift from fossil fuels to renewable sources for energy production. The high density of research institutes and larger corporations in the region is an asset that this cluster seeks to harness for the transition.

Source: Freistaat Sachsen (2018b), "Low-Carbon Energy Transition: A Saxon Perspective", PowerPoint Presentation for the Peer Learning in Regions in Industrial Transition Workshop "Low-Carbon Energy Transition", 14-15 May 2018, Brussels, Belgium.

Supporting green public procurement

The aim and challenge of sustainable procurement is to integrate environmental and social considerations into the procurement process. The goal is to reduce adverse impacts on health, social conditions and the environment, thereby saving valuable costs for public sector organisations and the community at large (OECD, 2002). For regions in industrial transition, sustainable procurement can be a useful policy instrument to accompany industrial development because it supports industrial renewal based on ecological foundations. It can provide industries with incentives for developing environmentally friendly processes, products and services. This is particularly the case in sectors where public purchasers represent a large share of the market, such as in construction, health services and public transport. Procurement rules in transition regions often focus strictly on cost, without encouraging or supporting broader policy objectives such as innovation or sustainability. This is frequently related to fears that the efficiency of buying processes is disrupted when procurement is used to support socio-economic goals. Setting up consistent legal and policy frameworks to assist buying entities incorporate green procurement rules is important, as is monitoring the results. While procurement guidelines may be set at a national level, regions may have a margin to use their purchasing power in a way that upholds regional and local objectives and benefits local goods, services and practices. This is the idea behind North Middle Sweden's initiative to deliver locally sourced food to the elderly, with one result being lower emissions from transport (Box 5.6).

Box 5.6. Sustainable procurement for food delivery to the elderly in North Middle Sweden

North Middle Sweden has started using procurement as a tool to promote changes in the meal-situation of the elderly. A project-based initiative was launched in four different municipalities. In all cases, the model developed was based on cross-disciplinary knowledge and a holistic and collaborative approach, where the real needs of each involved actor are first assessed. This insight then formed the basis of a procurement process for meal solutions for the elderly.

From the outset, a set of goals were established for each of the municipalities. Specifically, to:

- create added-value and quality of life for the end-users
- create new products and services that open up possibilities for new actors to participate, or to open up new directions for established stakeholders
- not be more expensive for the procuring stakeholder, from a holistic perspective
- be compatible with current legislation.

Despite the somewhat different needs of each municipality, the results of the process revealed less waste, decreased transport, increased engagement and improved quality of life for both the elderly and personnel, for instance through increased outdoor activity, enhanced appetite and a stronger sense of community.

North Middle Sweden found that it is possible to identify and implement solutions that are fundamentally new and not necessarily more costly for municipalities. Success, however, can rest on a procurement procedure developed by a cross-disciplinary group that is aware of the diverse effects and clear on the desired outcomes, and when the procedure is based on knowledge about the real needs of the end-users.

Source: InnovationX (n.d.), *Innovationsupphandling X – med fokus på äldres måltidssituation (Innovation Procurement X – With Focus on the Meal-situation for the Elderly)*, <http://www.innovationx.se/dokumentation.php>.

Multi-level governance practices and strategies

Transitioning to a low-carbon economy presents a set of governance challenges. While the transition calls for long-term strategic thinking and policymaking, it also requires an ability to accommodate electoral cycles and the associated desire of governments and other stakeholders to show the results of implemented projects in a relatively short time. One common challenge is to ensure that the region's multi-level governance systems can support its ambitions for a low-carbon transition. This includes integrating the low-carbon transition in wider regional development strategies, fostering local energy transitions at a proper scale, building stakeholder engagement and ensuring an enabling environment for change despite some framework conditions being outside of the control of the regional government (Table 5.4).

Table 5.4. Overcoming governance challenges: Policy issues, instruments and rationales

Policy issue	Policy response	Potential suite of implementation mechanism	Rationale/additional benefits
Reconcile the long-term strategic dimensions of a climate-neutral transition with short-term action	Foster local energy transitions	<ul style="list-style-type: none"> • Financial and strategic support schemes • Strategic collaborations 	Reorient investments towards energy and environmental goals Strengthens local leadership
	Integrate the low-carbon transition into larger regional development strategies	<ul style="list-style-type: none"> • Set low-carbon objectives and measures • Build co-operation and stakeholder alignment 	Long-term strategic thinking on how to reduce carbon emissions
	Ensure an enabling environment	<ul style="list-style-type: none"> • Structural policies • Phase out fossil subsidies • Carbon tax 	Creates supportive business conditions

Fostering local energy transitions

Achieving climate-neutral pathways requires strategies spanning infrastructure, technology development and innovation in the energy, land-use and agriculture sectors. Radical changes in infrastructure across sectors will be needed for low-emission pathways, not only to reduce the carbon intensity of energy supply but also to create less energy-intensive behaviours and to reduce energy use in transport, buildings and industry.

Local energy transition strongly contributes to achieving national and global energy transition goals. For example, the success of Germany's *Energiewende* (energy transition) relied to a great extent on energy transitions which were stimulated and supported by municipalities that become part of a thick network of actors on matters of fighting climate change (Moss, Becker and Naumann, 2015).

Infrastructure investment – and its impact – is highly relevant to subnational governments, as almost 60% of public infrastructure investment occurs at this level (OECD, 2018b). The decisions made by regions and cities regarding infrastructure can influence a country's ability to achieve emissions and other climate-related targets. Subnational governments are also often responsible for decisions regarding land-use planning, integrated transport planning, and buildings (construction, retrofitting, and demolition) in their territories. How these responsibilities are designed, implemented and maintained will affect the low-carbon transition.

Municipal administrations can have a significant degree of autonomy in designing and implementing policies and programmes within larger frameworks (e.g. regional development plans, national sector strategies, etc.). They can almost certainly determine how to reduce their own energy usage, as well as many aspects of local building regulations and planning – for example through building codes, the provision of energy, public transport and housing – and how best to support and inform their citizens. Piemonte's large number of small public administrations combined with the poor construction quality of public buildings generates a huge potential for energy efficiency gains. The region's *Together 2020* project harnesses this potential by specifically targeting small public administrations (Box 5.7).

Box 5.7. Supporting energy efficiency in Piemonte's small public administrations: *Together 2020*

Together 2020 is an investment programme based on Public-Private Partnerships and Third-Party Investment (TPI) to increase the energy efficiency of public buildings and institutions in Piemonte's small public administrations.

Bringing a low-carbon approach to smaller municipalities was a challenge for the regional government. A lack of financial resources at the local authority level hindered municipal authorities from undertaking infrastructure investments that could increase the energy efficiency of public buildings and in turn, save them money. On the public market, time-to-tender was significant due to the need for high-quality energy auditing work and there was difficulty in keeping a strong level of commitment in small public municipalities. The relative lack of interest among companies in the call for tender by small municipalities was another challenge, driven by municipal size and a perceived lack of critical mass.

Thus far, the programme has been successful: 18 small municipalities have been involved, 50 public buildings have undergone energy auditing, and, without drawing on the public budget, energy-saving investments have resulted in a 12% decrease in energy consumption.

Source: Piemonte Region (2018), "Workshop 'Low carbon energy transition'", PowerPoint Presentation for the Peer Learning in Regions in Industrial Transition Workshop "Low-Carbon Energy Transition", 14-15 May 2018, Brussels, Belgium, Unpublished.

Taking a strategic approach and aligning actors

Objectives and measures to implement the low-carbon transition should be part of larger regional economic development plans. Embedding low-carbon goals in broader regional development strategies is important for two reasons. First, policies to foster the transition towards a carbon-neutral economy require the alignment and joint efforts of different policy areas. For instance, regional science and innovation policy matters for supporting new low-carbon technologies, and skills policies need to take into account the requirements of green job profiles. Second, supporting the low-carbon transition might come with short-term costs. Displaced workers from declining and brown industries might not experience an immediate and smooth transition to new employment. Regional development strategies in regions in industrial transition, therefore, need to take into account the costs of adjustment and foresee the necessary support measures to help workers move into new jobs and to ensure employers create the jobs needed.

Ideally, regional development strategies rest on building socially sustainable growth while driving a low-carbon transition. Building co-operation among a diverse set of actors is one of the keys to a successful strategic approach. Co-operation can help identify and align priorities and focus effort across sectors and among a variety of groups, such as industry, universities, SMEs and entrepreneurs, financial institutions and different levels of government. Yet regions in industrial transition often find it challenging to create and sustain commitment and interest among different actors. Hauts-de-France's REV3 initiative highlights how low-carbon goals can be embedded in broader regional development strategies and objectives (Box 5.8).

In addition to fostering co-operation, regions must also mobilise and encourage stakeholders to participate in the transition to a climate-neutral economy. This ensures that local strategies turn into concrete actions driven by a shared commitment and engagement of businesses, universities, the government and civil society. On the part of the regional government, this requires communicating to all stakeholders the economic and environmental benefits of transition and providing the necessary incentives to take part in the transition where possible. Care should be taken to ensure that messaging is clear and appropriate to different stakeholder groups. This may require adapting messages so they resonate with the target audience and using audience-appropriate communication channels (e.g. print, websites, social media, etc.)

Box 5.8. Good practice in Hauts-de-France: REV3

The term "REV3" stands for the regional adaptation of the Third Industrial Revolution concept and is part of the Hauts-de-France regional strategy. It aims to integrate the energy transition, the digital revolution and new economic models in order to decarbonise the regional economy by 2050, create jobs and boost local innovation. In involving local governments, companies, academia, institutions and the civil society organisations, the goal is to make rev3 a part of the region's identity and a factor of attractiveness.

For its implementation, the rev3 dynamic mobilises research-oriented and competitiveness clusters such as Pôle MEDEE (*Maîtrise Énergétique des Entraînements Électriques*), Pôle IAR (bioeconomy), Energie 2020 and CD2E (energy efficiency in buildings and renewable energy). As part of the regional development strategy, rev3 is embedded in the different regional plans and roadmaps in order to ensure the coherence of regional policies.

Source: Hauts-de-France Region (2018), "Hauts-de-France region", PowerPoint Presentation for the Peer Learning in Regions in Industrial Transition Workshop "Low-Carbon Energy Transition", 14-15 May 2018, Brussels, Belgium, Unpublished.

Ensuring an enabling environment

The regulatory environment is fundamental to ensure a fair transition. Effective business regulations allow micro and small businesses to scale-up and innovate. They also support the creation of (low-carbon) start-ups that help diversify the local economy. Pro-competition reforms strengthen market entry and can lead to higher investment, innovation and productivity. Flexible labour markets help workers move from one industry to another.

Policymakers in regions in industrial transition need to ensure that policies not directly targeting the low-carbon transition are also not working against it. Mapping how various sectors and their policies affect climate-neutral goals is one way to accomplish this. The role and interests of governments in supporting fossil fuel activities should also be considered. Many governments still depend on royalties, taxes and other revenues linked to fossil fuels. This financial interest is a large barrier unless the revenue stream is compensated.

Even when framework conditions are outside the control of regional governments, they still may be able to influence change. It is, therefore, crucial for regions in industrial transition to re-evaluate the framework conditions that directly and indirectly relate to low-carbon policies, so that an enabling environment for the low-carbon transition can be established – taking action where they can and working within their governance system to influence change in areas where direct action is not possible. This requires well-co-ordinated transition planning at all levels of government, involving key stakeholders and effective communication among all levels of government.

Key considerations and conclusions

Past and present industrial transition and the current transition to a climate-neutral economy demands that policymakers smooth the transition by addressing worker reallocation, redeployment, re-skilling or compensation. There are potential lessons to be drawn from “transition management strategies” and the policy frameworks put in place to facilitate these transitions. The following points should be considered in regions in industrial transition when preparing for the transition to a climate-neutral economy.

Balancing short-term trade-offs and long-term benefits is a must

While many regions in industrial transition are striving to advance the climate-neutral agenda, certain economic sectors, firms and segments of society strongly resist ambitious climate and other environmental policies. This is due to the real or perceived negative impact of greening policies on jobs and competitiveness. The economic and social costs of climate policies are perceived as high, and firms express concern about competitive disadvantage. The perceived threat of climate change is too long term to balance short-term trade-offs and drive ambitious early action. Without addressing such concerns head-on and devising possible solutions, regions in industrial transition cannot make sufficient progress on the implementation of green policies.

Resources need to be concentrated on areas with highest adjustment costs

Changing the current allocation of investments will be challenging for even the most advanced countries and regions. Achieving the greatest impact requires to target resources to those areas that are most in need for it. A “managed” transition provides sufficient degree of public support for areas with highest adjustment costs. For regions in industrial transition, this may require developing strategies to support the reorientation of existing industries in order to increase their efficiency and lessen dependence on fossil

fuels and to invest in skills development in order to reap the benefits of potential job creation in new green activities.

Regions in industrial transition need to tackle climate, growth and a just transition in a mutually reinforcing way

In order to implement and deliver the carbon-neutral transition in an inclusive way, tailoring policies to regional and local circumstances and addressing the needs of different groups will be crucial. Policymakers in regions in industrial transition, in close co-operation with the private sector, should systematically work through their existing policy frameworks and make sure they can accommodate new business models and new technologies that are connected to the transition to a low-carbon economy, thereby ensuring that possible opportunities and related benefits can be realised.

The political economy aspects of the climate-neutral transition matter

There is no one-size-fits-all solution and a successful transition will depend on a number of factors that are specific to a given region. Taking a political economy approach to the low-carbon transition at the regional level can help understand who wins, who loses, how and why, and help design fit-for-purpose transition policies. Regions undergoing an industrial transition should undertake an analysis of structural and distributional consequences of the low-carbon transition. This is fundamental to make sure that industrial modernisation goes hand-in-hand with clean energy objectives and that existing inequalities between people and places are not further exacerbated by climate policies.

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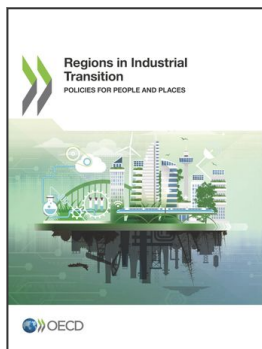
Note

¹ The share of male employment in high-carbon sectors is higher than that of women: 97% male employment in mining, and 77% in electricity.

Annex 5.A. Overview of policy issues and responses in the transition to a climate-neutral economy

Annex Table 5.A.1. Overview of policy issues, implementation mechanisms and rationales in the transition to a climate-neutral economy in regions in industrial transition

Policy issue	Policy response	Potential suite of implementation mechanism	Rationale/additional benefits
Creating job opportunities for the transition to the climate-neutral economy	Support green skills and jobs through training and upskilling	<ul style="list-style-type: none"> • Upskilling and retraining for displaced workers aligned with local labour market needs • Training on environmentally friendly production methods for existing workers 	Expansion of skillset to move from declining to emerging industries Progressive greening of existing industries
	Support workers in transition	<ul style="list-style-type: none"> • Dedicated job-search training for displaced workers • Flexicurity in labour markets 	Ensures the transition to high-quality jobs
	Support measures to a just transition	<ul style="list-style-type: none"> • Age- and gender-tailored measures • Social housing 	Ensures a fair transition
Lack of business opportunities for green innovations	Stimulate green behaviour in firms	<ul style="list-style-type: none"> • Regulatory simplifications and incentives • Information-based tools (e.g. advice, sector-specific certification, ecolabels) • Economic incentives (grants, low-interest loans, tax incentives) 	Creates an attractive innovation ecosystem for firms Higher awareness for green business opportunities
	Encourage innovation in environmentally friendly technologies	<ul style="list-style-type: none"> • Support for green research and development • Innovation clusters • Environmentally friendly public procurement 	Stimulates investments in green technologies
Reconciling the long-term strategic dimensions of a climate-neutral transition with short-term action	Foster local energy transitions	<ul style="list-style-type: none"> • Financial and strategic support schemes • Strategic collaborations 	Reorient investments towards energy and environmental goals Strengthens local leadership
	Integrate the climate-neutral transition into larger regional development strategies	<ul style="list-style-type: none"> • Set low-carbon objectives and measures • Build co-operation and stakeholder alignment 	Long-term strategic thinking on how to reduce carbon emissions
	Ensure an enabling environment	<ul style="list-style-type: none"> • Structural policies • Phase out fossil subsidies • Carbon tax 	Creates supportive business conditions



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