European Commission

Toolkit

Green skills

A guide to upskilling and reskilling workers for the green transition

Energy

European Commission

SUPPORT MATERIALS

Providing support materials to coal regions in transition

The Initiative for coal regions in transition developed the following support materials to assist practitioners in coal regions (including peat and oil shale regions) across Europe. Click below to download the toolkits.

- **Transition strategies**
- **Governance of transitions**
- **Sustainable employment**
- **Technology options**
- **Environmental rehabilitation and repurposing**
- **Clean air**
- **Transition financing**
- **District Heating**

European Commission

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How to use this toolkit

Slides / Pages 4-20

This section gives an overview of the topic of how to address the up- and reskilling needs of workers from both the private and public sectors, in the context of the green and energy transition.

For each slide, more detailed information can be found in the report section.

In-depth report / Pages 21-46

The in-depth report follows the same structure as the slides and offers more details for each section, with further resources, links, examples, and good practice case studies.

AIMS AND SCOPE

The aim of this toolkit is to **help stakeholders to address the upskilling and reskilling needs of workers in the context of the green economy**. It explores what constitutes a green job and the concept of green skills, examines the types of green skills that are likely to be needed in the future, and investigates how to plan for them. It explores the kinds of strategies that could be put into place and who should be involved in planning. It also links to EU initiatives such as the European Green Deal and the European Pillar of Social Rights.

WHO IS THIS TOOLKIT FOR?

- National and regional skills and employment authorities and local governments involved in the transition of coal regions
- Education and training providers
- Careers guidance and counselling organisations
- Public employment services
- Businesses in the region, including SMEs
- NGOs
- Social partners
- Chambers of commerce

WHY DO WE NEED THIS GUIDANCE?

The energy transition from coal, peat, lignite, or oil shale (i.e., 'coal+') towards alternative energy sources creates a demand for new types of skills. In particular, those skills that enable individuals to help develop, work with and maintain new green energy sources. There will be a need to **adapt current curricula and skills to work with new technologies** and to develop new technical skills. There will also be a need for updated knowledge in terms of **steering and stimulating demand through green public procurement**.

KEY MESSAGES

- The whole of the EU's economy will need, to varying extents, to **adapt skills in all types of occupations** in order to align with the demands of the green economy.
- Skills in specific sectors, such as **construction, clean and renewable energy, transport, food and agriculture, manufacturing, and recycling and waste management**, will be particularly affected.
- For enterprises and local authorities, carrying out **skills audits** to establish a baseline for current skills level is a valuable way to begin.
- Skills strategies are best **developed on a cooperative basis** between a wide range of key stakeholders at the appropriate administrative level (national, regional, local) to devise the appropriate instruments (e.g., a skills development programme) tailored to local needs.
- **Much can be learned** from other regions' experiences in the EU and beyond, both in terms of strategy and collaborative work between key stakeholders.

Introduction

What are green skills?

Inter-Agency Working Group on Work-Based Learning definition: 'Skills for the green transition' include skills and competences but also knowledge, abilities, values and attitudes needed to live, work and act in resource-efficient and sustainable economies and societies. They are: *technical*: required to adapt or implement standards, processes, services, products and technologies to protect ecosystems and biodiversity, and to reduce energy, materials and water consumption; *transversal*: linked to sustainable thinking and acting, relevant to work.

Green skills cover a **wide range of competences**, e.g. in the field of wind, solar and hydro, but also energy audits and training. These skills need to be taught in schools to provide the basis for green skills development for all.

According to Eurostat, there are just over 5 million green jobs in the EU economy, mostly in energy and water supply, sewerage, waste management and remediation activities (1.6 million) and construction (1.4 million)

Why are green skills important?

As the EU's economy increasingly **adapts to climate change** and the challenges of replacing traditional carbon-intensive energy sources with renewable energy, it is vital that the workforce has the skills in place to work in this new economic landscape.

How can we plan for green skills?

There are a range of ways of thinking about green skills – **adapting and applying existing skills to new sectors and tasks** is the most likely way forward.

What kind of processes should be put into place?

Skills development requires **careful strategy planning, supported by a solid evidence base**. A skills audit can establish the skills baseline, and tools such as a Theory of Change can support by defining the end goal and the steps needed.

The EU framework

Key EU initiatives with relevance to green skills

The European Skills Agenda

The European Skills Agenda, which aims to help individuals and businesses develop more and better skills and to put them to use by strengthening sustainable competitiveness, as set out in the European Green Deal

Read more

The European Green Deal

The European Green Deal, which aims to transform the EU into a modern, resource-efficient and competitive economy, ensuring: no net emissions of greenhouse gases by 2050; economic growth decoupled from resource use; and no person and no place left behind

Read more

The Pact for Skills

The Pact for Skills, under which a new Large-Scale Partnership (LSP) was launched for the renewable energy industrial ecosystem in March 2023

Read more

The Just Transition Fund (JTF)

The Just Transition Fund (JTF), which aims to support the areas that are most affected by the transition away from a carbon-based economy, including the upskilling and reskilling of workers

Read more

The Net Zero Industry Act 2023

The Net Zero Industry Act 2023, which aims to enhance skills for net-zero technologies

Read more

Types of green skills that are needed

Although the labour market has already changed significantly and will change further in the coming decades, **impacts will be felt in some sectors earlier than in others**:

- **Extractive industries**: coal mining (hard coal, lignite, peat harvesting and oil and shale gas extraction)
- **Construction**: retrofitting housing and constructing the infrastructure for new energy sources
- **Waste management**: including the circular economy.
- **Transport**: the introduction of electric vehicles
- **Agriculture**: climate change will have structural impacts

Urban planning therefore needs to take account of changing circumstances.

EXAMPLES OF DIGITAL SKILLS

- Digital skills to operate smart systems
- Data management skills
- Analytics skills
- Software development skills
- Skills to develop and maintain sustainable digital technologies, such as AI, 5G, cloud computing and the Internet of Things

EXAMPLES OF ENERGY PRODUCTION SKILLS

- Operators of construction machinery: photovoltaic, (PV) and wind
- Fitters/installers for PV and heating, ventilation and air conditioning (HVAC) systems and smart meters
- PV operation and maintenance technicians, maintenance and repair electricians.

Types of green skills that are needed

SKILLS LINKED TO WASTE MANAGEMENT AND RECYCLING

- Landfill design
- Landfill site management and monitoring
- Waste separation and waste assessment, hydrologists
- Collection, handling, sorting and processing of materials
- Incineration, landfill and biological treatment (such as composting)
- Technical skills to support new waste management technologies

SKILLS LINKED TO CONSTRUCTION

- Skills to work with environmentally-friendly materials and techniques
- Heating engineering skills
- Electricians, plumbers, joiners, roofers, plasterers
- Architects, urban and regional planners and designers
- Project management and site supervision skills
- Specific skills linked to retrofitting

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Assessing the need for green skills

Regional and local skills initiatives

- Skills requirements are closely linked to the **needs of sectors, industries and regions**
- Regional and local actors are likely to be more aware of the **types of skills in demand and the current skills base** and the local and regional educational options.
- Effective and targeted skills development activities are therefore best carried out at **local or regional level** since they can work towards developing skills initiatives that target local and regional needs
- This means that they can meaningfully work towards developing a skills development initiative **that truly targets local needs**.

REGIONAL SKILLS PLATFORMS IN SWEDEN

Regional Skills Platforms (Regionala kompetensplattformar) aim to strengthen collaboration between local authorities, businesses and education providers to anticipate and meet demands for skills.

These platforms are funded by the Swedish government and managed by the Swedish Agency for Economic and Regional Growth. They enable the regional actors who manage the platforms to carry out labour market and skills analyses and forecasts that can then be used by employment services to place individuals in the labour market.

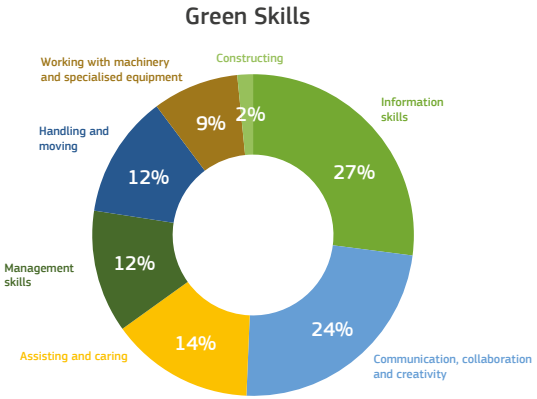
An evaluation of the Platforms recommended further strengthening the programme through closer cooperation between local, regional and national actors, goals and initiatives, and to make skills supply a regional development responsibility.

Source: Cedefop.

EU skills initiatives

ESCO

Taxonomy (classification system) of skills for the green transition in European Skills, Competences, Qualifications and Occupations.



GreenComp

European sustainability competence framework

Other key EU skills initiatives include the European Skills Agenda and the Pact for Skills

Skills audits

What is a skills audit?

- A way of **mapping existing skill levels**, both in terms of formal skills and informal competences
- Once skills have been mapped, an assessment can be made of **transferability options** to new and green jobs, alongside the need for upskilling and retraining.

Basic steps of a skills audit

- List the roles within an organisation or a region
- List the skills needed for each role
- Design, create and distribute a survey of workers
- Compile the results
- Analyse the data gathered

Source: Cognology

Using a skills matrix

- A skills matrix can **help to organise the data gathered** during a skills audit
- This can be **quite simple**, listing employees and skills and scoring competency against each skill.
- These might be **technical skills** linked to their role or **more generic skills**, such as marketing, sales, administration, finance or customer service.

Skills Matrix Template

Department Name		Skill					
Team Member Name	**Job Title**	Skill #1	Skill #2	Skill #3	Skill #4	Skill #5	Skill #6
Team Member A	Job Title Member A	0	2	1	3	3	3
Team Member B	Job Title Member B	3	2	2	2	1	2
Team Member C	Job Title Member C	2	2	3	1	1	1
Team Member D	Job Title Member D	2	2	1	3	3	0
Team Member E	Job Title Member E	1	2	2	2	0	2
Team Member F	Job Title Member F	3	3	3	0	3	3

Proficiency Level	
0	Not Applicable
1	Training/Beginner
2	Moderate
3	Expert

Source: effy.ai

Strategies and planning for green skills

- Planning for the development of green skills is a complex activity, requiring the **collaboration of a wide variety of stakeholders**.
- It is also important to develop **short-medium- and long-term strategies**.
- Some **form of forecasting and anticipation function** is also advisable, which could be developed in partnership between:
  - Employers
  - Central government
  - Regional authorities
  - Social partners
  - Vocational education and training providers
  - Community representatives
  - Public employment services
  - Funding bodies

PARTNERSHIP BETWEEN A FURTHER EDUCATION INSTITUTE AND INDUSTRY IN NORTHERN IRELAND

Southeastern Regional College (SERC) is supporting sustainable construction by establishing the first multi-faceted zero carbon centre in Northern Ireland. This is expected to significantly contribute to the decarbonisation of commercial and domestic buildings in Northern Ireland.

A wide range of qualifications at various levels will be on offer at the centre across five themes. SERC has worked closely with industry partners throughout the design and planning phase and has secured sponsorship from employers.

Source: Learning and Work Institute

Cooperation process

Engaging stakeholders requires an organised process to **ensure inputs from all key actors**.

It is particularly important to engage and consult all relevant stakeholders **as early as possible**.

Steps in this process could include:

- **Identification** of relevant stakeholders.
- **Mobilisation** of the stakeholders.
- Establishment of **communication** with the key actors.
- Organisation of a series of **workshops or meetings** to develop a plan.
- Development of **key roles and tasks** for stakeholders, timeline and monitoring indicators.

STAKEHOLDER COLLABORATION IN GERMANY

Germany's Commission on Growth, Structural Change and Employment (also known as 'Coal Commission') was set up in 2018 to help shape structural change in the country's lignite regions.

The Commission is comprised of 31 members from environmental associations, trade unions and business associations, energy and environment experts, energy sector representatives, and national, regional and local officials.

The Commission suggested an array of labour market policies and training measures, alongside redeployment of workers, both within lignite companies and into other sectors, alongside early retirement. The Commission set out concrete policy recommendations and some of these were translated into policy measures.

➲ Read more: Commission on Growth, Structural Change and Employment

How to carry out reskilling and upskilling initiatives

- Carrying out reskilling and upskilling initiatives requires **strategic planning and thought**
- The actors involved should meet on a **collaborative and partnership basis** to define a shared vision of common goals and how these goals can be best achieved
- One way of doing this is to develop a **Theory of Change model**

Source: own depiction

Good practice examples

Government support

NATIONAL QUALIFICATIONS FRAMEWORK IN PORTUGAL

In Portugal, to support the development of the environmental sector and to help the country to achieve its sustainable development objectives, changes are being made to the National Qualifications Framework. The National Agency for Qualifications and Professional Education (ANQEP) has created new competence standards linked to jobs created by the green economy, as well as new short training modules, which aim to adapt the competencies of workers whose job content may be influenced by climate-related regulations.

Following this, the Portuguese Institute for Employment and Vocational Training (IEFP) adapted the contents of vocational education and life-long learning programmes. Social partners have also been involved in the development of this process.

Read more: ETUC and Global Climate Jobs

EMPLOYMENT POLICY IN CZECHIA

In August 2020, the Czech government adopted a new Framework for Employment policy. The policy's goal is for the Czech labour market, based on a cooperative and effective public employment service, to be able to react to global trends and ensure both decent work for citizens and sufficient labour force that matches the needs of the economy. This Framework for Employment is closely linked with the government's new Strategy for Education Policy 2030+. One of the key objectives of this Strategy is to change the content of education and equip people with new competences (skills, knowledge, attitudes) linked to socially and environmentally responsible behaviour, and to adapt education to new trends connected with the digital and green transitions.

One concrete example of these policies on the ground comes from the coal region of Moravia-Silesia, where an NGO supported by the Moravia-Silesia Region, the City of Ostrava, the Regional Chamber of Commerce, the Association for the Development of Moravian-Silesian Region and the Association of Industry and Transport has developed the Moravian-Silesian Employment Pact (MS PAKT). This project helps people to change jobs, provides career advice, facilitates the cooperation of schools and companies, and offers employment opportunities in the region.

Read more: BusinessEurope and MS PAKT

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Good practice examples

Technical training and reskilling

TECHNICAL TRAINING FOR THE RENEWABLE ENERGY SECTOR IN ROMANIA'S JIU VALLEY

In Romania's Jiu Valley coal region, the Renewable Energy School of Skills trains former coal workers to prepare them to work in roles such as wind turbine technician or solar mounting technician. It offers a wide range of courses, including in wind turbine blade inspection and repairs, photovoltaic panel installation, and electrical equipment installation and maintenance.

This training centre is a pilot project that forms part of a larger proposal to reskill more than 8,000 people in the valley over the coming decade.

Read more: GWO Training

RESKILLING FOR DANISH RENEWABLE ENERGY

A retraining and reskilling programme was set up in Denmark with the support of trade unions, following the closure of a number of shipyards. This programme led to the creation of the Lindø Offshore Renewables Centre (LORC) and an R&D and training centre, in which the technologies associated with offshore wind energy can be tested and produced. Trade unions are closely associated with the management of the centre.

Read more: LORC

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Green public procurement (GPP)

What is green public procurement?

- GPP can function as an **important tool to achieve environmental policy goals** relating to climate change, resource use and sustainable consumption and production
- Public sector contracting authorities can specify **protection of the environment** as a factor in best value procurement
- GPP can also focus on **skills in particular areas**, such as in the removal of hazardous materials
- It is also important that those in decision-making and budget shaping roles have **the right skills** to put in place GPP. Skills development should also reach those in customer-facing roles and those supporting the community through health and social care. Those in **energy poverty** also need help to increase their energy, digital and financial literacy

"A process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured".

EUROPEAN COMMISSION COMMUNICATION (COM -2008- 400) PUBLIC PROCUREMENT FOR A BETTER ENVIRONMENT

The European Commission is developing **voluntary GPP criteria** for product groups in sectors such as road transport, office building design, construction and management, electricity, data centres and cleaning products and services. Further information is available here.

Good practice examples

Green public procurement

CUTTING ENERGY USE IN MUNICIPAL BUILDINGS IN VANTAA, FINLAND

The City of Vantaa in Finland contracted an energy service company to improve the energy efficiency of 14 of its municipal buildings. It used an Energy Performance Contract to ensure that the energy saving measures and associated cost savings would be realised more quickly than would otherwise be possible using investment from the City's budget. The technical specifications for this contract included a guarantee from the energy service company on energy saving and repayment periods.

The 8 year contract period, which ran from 2011 to 2020, saw a total of 7,500 tonnes of CO_2 emissions cut and annual savings in energy costs of EUR 200,000 for the city. Surplus savings were divided between the City and the energy service company.

Read more: European Commission, p.25

GPP SOLUTIONS USING A FRAMEWORK AGREEMENT IN GERMANY

In 2013, Germany's Procurement Agency of the Federal Ministry of the Interior published a tender for 50,000 thin client computer systems, valued at €15 million. This open tender specified technical standards and contract clauses, including a guarantee of compliance with environmental aspects for components, noise and waste management. The framework agreement was for 24 months with an optional extension of 12 months. The five-year energy savings were calculated to be 58,750,000 kWh of electricity, equivalent to 29,000 tonnes of CO_2.

Read more: European Commission, p.26

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In-depth report

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Aims and scope

The aim of this toolkit is to help stakeholders to address the up- and reskilling needs of workers from both the private and public sectors, in the context of the acquisition of green skills. It explores what constitutes a green job and the concept of green skills, examines the types of green skills that are likely to be needed in the future, and investigates how to plan for them, the kinds of strategies that could be put into place and who should be involved in planning for the development of green skills. The toolkit provides guidance on strategic planning, describes options and underpins these with good practice cases. It also links to the EU perspective and framework, including the European Pillar of Social Rights, the European Green Deal and the European Year of Skills 2023/24 and its Pact for Skills.

Who is this toolkit for?

The target audience for this toolkit comprises all who are stakeholders in skills development and lifelong learning in particular regions, although the principal stakeholders include:

- **National and regional skills and employment authorities and local governments involved in the transition of coal regions** – for example, in areas where coal mining and other types of extractive industries are closing, and other types of economic activity and possibly also energy generation need to be considered. This will then create demand for different types of skills. Local actors will therefore be looking for ways to retain and create jobs by ensuring that the local skills supply meets the emerging demand for the region.
- **Education and training providers** – these include tertiary education bodies, providers of vocational education and training, those involved in lifelong learning provision and public and private bodies involved in upskilling and reskilling workers.
- **Careers guidance and counselling organisations** which provide advice and guidance to individuals.
- **Public employment services** and other bodies involved in placing individuals in the labour market.
- **Businesses in the region, including SMEs** that are part of employment and business development processes at the regional and local levels.
- **NGOs** in the environment and education fields.
- **Social partners** – trade unions and employer organisations who represent the workers and the businesses in the region and have an interest in ensuring future employment and investment in the region. Chambers of commerce also look after business interests in a region.

Why do we need this guidance?

The energy transition from coal, peat, lignite, or oil shale towards alternative energy sources creates a demand for new skills. These include skills that enable individuals to develop, work with, and maintain new green energy sources, as well as those that support workers who will find themselves in different industries. More widely, skills will be needed to deal with impacts related to climate change, such as impacts on agriculture and the need for sustainable farming. Overall, there will be a need to *adapt current curricula and skills* to work with new technologies, and to *develop new technical skills*, alongside a range of other skills, including so-called 'soft skills'. There will also be a need for updated knowledge in terms of steering and stimulating demand through green public procurement.

This toolkit therefore focuses on the issue of green skills, both in terms of the restructuring of the energy sector, but also more widely. The toolkit has a strong regional focus, ensuring that it is relevant to, and covers, the skills needs across a region, rather than focusing exclusively on upskilling and reskilling options for workers in coal, peat, lignite, and oil shale sectors. It is written to be practical: it presents a number of good practices and initiatives working on upskilling and reskilling, makes links to education and lifelong learning, and explores the increasing importance of digital skills. The toolkit also explores potential linkages to the EU initiative 'European Year of Skills 2023/2024'.

This toolkit is not a "how to" manual; rather, it provides a framework for action and gives information, advice and guidance on the types of issues that are important in relation to green skills. It also serves as an information repository that provides examples of good practices and links to further information sources.

Introduction

As Europe's economy increasingly adapts to climate change and the challenges of replacing traditional carbon-intensive energy sources with renewable energy, it is vital that the workforce has the skills in place to work in this new economic landscape. According to Eurostat statistics, the green economy has been growing rapidly in recent years and consistently outperforms the overall economy in terms of both employment and value added.[1] The green transition represents a complete economic and societal transformation, which means that trying to map and prepare for its employment and skills impacts is complex and challenging.

What is a green job?

There are different approaches to assessing what counts as a green job and there is therefore no one definition of a green job, which in turn affects policymaking, as there is less data on which to base policies. Some researchers count the number of people engaged in sectors that directly drive the

1 There is much debate about what is encompassed by the term 'green economy', and what constitutes a 'green job'. The perspective taken throughout this toolkit is outlined in the section Taxonomies of green jobs and skills, below.

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transition to net zero, such as renewable energy or electric vehicle production. This approach usually finds the share of green jobs to be less than 5% of employment in developed economies. This would include studies such as Eurostat, 2021 and Georgeson and Maslin, 2019. Others take a different approach, looking at jobs that have a high share of green-related tasks (such as solar panel installers or architects switching to more energy-efficient design, chemists or hydrologists, which are in greater demand as a result of the green transition). This approach usually estimates that around one fifth jobs or more could be classified as green, and includes studies such as Bowen et al., 2018 and Bowen and Hancké, 2019.

According to Eurostat, which takes a broad sectoral approach, in 2020 there were just over 5 million green jobs in the EU economy, mostly in energy and water supply, sewerage, waste management and remediation activities (1.6 million) and construction (1.4 million). The environmental economy also provided 1 million jobs related to other service activities, 0.6 million jobs in agriculture, forestry and fishing, and 0.5 million jobs in mining, quarrying and manufacturing. Eurostat estimates that the number of jobs in the environmental economy has risen from 3.2 million in 2000 to 5.1 million in 2020.

Green skills cover a wide range of competences in a vast array of areas, ranging from the technical skills that will be needed to work with the technology and machinery for energy generation from sources such as wind, solar and hydro, to skills relating to conducting energy audits, advising on training in areas such as recycling, and skills to increase sustainability in the tourism sector.

Green skills and the EU context

There is a strong EU framework that supports skills developing, including the acquisition of green skills. This includes the European Skills Agenda and the Pact for Skills. Under the Pact for Skills, a new Large Scale Partnership (LSP) was launched for the renewable energy industrial ecosystem in March 2023, which will focus on the development of skills in this sector (see also below).

It is particularly important to focus on green skills in the context of the European Green Deal, which aims to transform the EU into a modern, resource-efficient and competitive economy, ensuring: no net emissions of greenhouse gases by 2050; economic growth decoupled from resource use; and no person and no place left behind. The Commission notes that plans such as the electrification of the European economy and a greater use of renewable energy are expected to generate higher employment in these sectors. Increasing the energy efficiency of buildings will also create an estimated figure of up to 160,000 new green jobs in the construction sector, with local labour in higher demand. It is therefore essential that workers are equipped with the right skills to work in these emerging roles, in order to help to move the European economy and labour market forward in the context of a greener economy.

The EU is also developing a "Just Transition" approach, to address the socio-economic effects of the green transition. As part of this, the Just Transition Fund (JTF) aims to support the areas that are most affected by the transition away from a carbon-based economy. With resources of €17.5 billion, the JTF aims to engage in activities such as sustainable investment in SMEs, the creation of new companies, R&I, environmental rehabilitation, clean energy, and most notably for this toolkit, the upskilling/reskilling of workers and active labour market policies.

The European Pillar of Social Rights, under Principle 1 'Education, training and life-long learning' states that: "*Everyone has the right to quality and inclusive education, training and life-long learning in order to maintain and acquire skills that enable them to participate fully in society and manage successfully transitions in the labour market*". This has direct relevance to the development of skills that will enable workers to participate in the green economy.

Further, the proposed Net Zero Industry Act 2023 aims to enhance skills for net-zero technologies by setting up dedicated training programmes through Net-Zero Academies and facilitating the portability of qualifications in regulated professions. The academies, each focusing on one net-zero industry technology, such as hydrogen and solar technologies, will aim to train 100,000 learners each within three years of establishment.

In addition, the European Centres of Vocational Excellence, inspired by the 2020 Council VET Recommendation, aim to make regional VET systems ready to integrate new and emerging skill sets, including green skills, for new/old occupations through partnerships.

KEY MESSAGES

- **The whole of the EU's economy will need to adapt skills in all types of occupations to some extent in order to align with the demands of the green economy.**
- **Skills in specific sectors, such as construction, clean and renewable energy, transport, food and agriculture, manufacturing, and recycling and waste management, will be particularly affected.**
- **For enterprises and local authorities, carrying out skills audits in order to establish a baseline for current skills level is a valuable way to begin.**
- **Skills strategies are best developed on a cooperative basis between a wide range of key stakeholders at the appropriate administration level (national, regional, local) in order to devise the appropriate instruments (ie a skills development programme) that are tailored to particular needs.**
- **Much can be learned from the experience in other regions of the EU and beyond, both in terms of strategy, and with respect to collaborative working between key stakeholders.**

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There are also a range of relevant sectoral initiatives with a skills dimension, such as the BATT4EU partnership in the batteries sector. This partnership developed a Strategic Research and Innovation Agenda in 2021, one of the general objectives of which is to *enable European leadership in the battery industry across the value chain and create economic growth and quality jobs in a circular economy, by supporting the development of an innovative, competitive and sustainable battery manufacturing industry and a skilled workforce in Europe*. One of the KPIs for this is the creation of new jobs and skills.

Taxonomies of green jobs and skills

There is much debate about the definition of green skills. The Inter-Agency Working Group on Work-Based Learning agreed the following definition in 2022: 'Skills for the green transition' include skills and competences but also knowledge, abilities, values and attitudes needed to live, work and act in resource-efficient and sustainable economies and societies. They are: technical: required to adapt or implement standards, processes, services, products and technologies to protect ecosystems and biodiversity, and to reduce energy, materials and water consumption. Technical skills can be occupation-specific or crosssectoral; transversal: linked to sustainable thinking and acting, relevant to work (in all economic sectors and occupations) and life. Alternatively referred to as 'sustainability competences', 'life skills', 'soft skills' or 'core skills'.

While the Eurostat statistics referenced above says that the green economy, "encompasses activities and products that serve either of two purposes: 'environmental protection' — that is, preventing, reducing and eliminating pollution or any other degradation of the environment, or 'resource management' — that is, preserving natural resources and safeguarding them against depletion." These skills need to be included in education and training to provide the basis for green skills development for all.

There are also a range of ways of thinking about the concept of green jobs and skills. It is unlikely that completely new types of skills will be required in most cases; adaptations of existing skills and the application of existing skills to new sectors and tasks is the most likely scenario that most will face. In order to frame the discussion around the development of green jobs and skills, some attempts have been made to sketch out the areas into which green jobs and skills are likely to fall.

The ILO has developed a taxonomy of green jobs. This taxonomy is based on three pillars, as set out in Figure 1 below, which evaluate whether jobs can be classified as green. Jobs should meet the criteria in all three pillars in order to be classified as green. They are:

- employment in the production of green products and services, i.e. whether a job produces goods or provides services that benefit the environment, such as green buildings or clean transportation;
- employment in environmentally-friendly processes, which would include jobs in traditionally polluting industries if these transition to employ environmentally-friendly technologies in their production processes. This could include processes

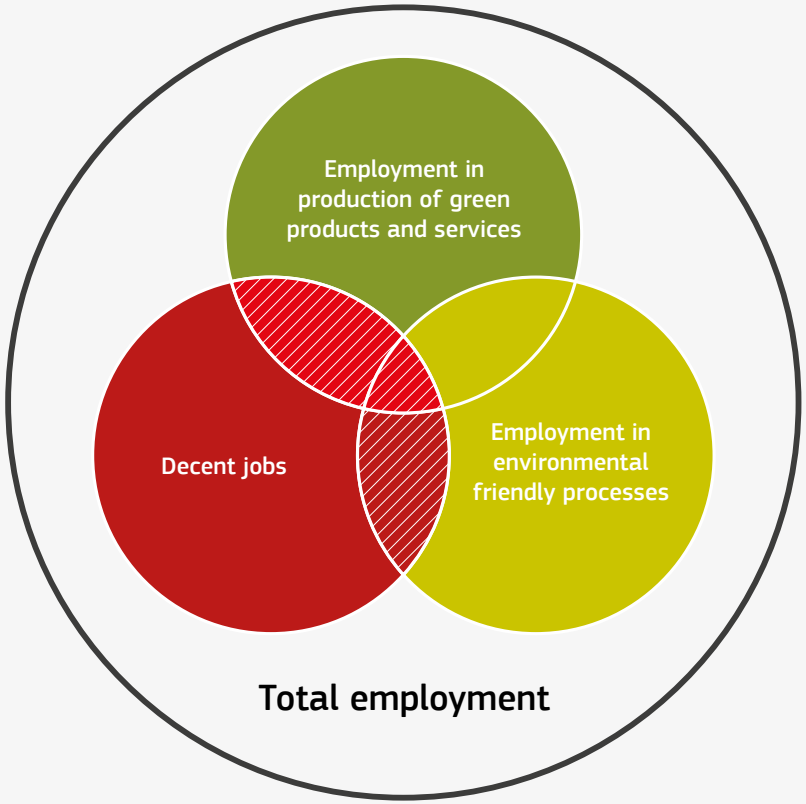

FIGURE 1: ILO TAXONOMY FOR GREEN JOBS.

Source: ILO 2016

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that, for example, minimise waste generation or water consumption, which can contribute to minimising environmental impacts; and

- decent jobs; as defined by the ILO in 1999 as work that is carried out 'in conditions of freedom, equity, security and human dignity' (ILO, 1999). This would cover issues such as pay, working conditions, career prospects, job security, worker rights and occupational health and safety.

Another representation of green skills comes from Green Skills Resources, which shows the types of skills that will be needed in the broad fields of renewables, environmental management and socio-environmental management, as described in Figure 2, below:

In January 2022, the European Commission published a taxonomy (classification system) of skills for the green transition in European Skills, Competences, Qualifications and Occupations (ESCO). This taxonomy includes a total of 381 skills, 185 knowledge concepts and five transversal skills that are considered to be most relevant for a greener labour market. See Figure 3 for a detailed breakdown by type of skill and the likely percentage of demand for each type.

Further, the European sustainability competence framework GreenComp responds to the aims of the European Green Deal and aims to set out a definition of sustainability as a competence. In this resource, 'competence' refers to "a set of knowledge, skills and attitudes", while the general JRC definition of competences encompasses: "attributes that refer to an ability to use knowledge, skills, social and/or methodological abilities".

GreenComp breaks down sustainability competence into 12 more specific competences, organised into the four areas of:

- *Embodying sustainability values*: this includes valuing sustainability, supporting fairness, and promoting nature;
- *Embracing complexity in sustainability*: this includes systems thinking, critical thinking and problem framing;
- *Envisioning sustainable futures*: this includes futures literacy, adaptability and exploratory thinking; and
- *Acting for sustainability*: this includes political agency, collective action and individual initiative.

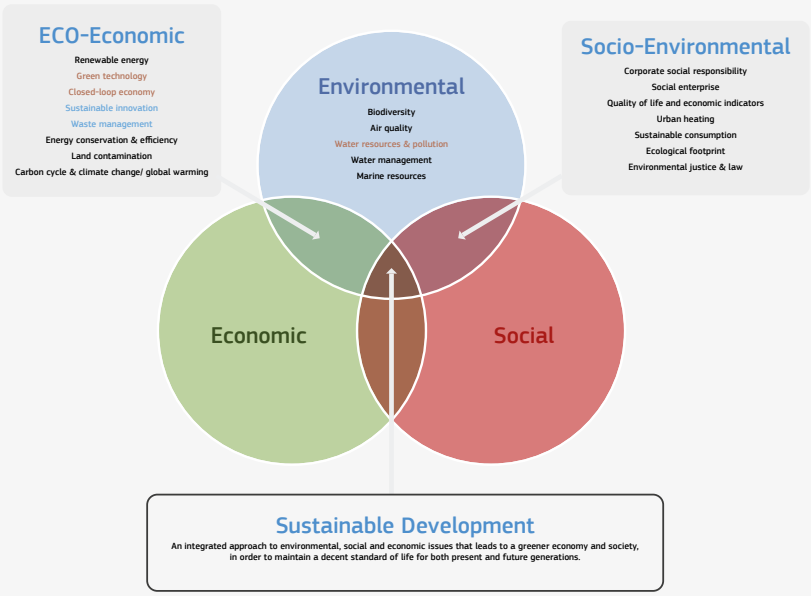

FIGURE 2: GREEN SKILLS CLASSIFICATIONS.

Source: Green Skills Resources

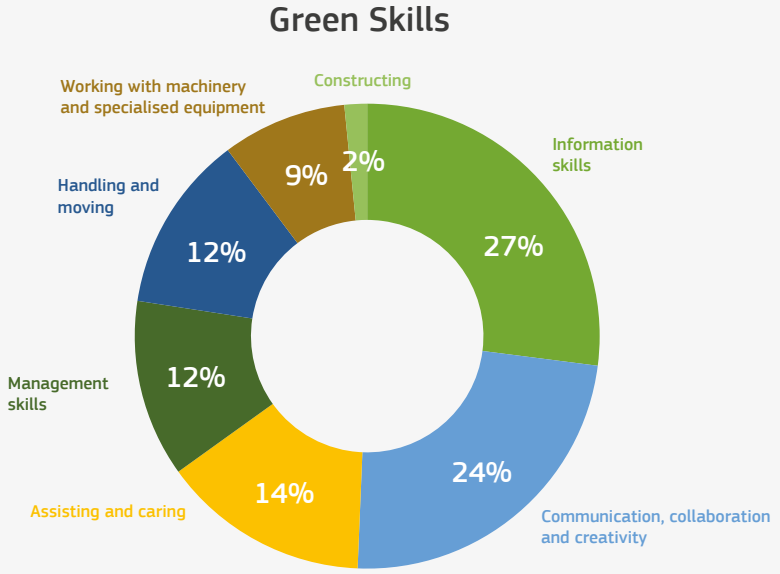

FIGURE 3: GREEN SKILLS IN ESCO.

Source: European Commission 2022

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Types of green skills that are needed

The impact of the green transition will be felt in all parts of the European economy. It is likely that the labour market will change to the point of being unrecognisable over the coming decades as a result of the green transition. This is already taking place in many countries and regions, and the impacts will be felt more intensely and sooner in some sectors rather than others. These sectors will principally be extractive industries such as coal mining (hard coal, lignite, peat harvesting and oil and shale gas extraction); the construction sector, both in terms of retrofitting housing and also constructing the infrastructure for new energy sources; and the waste management sector, which is an essential part of the circular economy. Electric vehicles will also revolutionise the transport sector, and impacts will be felt in agriculture in terms of structural changes linked to habitat loss and the collapse of insect pollinator populations.

Urban planning therefore needs to take into account these changing circumstances. Areas of focus include energy-efficient urban development with integrated neighbourhood concepts, systemic interaction between buildings, neighbourhoods and energy infrastructure and mandatory consideration of climate change mitigation and adaptation measures where public funding is provided. More specifically, and as noted by the European Environment Agency, this would include incorporating climate change adaptation concerns into building standards and retrofitting activities, ensuring that sewage systems can cope with heavier precipitation, reviewing building designs to better insulate against heat and adapting energy and transport systems to cope with higher temperatures, low water availability or flooding.

LinkedIn also produces regular research and reports on green skills. It publishes annual reports, the latest of which is the Global Green Skills report 2023.

FIGURE 4: VISUALISATION OF GREENCOMP SUSTAINABILITY COMPETENCES.

Source: European Commission 2022

BOX 1: CEDEFOP FORECASTING AND INFORMATION ACTIVITIES

Skills development needs careful strategy planning, supported by a solid evidence base. There are many resources available to help policymakers, employers and social partners to develop a skills development strategy. Cedefop carries out regular forecasting and information activities that can help inform strategic decisions. For example, a recent Cedefop report examines the green employment and skills transformation, emphasising that rapid changes in skill needs will have impacts far beyond the key occupations driving them, affecting all economic sectors, and not just the sectors that are traditionally in focus, such as the extraction industries, construction and waste management.

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Table 1 below, reproduced from BusinessEurope, shows the structural changes and the potential labour market consequences of the green transition by sector, focusing on energy, infrastructure, transport, construction, food and agriculture, recycling and reuse, waste management, digital technologies, and research and innovation.

Sector	Structural changes	Potential labour market consequences
Energy	• Reducing energy consumption • Phasing out coal and gas • decarbonisation • Development of renewable energy sector, i.e. offshore wind production or solar energy • "Smart infrastructure": deployment of innovative technologies and infrastructure (smart grids, hydrogen networks or carbon capture, storage and utilisation, energy storage and enabling sector integration)	• Disappearing jobs in the traditional energy production sectors, i.e. coal mines • New jobs/occupations in the renewable energy • sector and related services, i.e. production of subparts for wind turbines and their maintenance • Nature of jobs evolves due to changes in technology, maintenance and used materials
Large-scale infrastructure	• Infrastructure for fully integrated, integrated and digitalised European energy sector • Infrastructure for multi-modal transport • Production and deployment of suitable alternative transport fuels • Infrastructure for more efficient waste management	• Likely job creation in supporting infrastructure for electric cars: a safe, circular and sustainable battery value chain (all types of batteries)
Transport	• Multimodal transport • Promotion of environmentally friendly transport options (rail, inland waterways) • Transition to electric vehicles	• Change in the nature of jobs and production processes • Potential job creation in the environmentally friendly transport options • Potential job destruction in subcontracting chains in the automotive sector, if not modernised • Potential job employment cuts in air and ship transport due to smaller demand induced by increasing prices
Construction	• Climate-proof building, incl. nature-based solutions • "Smart" homes (digitalised, climate-proof) • Renovation of private houses and public building (energy efficiency, keeping homes adequately warm)	• Potential job creation/boost for the SMEs and local jobs • New skills required by using environmentally friendly materials/ techniques

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Sector	Structural changes	Potential labour market consequences
Food and agriculture	• Use of resources: land use, forestry, farming, fishing • More sustainable food production: changes across the whole food chain and development of alternative food • Development of precision agriculture, organic farming, agroecology, agro-forestry and stricter animal welfare standards • Eco-schemes to reward environmental and climate performance	• Declining employment in traditional farming • Potential job creation in alternative agri-sectors • New jobs in the former farmlands, i.e. organic farming or eco-tourism
Recycling and reuse	• Developing and implementing reusable and recyclable packaging (bio-degradable and bio-based plastics, secondary raw materials and by-products) • Stricter recycling requirements: mandatory recycled content (packaging, vehicles, construction materials, batteries) • Extending the recycling chain: reduction and reuse of materials before recycling	• Potential job creation in the extended recycling chains • New skills required by new materials and technologies
Waste management	• Advanced quality requirements (separate waste collection) • More waste to be processed within the EU as the export of waste will be stopped	• Potential job creation in waste separation and waste assessment • Changes within existing jobs to embrace new waste management technologies
Digital technologies	• Critical enabler to achieve climate neutrality goals • Development and deployment of sustainable digital technologies (AI, 5G, cloud computing and edge computing, the Internet of Things, distant monitoring of air and water pollution, use of energy or natural resources, support for "take-back" schemes)	• Important potential for job creation (IT jobs, but also complementary professions and maintenance services)
Research and innovation	• New technologies, new materials	• Significant potential for job creation (IT jobs, product, services and processes design etc.)

TABLE 1: SECTORAL STRUCTURAL CHANGES AND POTENTIAL LABOUR MARKET CONSEQUENCES.

Source: BusinessEurope 2021

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Table 2 outlines examples where skills adaptation will be required, providing examples of transition for specific roles in particular industries. These examples are differentiated based on whether adaptation will lead the role to remain in the same sector, whether or not the same types of skills will be required, and whether or not the role is expected to remain in the same region. The types of new skills needed would vary according to specific circumstances, but may include new technical skills and/or a different combination of existing skills.

Table 3 presents an overview of the emerging skill needs in waste management, circular economy, agri-food sectors and smart and green cities.

Example	Sector	Skill	Region
Power plant operator working in biomass power plant after plant conversion.	Same	Same	Same
Geologist working in research centre in same region.	Other	Same	Same
Industrial electrician retrained as wind farm technician working in wind farm located on the site of a former coal mine	Other	Other	Same
Industrial technician retrained as wind farm technician working in wind farm located in other region.	Other	Other	Other
Geologist working as specialist tour guide with a museum after mine reclamation.	Same	Other	Same

TABLE 2: EXAMPLES OF SKILLS ADAPTATION NEEDS FOR SPECIFIC ROLES

Source: European Commission JRC 2018

Sector	Technical skills	Soft skills
Waste management	ICT/engineering skills related to the adoption of new technologies for processing waste	Collaboration skills Persuasion skills to work with organisations to persuade them to reduce waste levels, including product design consistent with the circular economy
Circular economy	Skills linked to design and repair (some may be traditional manual ones currently in decline)	Marketing/communication skills Persuasion skills (e.g. to support change in consumer behaviour)
Agri-food	Skills linked to adoption of advanced agricultural production (e.g. precision farming). Skills linked to more sustainable foodstuff production. ICT/data analysis skills	Communication and persuasion skills (to engage with producers and the public)
Smart green cities	ICT and data analysis skills (at the heart of smart, green cities) Awareness of the potential of analysing data generated by sensors (municipal planning)	Communication and persuasion skills to encourage the general public to make use of the services/functions made possible by smart, green technologies (e.g. e-government). Collaboration skills (to engage with different types of organisations in cities)

TABLE 3: EXAMPLES OF TECHNICAL AND SOFT SKILLS NEEDS IN SELECTED SECTORS

Source: Cedefop 2023

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Skills adaption in the coal sector

There are a range of occupations and skills held by those working in the coal mining sector that can be adapted to the renewable energies sector. The Reskilling coal industry workers for the renewables energy sector project aimed to create transition pathways that match the skillsets of former coal workers to the most relevant occupations in the renewable energy sector. It focused on six roles held by former coal workers: mining machine operators; fitters; maintenance and repair workers; construction equipment operators; heavy vehicle and mobile equipment service technicians and mechanics; and mining electricians. It then provided examples of similar types of jobs in the renewables sector, listing technical and soft skills that would be needed to carry out these roles. Finally, the project calculated the length of training time that would be needed to complete the transition pathway to these new roles. Table 4 provides an overview of the main transition pathways outlined.

Role in coal sector	Role in renewables sector	Details	Length of time to retrain
Mining machine operators	Machinist of road construction machinery (Photovoltaic, PV) and machine operators (wind)	Even though mining machine operators have a similar set of skills to machinists of road construction machinery and machine operators (wind), workers in the renewable energy sector operate with heavy machines and therefore some training will be needed.	Approximately 6 months to learn how to operate heavy machinery and be retrained to machinists of road construction machinery (PV) and machine operators (wind).
Fitters in the coal industry	PV fitter/installers and heating, ventilation and air conditioning (HVAC) system installers	Fitters can transition to PV fitters/ installers and HVAC system installers with a low level of retraining.	Around 1 month, as they already have the skillset required.
Maintenance and repair workers	PV operation and maintenance technicians	Maintenance coal workers have extensive experience of maintenance.	Approximately 1 month to transition to the renewables sector.
Construction equipment operators	Machinist of road construction machinery (PV), Machine operators (wind)	Construction equipment operators have significant knowledge in handling construction machinery and therefore will need low levels of retraining.	Approximately 1 month to transition to PV and around 6 months to transition to machine operators (wind), as they will have to adapt to new equipment.
Heavy vehicle and mobile equipment service technicians and mechanics	PV operation and maintenance technicians, maintenance and repair electricians.	Heavy vehicle technicians and mechanics are already experienced in maintenance and repair	Approximately one month of retraining.
Mining electricians	PV electricians, electricians (wind), maintenance and repair electricians (wind).	Mining electricians can transition to PV electricians with low levels of retraining as they already have the skillset required. However, they will need a medium retraining to acquire the skills needed to transition to electricians (wind) and maintenance and repair electricians (wind).	Approximately one month of retraining to become PV electricians but around three months for wind electricians and maintenance and repair electricians in the wind sector.

TABLE 4: TRANSITION PATHWAYS FOR FORMER COAL SECTOR WORKERS BASED ON FULL-TIME TRAINING

Source: RES-Skill 2021.

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Assessing the need for green skills

Education and training

Education and training providers are key actors in the development of green skills, working with other stakeholders, such as national, local and regional authorities, businesses and their representatives and policymakers at all levels. The EU is very active in encouraging and supporting the European education and training sector to focus on the green transition and develop sustainability competences.

One of the EU's flagship initiatives is the Education for Climate Coalition, which links to the European Green Deal (see above). This is a community of practice, based on a participatory approach to ensuring that education and skills development is fully aligned with the challenges related to climate change. Accordingly, the priorities of this coalition are: training teachers; bridging education with science; developing green skills and competences; raising awareness; and changing behaviours

Regional and local skills initiatives

Skills requirements are closely linked to the particular needs of specific regions and sectors; therefore, effective and targeted skills development activities are best carried out at local or regional levels. This way, the actors involved are more likely to be aware of the types of skills that will be in demand regionally, as well as workers' current skills base, which means that they can meaningfully work towards developing a skills development initiative that truly targets local needs. There are many examples of such regional and local initiatives, some of which are outlined in Box 2 and Box 3, below.

The process of green skills assessment

Before a proper assessment can be made of what sorts of green skills should be fostered, it is essential that existing skills is understood, including both formal skills and skills that individuals have acquired informally in their jobs (without validated training). Skills assessments must also capture skills that employees have, but which they are not using in their current jobs. Conducting a skills audit is a way of unearthing and storing this information. Once skills have been mapped, an assessment can be conducted to gauge transferability options to new and green jobs, alongside the need for upskilling and retraining.

BOX 2: REGIONAL SKILLS ASSESSMENTS IN SCOTLAND

Skills Development Scotland works with partners and stakeholders to develop Regional Skills Assessments (RSAs). These RSAs are published on an annual basis and contain detailed information on regional labour markets in specific areas across Scotland. Each document contains information about the labour market and green skills context, the regional economy, and future demand for skills in the particular area, supported by summary infographics. The latest RSAs can be accessed on the Skills Development Scotland website.

BOX 3: REGIONAL SKILLS PLATFORMS IN SWEDEN

Sweden's Regional Skills Platforms (*Regionala kompetensplattformar*) aim to strengthen collaboration between local authorities, businesses and education providers in order to anticipate and meet demands for skills, with a focus on the business community's evolving competence needs. These platforms are funded by the Swedish government and managed by the Swedish Agency for Economic and Regional Growth. They enable the regional actors who manage the platforms to carry out labour market and skills analyses and forecasts that can then be used by employment services working to place unemployed people in the labour market. These analyses can also inform employment and education policymaking in the longer term. For example, they have been used by career guidance services in schools to help pupils choose their future education or training paths.

When this initiative was evaluated in 2013-2017, the main recommendations were to develop closer cooperation between local, regional and national actors, goals and initiatives, and to make skills supply a regional development responsibility that is highly prioritised at this level.

Source: Cedefop 2018.

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There are two main ways of assessing skills. The first is based on quantitative data, including labour market statistics and employer surveys, which help to estimate current and future skill needs. Alternatively, skills assessment can be done based on qualitative data such as interviews, focus groups and a review of documents, or by a mixture of the two.

Cedefop also reviews EU Member States' systems of anticipation of skills needs, noting that the use of big data is now also becoming more widespread; this can be used to map skills requirements in a range of occupations, to identify vacancies in green areas of the economy and also to identify education and training programmes that focus on the skills that will be needed in the green economy.

There are many types of green skills that can be developed to be applicable to other sectors, such as those relevant to administrative, management, and sales and marketing roles. Furthermore, qualified technicians, craftspeople, and operators of machinery and equipment are likely to find it easier to transfer to new sectors. For example, solar companies may be interested in hiring former coal miners for solar installation, assembly and maintenance roles. In particular, electrical and mechanical skills, experience working under difficult conditions, and sophisticated safety experience are highly valued in the wind and solar energy industries.

Skills audits

Figure 5 shows the six basic steps of a skills audit, which are:

1. **to list the roles currently held by workers within a region (or organisation)**. First, it is important to review any job descriptions that are currently in place to find out whether employees are already working in roles that no longer match the job description. Next, list the types of roles that these job descriptions relate to, considering overarching types rather than each individual position. This might involve grouping similar roles that require similar skills sets. In organisations, it is a good idea to speak to line managers or department heads and go through the job descriptions with them. They might know whether there are any responsibilities listed that are not being carried out, whether there are any duties that are missing from job specifications, and whether they have allocated additional duties to any of their team members;
2. **to list the skills needed for each role**. These should include both technical and behavioural(or 'soft') skills. This step will generate a resource that shows which skills are currently being deployed by employees;
3. **to design, create and distribute a survey of workers**. This will enable the organisation or region to find out which skills workers have beyond those they are using in their current jobs. People should be informed about why they are being surveyed and for what purpose the data will be used. The survey should be short to make it easy for people to respond. It could, for example, ask employees to write a list of their main duties and to estimate how much time they spend on each function. They should be asked to identify duties in their job descriptions that they no longer carry out, any tasks not listed, and whether they have obtained any new skills or qualifications since the last skills review, if a previous review has taken place;
4. **to compile the results**. This should be done in two ways: first list the skills held by each person, then list which people hold each skill; and
5. **to analyse the data gathered**. This will build an understanding of current skills among the workforce.

Creating a skills matrix

A skills matrix can help to organise the data gathered during a skills audit. This can be quite simple, listing employees and different capabilities, then scoring competency against each skill. These might be technical skills linked to their specific technical role in an organisation, or they might be more generic skills, such as marketing, sales, administration, finance or customer service. An example of a general skills matrix is set out below.

Strategies and planning for green skills

Planning for the development of green skills is a complex activity, requiring the collaboration of a wide variety of stakeholders.

To provide workers with the right types of skills to enable them to remain employable, some form of forecasting and anticipation function should be developed. This can be a difficult task, and is usually a medium- to long-term activity, as it needs to feed into training courses developed by vocational educational training (VET) providers, schools and colleges. Developing green skills also needs to fit with regional and industrial strategies, which will define the economic profile and skills demand for an area.

FIGURE 5: SKILLS AUDIT STEP

Source: Cognology

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Box 3, below, illustrates the benefits of collaboration by providing details of a regional partnership for skills in the chemicals sector.

Ideally, an anticipation and forecasting function would be developed in partnership between a range of actors such as:

- **Employers**. New and existing employers in a variety of sectors should be engaged as they will be key in terms of offering employment and/or training. Employers in green energy sectors are particularly important stakeholders as they will have detailed knowledge of the skills they need to operate effectively.
- **Central government**. The central government might be able to offer funding to support training and skills development outcomes at local and regional levels.
- **Regional authorities**. Subnational governments (local and regional) have a good overview of the region and the context and can serve as a link between various actors in relation to identifying which skills are needed and how to address the development of these skills.
- **Social partners** (trade unions and employer representatives). Trade unions will be able to advise and support workers collectively and individually, and may be able to offer or help devise training and outplacement. Employer representatives can offer guidance to companies. Social partners can also be key players in terms of working with other stakeholders to devise a skills development plan for workers affected by restructuring.
- **Vocational education and training providers**. Public education institutions, such as those involved

Skills Matrix Template

Department Name		Skill					
Team Member Name	Job Title	Skill #1	Skill #2	Skill #3	Skill #4	Skill #5	Skill #6
Team Member A	Job Title Member A	0	2	1	3	3	3
Team Member B	Job Title Member B	3	2	2	2	1	2
Team Member C	Job Title Member C	2	2	3	1	1	1
Team Member D	Job Title Member D	2	2	1	3	3	0
Team Member E	Job Title Member E	1	2	2	2	0	2
Team Member F	Job Title Member F	3	3	3	0	3	3

Proficiency Level	
0	Not Applicable
1	Training/Beginner
2	Moderate
3	Expert

FIGURE 6: SKILLS MATRIX TEMPLATE

Source: Effy

BOX 3: REGIONAL PARTNERSHIP FOR SKILLS IN THE EU CHEMICAL SECTOR

The second regional partnership network in the EU chemicals sector was launched at the start of 2023 under the EU's Pact for Skills initiative. The network is led by the European Chemical Regions Network (ECRN) and is part of the European Year of Skills 2023/2024. This network will support regional private and public partners in the coming years and could be a blueprint for future initiatives.

The main ambition of the partnership is to highlight the role of skills, education and training in the green and digital transition of the chemical industry. It will help regions to find the best solutions to tackle the challenges linked to the skills needed for the green and digital transition of this industry. It also aims to accelerate the identification of the most vulnerable regions by bringing all relevant partners to the table and surveying their needs.

This network aims to facilitate dialogue between regional administrations, social partners, education and training providers, research and development institutions and industry in the chemicals sector. It will support partners to work on specific tasks and create targeted working groups to work on applications of EU-funded projects, as well as the preparation of interregional strategies to tackle common challenges.

This network will benefit greatly from the links to the EU's Pact for Skills and the 2023/2024 Year of Skills. The ECRN is also a well-established body with a proven track record of developing partnerships and joint projects in the sector.

Source: European Commission 2023

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in general education, lifelong learning, digital education and dual education programmes, are a key element of the green skills acquisition process. See Box 4 below for an example of a higher education institute working with industry to develop green skills in the construction sector. Private sector training providers with a specialisation in green skills can also play a role.

- **Sources of advice and guidance**. In addition to the stakeholders listed above, other experts may have relevant expertise in areas such as reskilling and upskilling, and working with employers to develop skills on-demand.
- **Community representatives**. Local and community representative bodies are well-informed about the needs of the community. There are a range of environmental and education non-governmental organisations (NGOs), which could play a role in relation to developing education and training around green skills. These include local community centres.
- Public employment services. Public employment services at regional and local levels can play a vital role in helping to match supply of and demand for employment. They can also coordinate training needs and opportunities.
- Funding bodies. All levels of funding will be relevant, from the EU level (ESF and ERDF) to national-level funding, and local and regional sources of funds.

Time frame for strategic planning

When planning strategies for the development of green skills, it is also crucial to think about how to respond to and prepare for demand for skills in the short-, medium- and longer-term. **Short-term skills demands** could, for example, include a need for personnel to wind down power stations and close facilities.

Medium-term skills demands might include occupations connected to existing alternative industries, including renewable energy generation. This would be linked to concrete objectives within a time horizon of around 5-10 years.

Longer-term skills demands would need to be discussed between stakeholders and would also need to align with the future vision for a region in terms of economic and regional development. As transition and structural change processes generally take several decades, a vision for a region should include an outlook with a time horizon of around 30 years. This type of vision is generally qualitative and describes a narrative. It might include encouraging the development of particular industries or sectors in the region.

Establishing a dialogue between key stakeholders (including the social partners) would also help to minimise challenges and difficulties connected to issues such as conflicting aims and targets, vested interests, a lack of innovation and institutional capacity, a lack of synergies and conflicts around short-term and long-term visions.

Further detail on developing a transition strategy is available in the DG ENER Transition Strategies Toolkit.

BOX 4: LARGE-SCALE SKILLS PARTNERSHIP LAUNCHED IN THE RENEWABLE ENERGY SECTOR

In March 2023, renewable energy trade associations and representatives of installers of clean technologies, with the support of the European Commission, set up a large-scale skills partnership in the renewable energy sector. The partnership aims to provide workers with the skills needed for the manufacturing and management of renewable energy technologies to achieve the EU's energy and climate objectives for 2030 and climate neutrality by 2050. The focus will be on creating high-quality jobs and career paths, proposing policy recommendations to advance skills development, involving relevant national authorities, education institutions, vocational education and training institutions and training platforms, and attracting more women to the sector.

Source: European Commission 2023

Stakeholder engagement and cooperation processes

Where a range of actors is in place, it is vital that they meet on a collaborative and partnership basis to define a shared vision of common goals and how these goals can best be achieved. Engaging stakeholders in this way requires an organised process to ensure inputs from all key actors. It is of particular importance to engage and consult all relevant stakeholders as early as possible. This is no easy task: "tailored workforce transition programmes and the building of local economic resilience require time, preparation and learning by doing" (IDDRI 2018, p.6).

Steps in this process could include:

- Identification of relevant stakeholders; conduct research to find out who the key actors are in the region.
- Mobilisation of the stakeholders; establish contact with the key actors.
- Communication with the key actors to identify the areas in which they can contribute.
- Organisation of a series of workshops or meetings during which a plan is developed, based on a common vision and policy mix.
- Development of key roles and tasks for the stakeholders, timeline and monitoring indicators.

BOX 5: PARTNERSHIP BETWEEN A HIGHER EDUCATION INSTITUTE AND INDUSTRY PAVING THE WAY FOR SUSTAINABLE CONSTRUCTION IN NORTHERN IRELAND

Southeastern Regional College (SERC) is supporting sustainable construction by establishing the first multi-faceted zero carbon centre in Northern Ireland. The centre, incorporating five purpose-built units, will be created on site, equipped with innovative green technologies that are expected to significantly contribute to the decarbonisation of commercial and domestic buildings in Northern Ireland.

A wide range of qualifications at various levels will be on offer at the centre across five themes: electrification; air source heat pumps and solar thermal; hydrogen domestic boilers; hydrogenated vegetable oil HVO and BioLPG; and air tightness and insulation. The centre will cater for qualified tradespeople looking to upskill and attain a licence to practice for new technologies, non-tradespeople who want to undertake short introductory awards, as well as further education construction students and apprentices. SERC has worked closely with industry partners throughout the design and planning phases to ensure that the new centre meets industry standards and needs. The college has secured sponsorship from employers, including Greenview Energy Solutions, a company that installs, maintains, and repairs renewable energy systems. Greenview has contributed their products to enable hands-on experiential learning, and will sponsor the electrification unit, assisting with the installation of technologies on site. Once courses start, Greenview and other industry experts will provide guest lectures, enabling other businesses to understand and ramp up their efforts to support decarbonisation.

Source: Learning and Work Institute 2022

Read more

BOX 6: STAKEHOLDER COLLABORATION IN GERMANY

Germany's Commission on Growth, Structural Change and Employment was set up in 2018 to help shape structural change in the country's lignite regions. The Commission was made up of a total of 31 members from environmental associations, trade unions and business associations (employers and industry), energy and environment experts, representatives from the energy sector, regional and local officials and members of the coalition parties. The Commission's final report was submitted to the Federal Government at the beginning of 2019. This multi-stakeholder Commission considered several aspects of regional structural change, including the green transition and how to mitigate its potential negative effects on workers. It suggested an array of labour market policies and training measures, alongside redeployment of workers, both within the lignite companies and into other sectors, alongside early retirement measures for older workers. The Commission set out concrete policy recommendations and some of these were translated into policy measures.

On skills development in particular, the Commission noted that "Subsidised qualifications and vocational training can help to adapt the qualifications of the workforce in the mining areas to the changing vocational demands so that these employees are still able to work in industry and in the energy sector. The companies, especially the mine operators, should therefore cooperate with the Federal Employment Agency as early as possible to provide vocational training and qualification courses for their personnel. The teaching of fundamental digitisation and STEM skills should play a special role". (p.98).

COMPOSITION OF GERMANY'S COMMISSION ON GROWTH, STRUCTURAL CHANGE AND EMPLOYMENT.

Source: Agora Energiewende, 2019.

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How to carry out reskilling and upskilling initiatives

Carrying out reskilling and upskilling initiatives requires strategic planning and thought. One way of doing this is to develop a Theory of Change, which is defined as a "systematic and visual way to present and share an understanding of the relationships among the resources you have to operate your program, the activities you plan and the changes or results you hope to achieve". A Theory of Change can help show the steps that need to be taken to achieve change. A representation of a Theory of Change is set out in Figure 7, below.

The types of actors to involve in this process depend on the precise nature of the types of skills that are in focus, the sector, and the region. A combination of the actors outlined in the section above are likely to be involved.

It should also be noted that the European Commission's Pact for Skills is also open to individual companies, organisations and public sector actors, which can benefit from a range of support services offered by the Pact for Skills. Good practice examples

In this section we provide some examples of good practice in relation to upskilling and reskilling to provide workers with the green skills that will be needed in a range of areas of the economy. It begins with an examination of policy initiatives, before looking at skills forecasting, qualifications frameworks and examples of good practices in individual businesses around Europe and beyond.

FIGURE 7: THEORY OF CHANGE MODEL

Source: own elaboration

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Government policy initiatives

The example in Box 7 looks at how the Czech government is focusing on the development of green skills in its employment framework and education framework.

Further, Box 8 shows how the Portuguese government has developed qualifications policies to support skills development for the green economy.

BOX 7: THE CZECH GOVERNMENT'S EMPLOYMENT POLICY FRAMEWORK

In August 2020, the Czech government adopted a new Framework for Employment policy. The policy's 2023 goal is for the Czech labour market, based on a cooperative and effective public employment service, to be able to react to global trends and ensure both decent work for citizens and sufficient labour force that matches the needs of the economy.

This Framework for Employment is closely linked with the government's new Strategy for Education Policy 2030+. One of the key objectives of this Strategy is to change the content of education and equip people with new competences (skills, knowledge, attitudes) linked to socially and environmentally responsible behaviour, and to adapt education to new trends connected with the digital and green transitions.

Both strategic documents are framed by the strategic framework "Czech Republic 2030", which indicates the direction that the development of the country and society should take in the decades to come, pointing towards social, economic and environmental development. Czech social partners were consulted and involved in its development process.

Source: BusinessEurope 2021

One concrete example of these policies on-the-ground comes from the coal region of Moravia-Silesia, where an NGO supported by the Moravia-Silesia Region, the City of Ostrava, the Regional Chamber of Commerce, the Association for the Development of Moravian-Silesian Region and the Association of Industry and Transport has developed the Moravian-Silesian Employment Pact (MS PAKT). This project helps people to change jobs, provides career advice, facilitates the cooperation of schools and companies, and offers employment opportunities in the region.

Source: MS PAKT

BOX 8: NATIONAL QUALIFICATIONS FRAMEWORK IN PORTUGAL

In Portugal, to support the development of the environmental sector and help the country to achieve its sustainable development objectives, changes are being made to the National Qualifications Framework and the National Catalogue of Qualifications. The National Agency for Qualifications and Professional Education (ANQEP) has created new competence standards linked to jobs created by the green economy, as well as new short training modules aiming to adapt the competencies of workers whose job content may be influenced by climate-related regulations. Following this, the Portuguese Institute for Employment and Vocational Training (IEFP) was entrusted with the task of adapting the contents of vocational education and life-long learning programmes. As the governance of the Portuguese qualification system is tripartite, social partners have been involved in the development of the process.

Source: ETUC and FPEF 2017

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Skills forecasting initiatives

Skills forecasting and anticipation is a key part of all skills strategies, as this provides insights into the skills that will be needed in the short-, medium- and longer-term. Once information about future skills needs is available, policymakers and stakeholders can work towards putting into place the building blocks to develop those skills. A variety of skills forecasting initiatives are in place around the EU. Box 9, below, gives an overview of the system in place in Estonia.

BOX 9: SKILLS ANTICIPATION IN ESTONIA

The OSKA skills identification system in Estonia is designed to analyse and forecast (over a 5-10 year period) labour market needs, both in quantitative terms (i.e., how many employees are needed in key occupations by sector) and qualitative terms (i.e., what are the expected competence profiles in key occupations). It also recommends any adjustments necessary in the country's education and training offer and its active labour market policies.

OSKA combines statistics and registry data with expert knowledge and analysis. It specifically addresses the issue of better matching the needs of the labour market with the education and training that is available. The policy goal is to improve and tighten the linkages between education and the quantitative and qualitative needs and expectations of the labour market. This initiative engages all relevant stakeholders, so that they can provide input into skills anticipation and give recommendations to upgrade competency standards, provide relevant training and courses, and retraining possibilities.

The OSKA system creates a cooperation platform, which enables the exchange of information between employers, training providers, and educational institutions to comprehensively analyse the growth potential of different economic sectors and their needs, and to facilitate the planning of education provision at different levels of education and by types of school, as well as in the fields of retraining and in-service training.

One of OSKA's key areas of focus is green and digital transitions. It has produced an overview of the skills necessary for this, available on its website.

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Regional and sectoral practices

There are also examples of good practices at the regional level. The example in Box 10, below, shows how former coal workers are being trained to operate as technicians in the renewable energy sector in a pilot project in Romania.

Box 11 highlights trade union involvement in skills development in the Danish renewable industry sector.

Beyond Europe, Box 12 shows how a social enterprise initiative in the former coal region of the Appalachians in the USA has enabled the local economy to diversify and has helped former coal workers to retrain and move into alternative sectors.

BOX 10: TECHNICAL TRAINING FOR THE RENEWABLE ENERGY SECTOR IN ROMANIA'S JIU VALLEY

In Romania's Jiu Valley coal region, the Renewable Energy School of Skills trains former coal workers and other interested people in the region to prepare them to work in roles such as wind turbine technicians or solar mounting technicians. It offers a wide range of courses, including in wind turbine blade inspection and repairs, photovoltaic panel installation, electrical equipment installation and maintenance, and a range of other courses as required by industry or the local authorities.

The training takes place in the premises of the town's former mining school, which is now the University of Petrosani. This training centre is a pilot project that forms part of a larger proposal to reskill more than 8,000 people in the valley over the coming decade.

Source: Renewable Energy School of Skills

BOX 11: RESKILLING FOR DANISH RENEWABLE ENERGY

A retraining and reskilling programme was set up in Denmark with the support of trade unions, following the closure of a number of shipyards. This programme led to the creation of the Lindø Offshore Renewables Centre (LORC) and an R&D and training centre, in which the technologies associated with offshore wind energy can be tested and produced. Trade unions are closely associated with the management of the centre, as the LORC Council includes representatives of Danish Trade Unions organisations

Source: LORC

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BOX 12: SKILLS DEVELOPMENT IN THE APPALACHIAN REGION, USA

The Appalachian region of the USA has been shaped by coal mining. However, coal-related activities and employment in these activities has shrunk considerably in recent years. Employment in mining in the region fell from 140,000 workers in the 1940s to about 16,000 people currently. Accordingly, the areas with the greatest coal production have some of the region's highest unemployment rates, between 10% and 14%.

Recognising the challenges that the Appalachian region faces, the Coalfield Development Corporation, founded in 2010, aims to create jobs for chronically unemployed residents, following a relationship-based, holistic approach of personal development training, formal education and direct employment. The Coalfield Development Corporation's Quality Jobs Initiative is a 2.5-year personal academic development approach designed for unemployed and underemployed people (in particular former coal miners), consisting of 33 hours of paid work per week in a range of sectors, including renewable energy, six hours of training and skills development in a technical community college, and three hours of personal development mentorship. It brings together a family of social enterprises aiming to rebuild the region's economy through a relationship-based, holistic approach to on-the-job training.

Since the start of this initiative, a total of $16 million USD of new investment has been attracted to the region, directly creating 190 new jobs. Over 1,200 people have received training that has enabled them to expand their skillset in new economic sectors and two-thirds of the people who have taken part in the programme are now active in the labour market, including 95 that have full-time jobs.

This has enabled the region to move away from dependence on coal as the main economic activity and to develop alternatives from the ground up. Overall, more than 50 new businesses have been supported through this model, from development of formerly abandoned properties to agriculture and artisan trades, which has helped to diversify the economy and help the people in the Appalachian region to transform their communities into viable and thriving places to live.

Source: European Commission 2020

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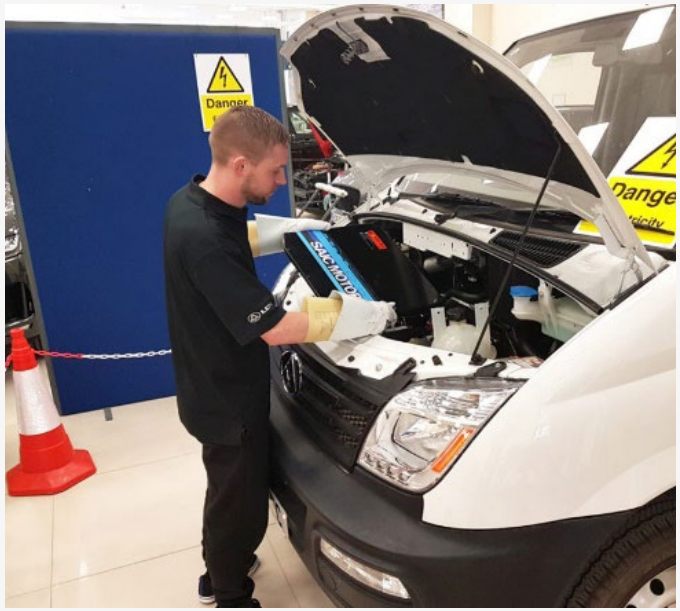
Company-level initiatives

There are, of course, also good practice examples from individual companies that have developed plans to meet forecasted demand for skills.

In addition to the good practice examples cited in the above boxes, it is also worth looking at the example of the European Training Foundation's annual green skills award. This award recognises initiatives that drive the transition towards a sustainable and green future, and which have demonstrated 'exceptional commitment and innovation in promoting and developing green skills throughout the world'. For more information and to browse examples of shortlisted initiatives and past winners, see the ETF's webpage on green skills awards.

More advice and information is also available from the EU's European Year of Skills 2023/2024, which aims to help companies, and in particular SMEs, to address skills shortages. The focus of the European Year of Skills is to promote reskilling and upskilling and it references in particular the green transition as a way of opening up new opportunities for individuals and for the EU economy as a whole. The European Year of Skills points to a number of ongoing EU initiatives in the area of skills, such as the European Skills Agenda, which is the framework for EU skills policy cooperation and aims to help individuals and businesses to develop skills and to apply them, and the Pact for Skills, which has 1,500 members and 20 large-scale partnerships in strategic sectors. The Pact has collected pledges to help upskill up to six million people in the EU.

BOX 13: INDUSTRY WORKING TO MEET THE DEMAND FOR ELECTRIC VEHICLE TECHNICIANS



The Institute for the Motor Industry (IMI) in the UK is a professional body for people working in the automotive industry, as well as an awarding body. With the ending of new diesel and petrol car sales from 2030, IMI is working to ensure that employers can access diverse talent to create green jobs, and ensure that relevant qualifications provide high standards in green skills development. Forecasting completed by IMI indicates that there will be a significant shortfall of qualified Electric Vehicle (EV) technicians by 2027 as consumer demand and government targets drive up purchases of EVs. There are serious risks associated with not having enough technicians to safely service, maintain and repair EVs, including potential health and safety concerns and a loss of consumer confidence. The automotive industry finds it challenging to fill EV technician posts, in part due to its reputation as a male-dominated field suitable only for those without an established academic record – a myth that needs to be dispelled.

In response, IMI is making a concerted effort to make the industry more attractive to a range of individuals and capitalise upon appetite across society for green jobs and careers. IMI has designed the TechSafe™ standard to recognise technicians working with these new technologies. It has also recently developed a new National Occupational Standard focused on hydrogen fuel cell systems, including how to remove components and diagnose issues with systems, as well as a standard on dismantling and disposal of End-of Life Vehicles. These have attracted interest from several countries also wrestling with the transition to electric and hydrogen vehicles and can help ensure the UK motor industry benefits from excellence in green skills development.

As Emma Carrigy, Research and Inisight Manager at IMI, explains: "The sector faces its biggest skills challenge in the past two decades. With currently a record number of vacancies across the sector and the task to meet the new skills required to meet the green agenda it certainly is a challenging time. Creating a more diverse and inclusive workforce is one way to tackle this issue as well as providing the support and training to equip the workforce to deliver the Government's climate commitments".

Source: Learning and Work Institute 2022

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Green procurement

Green Public Procurement (GPP) is defined in the Commission's Communication (COM -2008- 400) Public procurement for a better environment as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured."

The European Commission has produced a handbook on Buying Green in which it sets out how GPP can function as an important tool to achieve environmental policy goals relating to climate change, resource use and sustainable consumption and production.

The handbook notes that overall, public sector contracting authorities have an obligation to find the best value for money for everything they procure. However, identifying the most economically advantageous tender does not necessarily mean going only for the cheapest offer. It can also mean finding a solution that meets identified requirements – including environmental ones – in the most cost-effective way. Best value not only measures the cost of goods and services, but also considers factors such as quality, efficiency, effectiveness and fitness for purpose. Protection of the environment can be one of these factors and can therefore act as an equal consideration amongst others for the award of a contract.

GPP can also focus specifically on skills in certain areas. In the case of asbestos removal, for example – as asbestos insulation can still be found in many buildings across Europe (even though it is a banned substance) – it is important that qualified contractors safely remove asbestos when maintenance work is carried out on these buildings. To provide proof of competence, some Member States maintain licensing schemes for contractors that specialise in such work. Requiring in the selection criteria that contractors have the skills for this work is important to minimise the health, safety and environmental risks.

One important aspect of GPP is ensuring that regional and local administrative workers, and those working at the decision-making level, have the right skills to implement GPP efficiently. This relates to strategic decision-making and to budgetary considerations, and impacts roles that involve working with consumers, and work on broader issues such as tackling climate change, and energy transition issues, including tackling energy poverty. GPP could also reach support workers such as those working in health and social care. In a 2023 Recommendation, the European Commission notes that: "*To diagnose, design, establish and implement measures tackling energy poverty, policymakers at all levels need to be informed and understand the underlying causes of energy poverty of their constituency … moreover, workers in direct and regular contact with people at risk of energy poverty, such as those in health care, education, or social workers, as well as energy advisors should have the skills to identify energy poverty and provide advice and information to energy-poor households*".

BOX 15: CUTTING ENERGY USE IN MUNICIPAL BUILDINGS IN VANTAA, FINLAND

The City of Vantaa in Finland contracted an energy service company to improve the energy efficiency of 14 of its municipal buildings. It used an Energy Performance Contract to ensure that the energy saving measures and associated cost savings would be realised more quickly than would otherwise be possible using investment from the City's budget. The technical specifications for this contract included a guarantee from the energy service company on energy saving and repayment periods.

The 8 year contract period, which ran from 2011 to 2020, saw a total of 7,500 tonnes of CO2 emissions cut and annual savings in energy costs of EUR 200,000 for the city. Surplus savings were divided between the City and the energy service company.

Source: European Commission 2016.

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It is, therefore, of great importance that planners and those involved in devising strategies have a good understanding of GPP issues.

The European Commission also notes that energy consumers need to possess the right skills to enable them to benefit from the green energy transition, specifically in terms of using smart metres and benefiting from demand flexibility and renewables. Special attention needs to be paid to vulnerable households and those affected by energy poverty to help them increase their energy, financial, and digital literacy.

The European Commission has also been working to develop voluntary GPP criteria for a range of product groups, including in sectors such as road transport, office building design, construction and management, electricity, data centres and cleaning products and services. Further information is available here.

The European Commission has been collecting good practices on GPP to illustrate how public authorities in Europe have successfully introduced green principles into a public tender or procurement process. These include the use of life-cycle costing (LCC), circular economy principles, and approaches fostering sustainable innovation. These good practice cases also provide some lessons for those wishing to replicate experiences.

Examples of using GPP to achieve environmental goals can be viewed in Box 15 and Box 16.

BOX 16: GPP SOLUTIONS USING A FRAMEWORK AGREEMENT IN GERMANY

In 2013, the Procurement Agency of the Federal Ministry of the Interior in Germany, published a tender for 50,000 thin client computer systems valued at €15 million. The open tender specified technical standards and contract clauses, including a guarantee of compliance with environmental aspects for components, noise and waste management. The framework agreement was for 24 months with an optional extension of 12 months. The five-year energy savings were calculated to be 58,750,000 kWh of electricity, equivalent to 29,000 tonnes of CO2.

Source: European Commission 2016

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Initiative for coal regions in transition

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