

# Skills for green jobs

2018 update

European synthesis report





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# Foreword

The year 2018 has raised public awareness of environmental issues and climate change globally, despite some controversy over their causes. Addressing the impact of climate change is high on the EU agenda. Supporting the long-term goals of the Paris Agreement and in preparation for the 2018 United Nations climate change conference (COP 24) to be held in Poland <sup>(1)</sup>, the Council of the European Union adopted conclusions to support action on climate change. In October 2018, EU Member State ministers of environment agreed on new targets for stricter CO<sub>2</sub> emission standards <sup>(2)</sup>.

The shift to a low-carbon economy implies structural changes across sectors and occupations as new ‘green’ occupations arise or grow in demand. However, ‘greening’ of existing ones is what is mostly required. This translates into new skill sets that necessitate curriculum updates or even new qualifications across education and training levels. These new ‘green skills’ can range from very technical and job-specific skills to ‘softer’ ones, such as responsible use of resources, which can be relevant across occupations, levels of hierarchy and sectors. While the ‘greening’ <sup>(3)</sup> of the economy creates skill needs, particularly in specific sectors such as energy and resource efficiency, construction or manufacturing, moving towards a circular economy creates ‘green’ skill needs across the board.

Acknowledging the importance of research into developments on skills, employment and VET provision relevant to the ‘green’ economy, Cedefop continues its work on [skills for the green economy](#). As the transition to a ‘greener’ economy requires the right ‘green’ skills, Cedefop and the

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(1) [https://ec.europa.eu/clima/events/katowice-climate-change-conference-cop-24\\_en](https://ec.europa.eu/clima/events/katowice-climate-change-conference-cop-24_en) [accessed 24.10.2018].

(2) <https://www.consilium.europa.eu/en/meetings/env/2018/10/09/> [accessed 24.10.2018].

(3) The European Commission views ‘greening of the economy’ as actions and policies that are relevant to ‘better management of resources, economic instruments that are good for the environment, support for innovation, better policies for water and waste, and efforts to boost sustainable consumption and production’. [http://ec.europa.eu/environment/basics/green-economy/index\\_en.htm](http://ec.europa.eu/environment/basics/green-economy/index_en.htm) [accessed 24.10.2018].

The ILO defines ‘green jobs’ as ‘decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency’. [https://www.ilo.org/global/topics/green-jobs/news/WCMS\\_220248/lang--en/index.htm](https://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang--en/index.htm) [accessed 24.10.2018].

International Labour Organization (ILO) collaborated in 2010 and published the report *Skills for green jobs: a global view* (ILO; Cedefop, 2011). The research demonstrated how national policies for ‘greening’ economies were complemented by skill needs identification and efficient skills response strategies. To understand progress made since then, this fruitful collaboration was repeated. Cedefop’s updated reports on the state of play in Denmark, Germany, Estonia, Spain, France and the UK informed ILO’s report *World employment social outlook 2018: greening with jobs* (ILO, 2018) and this European synthesis report.

While the financial crisis had occurred before the previous report was published, its impact was not fully evident at that time. This publication offers interesting insights in its effects on policies and other initiatives relevant to ‘green’ skills and jobs. As the developments since 2010 reveal, countries use different approaches to defining and measuring ‘green occupations’. However, strategies, policies and regulations that focus explicitly on green skills and employment are rare.

This report also presents policies and initiatives that have proved successful in addressing challenges such as assessment and anticipation of green skill needs; curriculum design or update; and training provision at local and regional levels, as well as the role of stakeholders, including social partners and the private sector. Although these practices respond to particular country specificities and needs, we believe they can be inspiring for other Member States in their effort to benefit from the potential of ‘greening’ their economy and overcoming the consequent challenges.

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# Executive summary

Cedefop and the International Labour Organization (ILO) worked together in 2010 on the *Skills for green jobs* report, based on country studies. Cedefop reported on six EU countries: Denmark, Germany, Estonia, Spain, France and the UK; a European synthesis report based on these countries was also developed. The report explored the policy context, the role of stakeholders and vocational education and training (VET), while identifying good practices on meeting the challenges posed by new 'green jobs' and the 'greening' of existing occupations <sup>(4)</sup>. This collaboration was repeated in 2017, to follow up on national developments in 'green jobs and skills' since 2010.

This report provides a synthesis of information analysed in the six country reports of 2018 <sup>(5)</sup>. It examines major changes in green jobs and employment since 2010, and analyses the regulations and policies supporting green skills and employment, including the surrounding institutional set-up and the role played by social partners. It also analyses green skills development policies, including green skill anticipation mechanisms, relevant provision in VET and higher education (HE), active labour market policies (ALMPs) and retraining measures, and the role of the private sector.

The first key finding is that, across the six countries, there is no common approach to, and thus no definition of, green skills and jobs. Even within countries, it has often been hard for the concept to be pinned down, and sometimes definitions continue to evolve.

How 'green' terms (skills, jobs, economy) are perceived and categorised in the six countries is detailed below.

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<sup>(4)</sup> More on the outputs of the 2009-10 project is available in the following publications and background studies:

Cedefop synthesis report which includes summaries of the key findings in the six EU Member States: Cedefop (2010). *Skills for green jobs: European synthesis report*. Luxembourg: Publications Office. <http://www.cedefop.europa.eu/en/publications-and-resources/publications/3057>

ILO; Cedefop (2011). *Skills for green jobs: a global view: synthesis report based on 21 country studies*. Geneva: ILO. [https://www.ilo.org/global/publications/books/WCMS\\_159585/lang--en/index.htm](https://www.ilo.org/global/publications/books/WCMS_159585/lang--en/index.htm)

The initial background country studies: [http://ilo.org/skills/inst/WCMS\\_144268/lang--en/index.htm](http://ilo.org/skills/inst/WCMS_144268/lang--en/index.htm)

<sup>(5)</sup> When referring to the UK in this report, all four devolved administrations (England, Scotland, Northern Ireland and Wales) are covered, unless otherwise stated.

### Denmark

The green economy is defined as covering goods and services produced in order either to protect the environment or save resources. Green employment is that involved in the production of these goods and services. Major activities in the green economy include renewable resources, saving of energy and heat, handling of waste water, and handling of other waste.

### Germany

A total of 31 occupational types (*Berufsgattungen*) on the five-digit level of the classification of occupations (*Klassifikation der Berufe 2010*) have been identified as ‘environmental occupations’ by the German Federal Agency for Labour (*Bundesagentur für Arbeit*). These occupations have been identified as directly contributing to environmental protection, resource conservation, sustainable use of nature, recycling or similar purposes; they exclude jobs – like marketing, trade, or IT – which are not substantially concerned with environmental regulation. They are pooled into six sub-groups: conservation of nature and landscape (four occupational groups); environmental technology and renewable energy use (nine); water supply and waste water management (three); waste management (four); biology, geology, and meteorology (three); and environmental administration and consulting (eight).

### Estonia

There is no unified approach among stakeholders to what classifies a green job and whether it is possible to define green skills as a separate competence. Green skills and jobs are seen as heterogeneously spread between economic sectors.

### Spain

Green skills and green jobs are seen as spread across sectors and occupations. Many ‘new green occupations’ are regarded as being similar to traditional non-green occupations; similarly, the greening of traditional occupations in non-green sectors is seen as requiring only additional ‘green’-relevant aspects in terms of skills development.

### France

The French National Observatory for Jobs and Occupations of the Green Economy (Onemev) has developed two approaches to monitoring employment: an activity-based approach, which highlights changes in ‘eco-activities’; and a second approach based on jobs and occupations, making it possible to estimate the number of jobs in the so-called ‘green’ and ‘greening’ professions. Onemev recognises nine green occupations and about 70 greening occupations.





## UK

In Scotland, the document *Green skills and jobs in Scotland* adopts a framework for anticipating green skills that is based on the US O\*NET classification of green occupations. Three sets of green occupations are recognised based on the level of new and enhanced skills required: new and emerging green occupations; green enhanced skills occupations; and green increased demand occupations.

In England, 'green skills' were defined and listed in the government report *Skills for a green economy* in 2011. A four-way classification was used: resource efficiency, the low-carbon industry, climate resilience, and skills to manage natural assets. The list reflects a different approach to that taken by a 2009 government report, which identified nine groups of skills and 45 subgroups, giving a more detailed breakdown of green skills. This particular development illustrates how fluid the definition of green skills can be.

Source: Cedefop (2018a to f). *Skills for green jobs* country reports for Denmark, Germany, Estonia, Spain, France and the UK. Summaries are available in Annexes 1 to 6.

These different understandings can make it difficult to compare patterns and trends between countries and to make general observations. Nonetheless, since 2010 trends in green employment have tended to parallel the general economic trends in each country, while also being influenced by governments' green-related policies. Carbon reduction targets and associated incentives and subsidies have been especially influential on green jobs and skills, although other green policies, such as legislation to protect the environment, have also been important.

Regulations, policies and strategies with an explicit focus on green skills and employment are rare. Instead, consideration of green jobs and skills is framed by a range of broader green strategies, plans and legislative acts of parliament, such as policies to protect the environment, encourage biodiversity, improve energy efficiency, and reduce reliance on fossil fuels. Plans and strategies with a specific focus on green jobs and skills tend to be produced ad hoc, notably by organisations in sectors strongly affected by the greening of employment.

There tends to be a weak connection between organisations involved in national policy-making on environmental topics and those involved in labour markets and skills policy, including skills anticipation. This parallels a generally weak connection between environmental and skills policies. There are also gaps in policies and regulations in relation to gender issues and to monitoring and evaluation of policies or activities relevant to green skills.

Social partners are generally involved in policy design, with the scale and nature of involvement being shaped by the overall approach to social partner engagement in individual countries. Consultative bodies and platforms are a common way of involving social partners in the development of policies and regulations. Often these cover broader topics than just green skills; such as in Germany, where a national platform *Education for sustainable development (Nationale Plattform 'Bildung für nachhaltige Entwicklung')* has been established within the framework of the UNESCO World Action programme *Education for sustainable development*. This involves stakeholders from politics, business and civil society.

Monitoring and anticipation of green jobs and skills tends not to take place through permanent mechanisms dedicated to the green economy, green jobs or green skills; instead, green skills anticipation tends to be part of overall skills anticipation mechanisms. A notable exception is France's National Observatory for Jobs and Occupations of the Green Economy.

**The French National Observatory for Jobs and Occupations of the Green Economy (*Observatoire national des emplois et métiers de l'économie verte, Onemev*)**

Onemev was created in 2010 by the Ministry of Environment with the aim of analysing employment shifts in the green economy and producing relevant methodologies and statistics. It brings together a broad range of institutions including relevant national ministries and agencies, key public employment service organisations, the main VET association, the national statistical institute, research bodies, and regional employment and training observatories. Since 2015, Onemev has comprised two groups: Observation, methods and quantifications, which deals with quantitative data and statistics; and 'Analysis capitalisation and sharing, which focuses on green employment, skills and training issues. It has devised the approaches now used to assess the development of 'eco-activities' and green jobs and occupations.

Source: Cedefop (2018a). *Skills for green jobs in France: an update*.

Sector-based anticipation mechanisms are common to all countries, and can play an important role in relation to green skills. Regional cooperation is also common. France has regional observatories for employment and training which publish studies on green jobs and skill needs, contributing to building regional strategies.

Across the six countries social partners are involved in skill anticipation but in different ways and to varying extents: their involvement ranges from

being involved in consultation exercises to assessing the demand for green skills and the implication for skills supply. In Estonia, the relatively new skills anticipation system, OSKA, strongly features stakeholders: representatives of employers and trades unions sit on both the OSKA Coordination Council and its sector skills councils. Although green skills are not explicitly addressed in OSKA, it could be inferred that such a degree of stakeholder involvement can aid identification of current needs and anticipated developments in the relevant skills and occupations.

Rather than special procedures dedicated to green skills and jobs there have been updates to general processes that review VET programmes and qualifications in light of changing skill demands in the labour market. There have also been adaptations at local and regional levels, where authorities and even individual training providers have scope to tailor provision to local and regional needs.

#### **Examples of local and regional training provision for green skills**

In 1997, the small island of Samsø became Denmark's renewable energy island after it won a competition organised by the Danish Ministry of the Environment. The island is now self-sufficient and meets its energy needs from sustainable sources like wind, sun and biomass. It has an Energy Academy, which runs exhibitions and workshops, attracting more than 5 000 politicians, journalists and students from around the world every year.

Denmark's local Vocational Education Centre South (EUC Syd) aims to provide green skills in all its 75 study programmes and has also organised a special adult education centre for construction workers that focuses on new energy-saving techniques. The centre combines traditional classroom training with learning in its test facility where participants can use real energy-saving tools and materials.

In the UK, Liverpool City Region Local Enterprise Partnership has a development strategy focused on skills for the low-carbon economy. As part of this, the partnership has sought to coordinate skills training in higher education colleges with the demands of local companies manufacturing products used by offshore wind. It has also played a central role in filling a skill gap reported by the company Scottish Power, which faced an imminent shortage of labour, caused by an ageing workforce and lack of new apprentices. To tackle this, the partnership created a strategy to help upskill the existing workforce and train new engineers.

Training programmes for the skills development of the unemployed or of people in work generally do not have a specific focus on green skills. This also applies to active labour market programmes (ALMPs). There are examples of the opposite, such as in France where the public employment service (*Pôle Emploi*) monitors green developments and, at the territorial level, *Pôle Emploi*'s agencies help direct clients into green job opportunities. Sector organisations and charitable/not-for-profit organisations are sometimes active in developing green skills, such as in the UK, where the Groundwork charity provides skills training to unemployed people leading to recognised qualifications in green jobs.

The role of the private sector in designing and implementing VET provision related to green skills tends to reflect general institutional set-ups. Subsidies and incentives targeted at private companies for green skills development are rare, yet there are interesting examples of sector bodies and individual companies (normally large corporations) forming partnerships for the development of such skills. In Spain, for example, the company Acciona operates the Acciona University programme which, in 2015, provided nearly 35 000 training hours to employees in green and environmental subjects in cooperation with the University of Alcalá (Madrid). Activities such as these can have a catalytic effect where they involve companies in the vanguard of green production processes and green products, and where they set ambitious standards in green skills for employees that can provide inspiration for other companies.

Courses related to green skills continue to be offered by universities. In Denmark, for example, university provision includes three-year bachelor programmes in environmental technology and energy technology and planning, and two-year master programmes in water and environment, and environmental and natural resource economics. However, data on the extent of provision are scarce, making it difficult to have an overview of developments.

Owing to their high degree of autonomy, universities tend not to be directly affected by governments' 'green' policies. National governments may have encouraged universities to provide green skills programmes in the context of wider policies on the green economy but no evidence was found in the six countries of governments launching specific higher education policies for this purpose. Universities sometimes engage with businesses to set up specific forms of provision, as in France where universities are involved in 'campuses of professions and qualifications'.



Private sector involvement in green skills takes different forms in different countries, reflecting the general situation. Subsidies and incentives targeted specifically at green skills development are few; many have been withdrawn in austerity measures introduced by governments in the wake of the financial crisis. Between the poles represented by Germany (the involvement of the private sector in skills training is in many ways intrinsic to VET) and the UK (market actors have the lead in shaping the 'skills systems'), the other countries use a variety of structures and processes to ensure the systematic involvement of the private sector in training provision. Sector bodies and individual companies, normally large corporations, also often enter into partnership arrangements for green skills development. Such companies can have a positive impact by acting as frontrunners in green production processes and green products, and setting ambitious standards in green skills for their employees, which can act as an inspiration for other companies to follow. Collaboration between companies can also be used to meet training needs; this can be especially helpful for SMEs lacking the time and resources to provide training on their own.

A number of conclusions can be drawn from the findings:

- (a) since 2010, different countries have experienced different patterns in the development of green skills and jobs and have defined green jobs and green skills in various ways. This poses a particular challenge for skills anticipation if a reliable picture is to be built up across Europe regarding the supply of, and demand for, green skills. With that aim in mind, there appears to be an opportunity for countries to share their knowledge and understanding about how to define and estimate green skills; and subsequently about designing and implementing effective policy and training initiatives to foster green jobs and address respective skill needs;
- (b) green skills and green jobs tend to be dealt with as a part of different policies and strategies covering environmental as well as employment and skills issues. Good coordination among these policy fields and relevant policies is necessary to ensure a comprehensive national approach to green skills and jobs;
- (c) green skills are typically covered by general skills anticipation mechanisms, one-off studies and sector-based and regional/local approaches; consequently, green skills tend to be dealt with ad hoc;
- (d) continuing monitoring and evaluation of policies and/or activities relevant to green skills are rare. Little or no consideration has so far been given to gender balance in occupations affected by the greening of the economy, even where requisite data are available.

# Introduction

This report provides a synthesis of the information gathered and analysed in six country reports as part of the International Labour Organization (ILO)/ Cedefop project *Skills for green jobs: an update* <sup>(6)</sup> <sup>(7)</sup>.

In 2011, Cedefop and the ILO joined forces to produce the report *Skills for green jobs: a global view*. The report was based on 21 country studies which analysed the policy context and highlighted sectors where extensive restructuring was anticipated as a result of the growth of the green economy. The reports also discussed where training and active labour market policies were most needed to avoid long-term displacement; as well as analysing information and collecting case studies on successful policy responses to meet the challenges posed by new 'green jobs' and the 'greening' of existing occupations <sup>(8)</sup>. In 2017, the ILO and Cedefop revisited their collaboration to map relevant developments in countries since 2010. Cedefop again oversaw the updates of the same six country reports: Denmark, Germany, Estonia, Spain, France and the UK <sup>(9)</sup> <sup>(10)</sup>. The aim of this synthesis is not to summarise these country reports but to identify common patterns and differences across the countries to provide more general insights into the nature of the policies and practices surrounding green skills since 2010.

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<sup>(6)</sup> Green jobs are jobs that reduce the environmental impact of enterprises and economic sectors, ultimately to levels that are sustainable. The ILO defines 'green jobs' as work in agriculture, industry, services and administration that contributes to preserving or restoring the quality of the environment while also meeting requirements of decent work: adequate wages, safe conditions, workers' rights, social dialogue and social protection (UNEP et al., 2008).

<sup>(7)</sup> The term 'skills' is used throughout this document as an overarching term which refers to the knowledge, competence and experience needed to perform a specific task or job. Skills development in this context comprises all forms of human resources development: lifelong learning including initial and continuing vocational education and training, and life-wide learning including formal and informal/non-formal learning.

<sup>(8)</sup> More on the outputs of the 2009-10 project can be found in Cedefop's 2010 synthesis report which includes summaries of the key findings in the six EU Member States (Cedefop, 2010), in the global skills for green jobs report (ILO; Cedefop, 2011), and in the initial background studies: [http://ilo.org/skills/inst/WCMS\\_144268/lang--en/index.htm](http://ilo.org/skills/inst/WCMS_144268/lang--en/index.htm)

<sup>(9)</sup> When referring to the UK in this report, all four devolved administrations (England, Scotland, Northern Ireland and Wales) are covered, unless otherwise stated.

<sup>(10)</sup> The six country reports updated in 2018 can be accessed at: <http://www.cedefop.europa.eu/en/events-and-projects/projects/skills-green-economy> Summaries are available in Annexes 1 to 6 of this publication.

The country reports were produced by country experts, according to templates developed by the ILO and Cedefop. Reports were focused on the country/national level, with reference being made to examples of regional activities where these were significant or provided good practices. A combination of desk research and interviews/focus groups was used. Primary collection of statistical data was not a focus.

This synthesis report is structured as follows: Chapter 2 examines the major changes in the economy and employment since 2010 in the six EU countries, with an examination of how green jobs and employment have changed. Chapter 3 analyses the regulations and policies that have been supporting green skills and employment, looking both at policies related to the environment and relevant skills development strategies. The institutional set-up surrounding these policies, and the role played by social partners, is also examined. Chapter 4 focuses on skills development regulations and policies related to green skills, starting with consideration of skill anticipation mechanisms, before moving on to examine VET and higher education provision, ALMPs and retraining measures, and the role of the private sector and associated institutional arrangements. Chapter 5 draws conclusions and recommendations based on general patterns observed across the countries included in the analysis.

## CHAPTER 2.

# Major changes in the economy and employment since 2010

## 2.1. Economic and labour market trends since 2010

In 2010, the six countries under analysis in this report (henceforth ‘the countries’) were still feeling the effects of the 2008 financial crisis, though the severity of the effects and the patterns of recovery have been variable. For several EU countries 2010 was the bottom of the economic cycle, but in all cases the journey back has been protracted. Denmark and Germany began their recovery in 2010; but it was not until 2014 that GDP in Denmark reached pre-crisis levels with more rapid growth since. In Estonia, GDP reached bottom in 2009 and unemployment peaked in 2010 with a quick but volatile recovery thereafter. In the UK unemployment peaked in 2011 at 8.4%, falling to 4.4% in 2017, with GDP having been relatively stable for the past few years. The worst affected country has been Spain, whose recovery was delayed until 2014: there was a severe rise in unemployment from 8.2% in 2007 to a peak of 26% in 2013, falling to 19.6% in 2016.

## 2.2. The shift to a green economy: changes in jobs and employment

### 2.2.1. Definitions, categorisations and data collected

In light of these overall economic and labour market trends, what developments took place in the green economy between 2010 and 2016? Answering this question can be challenging, primarily because there seems to be no common approach to, or definition of, what green skills and jobs are (as shown in Box 1). There are different approaches to data classification

and collection (where these take place) making it challenging to compare patterns and trends between countries and to make general observations.

**Box 1. How ‘green’ terms (skills, jobs, economy) are perceived and categorised in the six countries**

**Denmark**

The green economy is defined as covering goods and services produced either to protect the environment or to save resources; green employment is the employment involved in the production of these goods and services. Major activities in the green economy include renewable resources, saving of energy and heat, handling of waste water, and handling of other waste.

**Germany**

A total of 31 occupational types (*Berufsgattungen*) on the five-digit level of the classification of occupations (*Klassifikation der Berufe 2010*) have been identified as environmental occupations by the German Federal Agency for Labour (*Bundesagentur für Arbeit*). These occupations have been identified as directly contributing to environmental protection, resource conservation, sustainable use of nature, recycling or similar purposes; they exclude jobs – like marketing, trade, or IT – which are not substantially concerned with environmental regulation. They are pooled into six sub-groups: conservation of nature and landscape (four occupational groups); environmental technology and renewable energy use (nine); water supply and waste water management (three); waste management (four); biology, geology, and meteorology (three); and environmental administration and consulting (eight).

**Spain**

Green skills and green jobs are seen as spread across sectors and occupations. Many ‘new green occupations’ are regarded as being very similar to traditional non-green occupations and, similarly, the greening of traditional occupations in non-green sectors is seen as requiring only additional ‘green’-relevant aspects in terms of skills development

**Estonia**

There is no unified approach among stakeholders to what classifies a green job and whether it is possible to define green skills as a separate competence. Green skills and jobs are seen as heterogeneously spread between economic sectors.





## France

The French National Observatory for Jobs and Occupations of the Green Economy (*Observatoire national des emplois et des métiers de l'économie verte*, Onemev) has developed two approaches to monitoring employment: an activity-based approach, which highlights changes in 'eco-activities'; and a second approach based on jobs and occupations, making it possible to estimate the number of jobs in the so-called 'green' and 'greening' professions. Onemev recognises nine green occupations and about 70 greening occupations.

## UK

In Scotland, the document *Green skills and jobs in Scotland* adopts a framework for anticipating green skills that is based on the US O\*NET classification of green occupations. Three sets of green occupations are recognised based on the level of new and enhanced skills required: new and emerging green occupations; green enhanced skills occupations; green increased demand occupations.

In England, 'green skills' were defined and listed in the government report *Skills for a green economy* in 2011. A four-way classification was used: resource efficiency, the low-carbon industry, climate resilience, and skills to manage natural assets. The list reflects a different approach to that taken by a 2009 report published under the previous government which identified nine groups of skills and 45 subgroups, giving a more detailed breakdown of green skills. This particular development illustrates how fluid the definition of green skills can be.

Source: Cedefop (2018a to f). *Skills for green jobs* country reports for Denmark, Germany, Estonia, Spain, France and the UK.

Even within countries, it can sometimes be hard to pin down 'green' terms as a concept. For example, in the UK until recently the green economy was considered to be about reducing carbon emissions, with a lack of priority given to the economic development opportunities associated with a low-carbon economy. Since 2011, policy has been broader, focusing on new environmental technologies, new ways of working, and green consumption. There is also variation between countries in the way in which green skills as a concept is located in wider thinking. In both Denmark and Germany, the link to education for sustainable development is highlighted in relevant policy documents and initiatives, while this is not always the case in the rest of the countries.

The methods for categorising and measuring the size of the green economy and for counting green jobs also vary among countries; often they are still subject to debate or have only recently been introduced. However, efforts

are observed regarding the collection of relevant data on developments in the 'green economy'. Broadly the various approaches encompass:

- (a) identifying green occupations and extracting data from existing employment databases, to provide, for example, national overviews of the numbers of jobs in different types of green occupation (as in Germany);
- (b) combining quantitative and qualitative information on green skills in particular sectors (such as construction, energy, transport, waste management, manufacturing, and agriculture) using existing data sets and the views of stakeholders and experts, often under the leadership of sector bodies;
- (c) defining and examining the 'environmental goods and services' sector: for example, in 2017 Statistics Denmark published the first Danish 'green national accounts', which aimed at providing a comprehensive and systematic overview of the green economy in the country. In the UK, the government recently commissioned research to understand the size and performance of those services, products and technologies which contribute to the UK transition to a greener economy; it identified the environmental goods and service sector, which includes the production of goods and services for environmental protection purposes, as well as activities to conserve and maintain natural resources. It also identified a narrower 'low-carbon' sector that includes products and technologies which deliver low-carbon outputs or energy efficiencies.

Across these different types of data, specific consideration may be given to skills issues in industrial and business activities directly related to climate change and energy efficiency. These areas have tended to be a focus of government policy. In the UK, perhaps the most in-depth skills anticipation exercise undertaken in relation to green skills has been RenewableUK's report *Working for a Green Britain and Northern Ireland*, published in 2013 (RenewableUK, 2013). This provided an assessment of the total number of people employed in the renewables sector, both directly and indirectly through the wider supply chain.

### 2.2.2. Trends in green economy and green employment

Despite these variations in definitions and methods, it appears that the green economy and green employment have ebbed and flowed according to two main factors: the general economic cycle; and trends in government policy and the availability or otherwise of government incentives and subsidies.

Since 2010 the green economy has tended to parallel the general economic pattern. In Denmark, green employment and production grew between 2012 and 2015, with production growing from 170 billion Danish kroner to 192 billion and employment from 60 000 to 67 000. Measured as a share of total employment, the green economy amounted to 2.4% in 2015, a proportion that has been constant in recent years. In Germany, green jobs as a share of total employment rose from 4.8% in 2010 to 5.2% in 2012; however, since 2012 environmental occupations directly contributing to environmental protection and management has shown little growth. In the UK, the output of the environmental goods and services sector grew 18.7% from 2010 to 2014, when it accounted for 1.6% of GDP and 337 500 full-time equivalent jobs. Using narrower definitions, the low-carbon sector also grew between 2010 and 2014, accounting for 1.6% of UK employment at the end of that period (269 800 directly employed and 190 800 indirectly employed). An analysis of green activities by the National Observatory for Jobs and Occupations of the Green Economy (Onemev) in France has identified two periods: a first phase (2004-11) when the green economy was 'set in motion' and the second (2011-14) when growth rates stabilised, with employment peaking in 2012. On the basis of these calculations, so-called 'eco-activities' accounted for 1.7% of total employment in 2015.

Pursuit of carbon reduction targets has not been the only aspect of government policy affecting green jobs and skills; other factors, such as legislation to protect the environment, have also been important. Nonetheless, these targets have been the dominant driver in most countries (Section 3.1), as related incentives and subsidies have had important effects on green jobs. Since 2010, the pursuit of austerity measures following the economic crisis led many governments to cut back the availability of incentives and subsidies, with negative effects on green jobs. In Spain the support system that had provided incentives for investors in renewable energies since 1994 was brought to an end in 2012; direct employment in the sector fell from 56 000 in 2012 to 47 000 in 2015, and indirect employment from 60 000 to 29 000. The effects of the economic downturn were greater, as in 2008 the number of people directly employed in the renewable energy sector had been 83 000. In France, the tax advantages of photovoltaics were abolished in 2011, leading to job losses. Grants to households to improve the energy efficiency of their buildings have varied from year to year, which may have disincentivised some consumers. In the UK, 2015 saw the withdrawal of a range of subsidies including those for onshore wind, biomass conversions



and plans to make all new homes carbon neutral, although the full effects of these changes are yet to register. Notwithstanding these examples, the picture across the six countries is not uniformly one of cuts to subsidies and incentives. For example, in Denmark a ‘housing-job’ scheme was introduced in 2011 as part of an economic stimulus package and since 2015 it has become focused only on green measures.

The structure of green employment is categorised differently in different countries. Table 1 provides examples of the breakdown of green production and jobs. Where data are available, they suggest that waste management and renewable resources have typically evolved to comprise significant proportions of green economic activity and employment. In France, of the 440 950 people employed in eco-activities, the top activities are waste (88 250), wastewater (71 950), soil and wastewater rehabilitation (68 500) and renewable energies (54 800); these comprise 64% of all eco-activity jobs. In the UK, the production of renewable energy activities doubled from 2010 to 2014, resulting in employment growth.

Table 1. **Breakdown of employment in green activities: country examples**

<b>Denmark, 2015 – main areas (does not sum to 100%)</b>	<b>% of total green production <sup>(1)</sup></b>
Renewable resources	49
Saving of energy and heat	14
Waste water handling	10
Other waste handling	10
<b>Germany, 2016</b>	<b>% of environmental occupations <sup>(2)</sup></b>
Water supply and waste management	27.5
Environmental technology and energy use	22.2
Renewable energies	17.9
Environmental administration and consulting	13.6
Conservation of nature and landscape	12.1
Biology, geology and meteorology	6.7
<b>France, 2015</b>	<b>% of jobs in 'eco-activities' <sup>(3)</sup></b>
Environmental protection	58.7
Resource management	24.0
Cross-cutting activities, e.g. R&D, engineering	17.3

NB: relevant data were not available for all six countries.

Source: Cedefop (2018a, b and e). *Skills for green jobs* country reports for Denmark, Germany and France.

<sup>(1)</sup> For Denmark (*Danmarks Statistik*) 'green production' accounts for areas in which the major activities in the green economy occur.

<sup>(2)</sup> For Germany (*Bundesagentur für Arbeit, BA*) 'environmental occupations' are those which contribute to environmental protection, resource conservation, the sustainable use of nature, recycling or similar purposes. However, this excludes jobs – such as marketing, trade, or IT – which are not substantially concerned with environmental regulation.

<sup>(3)</sup> For France (Onemev) 'eco-activities' refer to those which are involved in the production of goods or services for the purpose of protecting the environment, or the sustainable management of resources.

# Skills development regulations and policies

## 3.1. Regulations, policies and strategies in support of green skills and employment

Regulations, policies and strategies explicitly focused on green skills and employment are a rarity in the six countries. Instead, all have a set of strategies, plans and legislative acts of parliament related to environmental matters, and sustainable development. Such documents frame discussions about green jobs and skills, although this tends not to be an intentionally developed framework. The precise mix of these plans and policies varies from country to country. Ad hoc plans and strategies specifically on green jobs and skills are a feature of the landscape, especially those devised by sector bodies most affected. An example is the RenewableUK report that provided employment figures for the wind and marine energy industries plus future forecasts (RenewableUK, 2013).

Among the six countries green skills are found to be considered through different types of policies, which may not give explicit consideration to green skills. In Spain, key green policy measures are put forward by the Ministry of Agriculture, Fisheries, Food and the Environment (*Ministerio de Agricultura, Pesca, Alimentación y Medio ambiente*). Under the Ministry of Environment, the Spanish Office of Climate Change (OECC) is responsible for defining and coordinating policies related to climate change, which are then collated in the Spanish National Climate Change Adaptation Plan (PNACC). Green programmes and policies are mostly developed at national level by the Ministry of Environment: the Plan to promote the environment (*Plan de Impulso al Medio Ambiente*, PIMA), which offers economic incentives to reduce the environmental impact of economic activities and promotes the use of alternative energy sources; and CLIMA (Environment) projects, which provide subsidies to reduce greenhouse gas emissions in sectors which are not part of the European regime of emissions trading. In Denmark, the Energy agreement covering the period 2012 to 2020 has been the cornerstone of

policy directed at moderating climate change in supporting the transition to a greener economy. Its main initiatives are building renovation and reduced energy consumption, large-scale expansion of wind-power, substitution of coal by biomass, and greater emphasis on energy efficiency and electricity in transportation.

The mix of policies typically includes policies to protect the environment, encourage biodiversity, improve energy efficiency, and reduce reliance on fossil fuels. However, it is the countries' plans for reaching carbon reduction targets that have had the greatest influence on green skills. In Germany, since 2010, the main focus of green policies has been climate protection, with the protection of nature and waste management being of secondary importance; decarbonisation was given added stimulus by the Fukushima accident in 2011. There has been a sharp increase in the country in the percentage of electricity based on renewables thanks to the introduction of new instruments, such as auction schemes for specific renewable energy technologies. Most political activity related to ensuring a supply of green skills has been focused on skill requirements in the context of the *Energiewende* policy (which promotes increased energy efficiency and the shift to renewables). The UK 2020 targets for renewables and carbon reductions by 2050 have driven government policies; the 2013 Energy Act, which is aimed at carbon reduction, has been a key driver of the green economy.

Along with the variation in how green skills policies are framed, there is variation in how green skills are dealt with. Policy documents may include explicit consideration of green skills but not always, so there is variation in the strength of the relationship between environmental policies and those for green skills. Germany has had a national sustainability strategy since 2002: this is updated every two years and strengthens the incentives to include green and 'sustainability oriented' skills in education and training. However, there is no coherent strategy aimed at the needs of a greening economy; instead, political activities have been undertaken to address the question of the sufficient supply of required green skills at different VET and university education qualification levels.

There are examples of national policy documents focused on the green economy and green skills. In 2011 the UK government published the policy paper *Enabling the transition to a green economy*, accompanied by a supplementary report *Skills for the green economy: a report on the evidence*. The paper explained the government's plans to strengthen the green economy with a strong emphasis on the role of business and made

a commitment to ‘ensure the skills system responds to the demand for skills created by shift to green economy’ (HM Government, 2011). It also encouraged businesses to ‘articulate skills demand through involvement in Local Economic Partnerships, and Sector Skills Councils’. A new ‘skills for a green economy’ grouping of sector skills councils was set up to help businesses understand changing skill requirements; Unionlearn<sup>(14)</sup> was charged with raising awareness of the green economy among the workforce; and steps were taken to improve the quality of information, advice and guidance on careers in a green economy available through the new National Careers Service.

A strong degree of coherence among environmental, economic and employment policy has been achieved in France. Although the different policies are not ‘linked’ through a common regulation or standards for identification and development of green skills, they provide a clear framework and incentives, as shown in Box 2.

### Box 2. Coherence between environmental and economic policy in France

Starting from its work for the Paris 2015 United Nations climate change conference (COP 21), the French government has undertaken a series of measures to achieve its objectives:

A national low-carbon strategy (SNBC) has been launched, which anticipates increases in the number of jobs by 100 000 to 350 000 between 2015 and 2035 and which requires territorial initiatives to anticipate jobs and skills.

In 2015 the Energy Transition for Green Growth Act (*Loi sur la transition énergétique pour la croissance verte*) was adopted with the objective of achieving France’s energy reduction targets. It includes measures for building renovation, with the aim of improving energy efficiency, for the development of clean transport, particularly electric cars, and for the development of renewable energies and the fight against fuel poverty. The employment effect of this legislation alone has been estimated at 300 000 jobs by 2030, mostly in the energy efficiency sector and a smaller part in renewable energies.



<sup>(14)</sup> Unionlearn is the learning and skills development organisation of the UK’s trades union umbrella body, the Trades Union Congress: <https://www.unionlearn.org.uk/>

The Reconquest of the Biodiversity of Nature and Landscapes Act (*Loi pour la reconquête de la biodiversité de la nature et des paysages*) was adopted in 2016. It aims to support new sectors, particularly in the circular economy (sometimes called 'blue jobs'). Following this, a French agency for biodiversity was created (*Agence française pour la biodiversité*). This law also includes a EUR 50 billion future investment programme (PIA) for 2010-20, which includes support to SMEs developing innovative projects that preserve biodiversity, a support plan for education, research, and innovation in industry, transport and energy, and investment in vocational training.

Source: Cedefop (2018a). *Skills for green jobs in France: an update*.

Environmental and skill policies seem rather weakly linked; this can be related to the fact that environmental policies and policies on labour markets and skills are dealt with by different ministries and other bodies (see Section 3.2 on the institutional set-up). In Denmark, yearly progress reports to Parliament on the Energy agreement are prepared by the ministry responsible for energy and climate, and omit analysis of green skills or green jobs. While green jobs and green skills policies exist, they are mostly prepared separately from the overall strategy.

In the countries examined, national policies and strategies typically provide a framework for action at sectoral and/or regional/local levels. The extent to which they stimulate action can vary according to the degree to which they deal with green skills explicitly or have an indirect effect on them. Estonia has three national 'horizontal' development plans and strategies that should be taken into account in planning at lower levels: Sustainable Estonia 21, Estonia 2020 and the National security concept of Estonia. However, the extent to which they are taken into account at lower governance levels is variable. While most measures affecting green jobs and green skills have been implemented under this framework of environmental policies – at sector/area level – they are rarely, if at all, linked to labour and skills policies; there is no separate national strategy document addressing the green economy and skills. In France, the State supports the transition to a green economy through a range of regulations and incentives focused explicitly on the structuring of green sectors and encouragement of research and development and innovation. Several sectors are relatively well supported, such as water, sanitation, recycling and recovery of waste, or marine energies.

Two main gaps are generally observed in relevant policies and regulations. First, consideration of gender issues seldom features. Although they might

appear in breakdowns of data on the green employment or green skills, there is typically little discussion and no policy conclusions are drawn. An exception to this is Estonia where, in 2013, as part of the preparation of the strategy for the bio-economy 2030, the Estonian Gender Equality and Equal Treatment Commissioner advised on taking gender issues into account and developing equal opportunities for men and women, since women are underrepresented in typically 'green' sectors. The importance of equal opportunities for women in technical and vocational education and training and retraining opportunities was emphasised. Despite this, systematic practical actions in Estonia are still lacking.

The second missing aspect is evidence as to the effectiveness of policies and regulations that have been implemented. Related to this is absence of monitoring and evaluation frameworks and associated reports that could provide proof of their impact on the green economy, green jobs and skills.

## 3.2. Institutional set-up for green skills

A common feature of the institutional set-up around green skills is the weak connection between, on the one hand, organisations involved in national policy-making on environmental topics and, on the other, organisations involved in labour markets and skills policy, including skills anticipation. For example, some experts in Denmark support the view that there is a lack of coordination between the Ministry of Education, Ministry of Employment and Ministry of Energy, Utilities and Climate. In Germany, there is no body for inter-ministerial coordination. In some cases, such as France and Estonia, skills anticipation organisations are seen as bodies that will achieve stronger coordination. 'Green skills' tend to be dealt with as part of existing decision-making structures and processes, rather than through permanent, dedicated organisations. As a result, it can be argued, they tend to 'fall between the cracks' of existing institutions.

Although rare, there are examples of coordination, though tending to be for specific, time-limited purposes. In the UK, the *Enabling the transition to a green economy* policy paper was a joint publication by the Department for Business, Innovation and Skills, the Department of Energy and Climate Change, and the Department for Environment, Food and Rural Affairs. In France, coordination has been on an altogether more comprehensive scale, achieved through, first the *Grenelle de l'environnement* – environment round

table launched in 2007 – and then the Paris 2015 climate change conference (21st United Nations Conference of the Parties, referred to as COP 21). The round table involved a multi-level governance process with five partners – the government, local authorities, trade unions, business and voluntary sectors – in a process called ‘governance of the five’. It largely provided the basis for the second national strategy for sustainable development covering 2009-12, as well as the follow-up plan, launched in 2010, to mobilise territories and sectors (*Plan de mobilisation des territoires et des filières*); this was established with the aim of enriching green growth by supporting the development of new activities and adapting skills. As of 2012, the new government anchored its strategy in the preparation of the COP 21. This new strategy introduced the principle of a national climate conference to be held annually, to reignite the multi-level governance process introduced by the *Grenelle de l’environnement* and to revive the enthusiasm of the round table, which had begun to run out of steam.

There are also platforms on broader topics relevant to green skills, such as sustainable development. Estonia has a Commission for Sustainable Development (*Säästva Arengu Komisjon*) and an inter-ministerial working group for sustainable development, both of which have advisory functions. The Commission for Sustainable Development comprises 19 non-governmental organisations such as the Estonian Trade Union Confederation and the Estonian Chambers of Commerce and Industry. The inter-ministerial working group for sustainable development comprises representatives of ministries concerned with the implementation of Sustainable Estonia 21<sup>(15)</sup>, as well as representatives of Statistics Estonia. The task of the working group is to coordinate and monitor the implementation of Sustainable Estonia 21 and to organise information and best practices exchange in sustainable development. In Germany, a national platform *Education for sustainable development (Nationale Plattform ‘Bildung für nachhaltige Entwicklung’)* has been established within the framework of the UNESCO World Action programme *Education for sustainable development*. It assembles decision-makers from politics, business and civil society, recently adopting a national action plan.

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<sup>(15)</sup> The Ministry of the Environment, the Ministry of Economic Affairs and Communications, the Ministry of Agriculture, the Ministry of Social Affairs, the Ministry of Education and Research, the Ministry of Culture, the Ministry of Finance, the Ministry of the Interior, the Ministry of Justice.



Sectoral bodies and regional and local authorities are commonly provided with frameworks by national authorities in respect of the green economy. In France, following the mobilisation plan for green jobs launched in 2010 (*Plan national de mobilisation pour les métiers de la croissance verte*), 11 sectoral committees were launched in the economic sectors with the greatest potential for creating 'green' jobs: agriculture and forest industries; automobile industry; biodiversity and ecosystem services; construction; electromechanics, electric construction and networks; fuel and 'green' chemistry; renewable energies; sea trades; transportation; tourism; water, sanitation, waste and air. Part of their mission has been to research green occupations and skill needs in the French economy. Today, anticipation of new skills for this transition has largely been integrated into the prospective work of many sectors.

Social partner involvement is shaped by the overall approach to social partner engagement in individual countries but, in general, they are widely involved. In some countries, social partners are woven into the fabric of decision-making on training and skills. Denmark has several bipartite and tripartite councils and committees in VET, while vocational colleges have boards in which social partners are in the majority. When green skills issues arise in this context, social partner involvement is automatic. At the other end of the spectrum, the UK does not have a tradition of institutionalised social dialogue: while employers, social partners, workers and trades unions may contribute to skills strategies through national consultations, there is no official coordination of this process. In 2017 the closure of the UK Commission for Employment and Skills (UKCES), which was a publicly funded, industry-led organisation providing advice on skills and employment issues, further weakened the role of social partners. Social partners are also found to be active in skill anticipation mechanisms that are in place in each of the six countries. More information about this is available in Section 4.1.2.

A feature of the institutional set-up for green skills more specifically is consultative bodies and platforms. These involve social partners as a matter of course in a consultative role in the development of policies and regulations, as in France's regional observatories for employment and training. Social partners are also involved in implementation. In the UK, the government has stressed the role of employer-led sector skills councils in responding to the need for green skills; measures to support green skills in the 2010 national skills strategy included a new 'skills for a green economy' group of sector skills councils. More specific organisations have also been set up, such as the trade-union-based Greener Jobs Alliance.

## CHAPTER 4.

# Skills development measures and programmes for the green economy

## 4.1. Skills anticipation mechanisms

### 4.1.1. Key features of skills anticipation in relation to green jobs and skills

Permanent mechanisms dedicated to the green economy, green jobs or green skills are currently rare among the countries in the synthesis. France, which has a dedicated observatory, is a notable exception (Box 3). More commonly, green skills anticipation is part of overall skills anticipation mechanisms, with some countries, such as Estonia, only recently introducing a comprehensive approach <sup>(16)</sup>.

#### Box 3. The French National Observatory for Jobs and Occupations of the Green Economy (Onemev)

Onemev was created in 2010 by the Ministry of Environment with the aim of analysing employment shifts in the green economy. Onemev produces statistics and methodologies to improve understanding of occupations within the green economy. Since 2015, Onemev has comprised two groups: 'Observation, methods and quantifications', which deals with quantitative data and statistics; and 'analysis capitalisation and sharing', which focuses on green employment, skills and training issues. It brings together a broad range of institutions including:



<sup>(16)</sup> More information on approaches to skills anticipation in EU countries is available on the Cedefop Skills Panorama website: <http://skillspanorama.cedefop.europa.eu/en>



- the National Institute of Statistics and Economic Studies (INSEE);
- the Evaluation and Statistics Department of the General Commissariat for Sustainable Development (CGDD);
- the Ministries of Ecology;
- the Directorate of research, studies and statistics (DARES) of the Ministry of Employment;
- the Treasury Directorate (DGT);
- the Centre for Studies and Research on Employment and Skills (Céreq);
- France *Stratégie*, a think tank supervised by the Prime Minister's Office;
- the Agency for Environment and Energy Management (ADEME);
- the *Alliance Villes Emploi*;
- *Pôle Emploi* (the public employment agency);
- the French Association for Vocational Training (Afp);
- the National Centre for the Territorial Civil Service (CNFPT); and
- regional employment and training observatories (OREF).

Source: Cedefop (2018a). *Skills for green jobs in France: an update*.

The incorporation of green skills into general anticipation systems is achieved in various ways. In Spain, skills forecasting is part of the work of parallel processes, led by different authorities covering employment and education:

- (a) the Observatory of Occupations (*Observatorio de las ocupaciones*) which is overseen by the central public employment service and analyses around 200 selected rapidly growing occupations each year. Skill gaps relevant to these occupations are analysed by groups in the regional network of the observatory. Several green occupations have been studied. *Fundae*, the State Foundation for Training for Employment (*Fundación estatal para la formación para el empleo*), is responsible for lifelong learning for employed workers; it also leads a scheme for forecasting and planning skill demands and the organisation of the skills response through studies and research;
- (b) on the education side, the National Qualifications Institute (INCUAL) monitors the evolution of professions (mainly through the Observatory of Professions, a department within INCUAL) and defines training responses to the skill gaps identified. INCUAL, although under the remit of the Ministry of Education, is also the technical body of the General Council of Vocational Training, which gathers together representatives from central and regional governments, as well as from social partners, but is governed by the Ministry of Employment and Social Security.

There is a strong and well-established relationship between these elements for producing skills intelligence. Coordination was strengthened under a new law in 2015 that regulates VET for employment in the labour market. These institutions have recently started to use common methodologies to develop training needs identification and forecasting.

Estonia provides a good example of a country where a comprehensive skill anticipation system has recently been introduced. In recent years, Estonia has invested in reforming its skills anticipation process, including the newly launched System of labour market monitoring and future skills forecasting (*Oskuste Arendamise koordineerimisüsteem*, OSKA). OSKA produces data to supplement Ministry of Economic Affairs and Communications forecasts; it also enables the adjustment of sectoral forecasts based partly on sectoral panels of experts. While the green economy, green skills and green jobs are not explicitly part of the OSKA system, sectoral experts and other stakeholders can make recommendations on relevant changes arising from the green economy. These changes include efficient use of resources, green transport, the circular economy and the corresponding revisions required in technical and vocational training.

Despite these examples from Spain and Estonia, it is not always the case that data and intelligence on green skills will be regularly produced. Even in Germany, with its long-established anticipation mechanisms, and despite the green economy and green skills having some prominence in political and scientific debates, green skills are not part of regularly produced data and intelligence for skills identification and anticipation. Instead, green skills tend to be covered in specialised studies.

A common feature of all systems, highly pertinent to green skills and jobs, is the use of sector-based anticipation mechanisms. Besides OSKA in Estonia, France has also focused on sectors. In the UK, most skills anticipation exercises are carried out by sectoral bodies, such as the sector skills councils (SSCs). SSCs undertake sector skills assessments which are important sources of labour market intelligence. Originally, SSCs produced bi-annual assessments as a condition of their continued grant-based funding. These were widely shared by the UK Commission for Employment and Skills and supplemented by skills assessments of 'emerging sectors', many of which contributed to understanding of the green economy. However, since 2010, more competitive, project-based funding of SSCs has led to their producing assessments more ad hoc, provided that an employer or an employer association is willing to fund the work. Perhaps the most in-

depth skills anticipation exercise undertaken in the UK on green skills has been the RenewableUK report (2013), which provided an assessment of the total number of people employed in the renewables sector (both directly and indirectly through the wider supply chain).

Regional cooperation is also a common feature of skills anticipation in green skills. In France, the regions operate the regional observatories for employment and training (OREFs) which regularly publish studies on green jobs and skill needs; these contribute to building regional strategies. The regions are also able to work with the professional branches, the social partners and local authorities to build a training offer adapted to economic needs.

#### Box 4. An example of regional cooperation on green skills in France

The ECECLI project (*Evolution des compétences emploi climat Ile-de-France*, 2012-14, part-funded by the EU) focused on the ecological and energy transition in the Great Paris area. Working together, regional representatives of the Ministries of Employment and Ecology, the regional authorities, and the Seine Normandie Water Agency identified the evolution of skills in 35 professions. These included emerging professions (such as ecologists specialised in the restoration of natural environments; eco-mediators for sorting waste and energy efficiency) and professions subject to transformations (such as bus drivers who will have to master eco-driving as well as computerised vehicles, and site managers in construction who will have to organise the sorting of materials).

Source: Cedefop (2018a). *Skills for green job in France: an update*.

In Spain, the National Observatory of Occupations has a regional network. Skill gaps relevant to occupations selected for analysis each year are analysed by regional groups of experts. Table 2 demonstrates some of the green occupations and the respective skill gaps identified for the 2017 annual report of the observatory.

Table 2. **Examples of green occupations in 2017 in Spain (\*)**

Green occupation	Skill gaps identified
Forest and environment agents	Prevention of forest fires; topography; use of compass; driving of vehicles.
Prevention of labour and environment risks agents	Law, new chemical substances, nanotechnology.
Waste classification workers	Differentiation of types of waste and treatment for each type of waste. In the future training on new regulations, new materials and new waste management systems may be needed.
Environmental and forest technicians.	Cost and process analysis of forest exploitation, forest certification (PEFC and FSC), forestry-related legislation, management and planning methodologies.
Electricity technicians	Renewable energy; energy efficiency; electric and hybrid vehicles; LED lighting.

(\*) National observatory of occupations, 2017 annual report.

Source: Cedefop (2018d). *Skills for green jobs in Spain: an update*. This report also contains a full list of the respective occupations.

Across most countries the regional level appears to be more important in the provision of training for green skills than in skills anticipation per se. However, regional training provision will often include an element of intelligence gathering to ensure that provision addresses regional needs.

#### 4.1.2. Social partner involvement in skills anticipation

Social partners tend to be involved in skill anticipation processes in all six countries examined, but in different ways and to varying degrees. At the very least, they are engaged in consultation but they can also be involved more directly in assessing the demand for green skills and what this might mean for skills supply. In Estonia, new skills anticipation approaches are seen as a means of increasing the involvement of stakeholders and creating a systematic process by which they can provide input into skills anticipation and give recommendations to upgrade competence standards. Representatives of employers and trades unions sit on both the OSKA Coordination Council and its sector skills councils.

Where general social dialogue mechanisms are well-developed, business organisations and trades unions are likely to be involved. In Spain, *Fundae*, which leads one of the processes for forecasting and planning skill

demand and supply, includes 87 sectoral joint committees (*Comisiones Paritarias Sectoriales*) in the process. Social partners play a key role in these committees, which are a traditional institution of social dialogue. Elsewhere, the emphasis in green skills anticipation on sectoral analysis can mean that the business community can take the lead. In the UK, governments have increasingly emphasised the demand-led nature of the skill system, placing responsibility for assessing the demand for skills on sector skills councils, which are business-led.

## 4.2. VET provision for green skills

### 4.2.1. Features of VET for green skills

In all six countries, qualifications and training programmes have been updated since 2010 in response to the growth of green employment. These updates, however, were usually not led by established government process or organised by legislation or strategy. Instead, there are common processes to identify skills demanded by the labour market that are applied to VET qualifications and programmes; either these processes are applied to new green occupations or they take into account new skill demands from green employment in respect of existing occupations.

The view across all countries is that there are few green occupations per se; the impact of the greening of the economy and employment mainly takes the form of new green skills within existing occupations. As a result, training is mainly a question of adding green components to existing qualifications or programmes. For example, experts in Spain argue that green occupations can be performed by workers of similar occupations if suitable complementary training is provided to them. Table 3 shows examples of green activities in traditional sectors in Spain. Three categories of occupations have been identified in France: new green occupations; occupations that require adaptation of skills by adding modules or redesigning the training path; and occupations where awareness-raising is needed, such as helping drivers understand how they can adjust their driving techniques to make their jobs more eco-friendly.

Table 3. **Green activities in traditional sectors: an example from Spain**

Traditional sector	Green activity
Auxiliary automotive industry	Components for wind turbines
Electronic components and electricians	Components for wind turbines
Civil public works	Construction of thermoelectric generators
Chemical and electronic industries	Photovoltaics
Agriculture	Biomass activities
Shipyards	Offshore wind farms
Plumbers	Solar thermal energy

Source: Cedefop (2018d). *Skills for green jobs in Spain: an update*.

Different countries have different patterns in their ‘greening’ of VET qualifications and programmes. In Spain, during 2007-10 all VET diplomas incorporated ‘green’ content to some degree, following a trend of including transversal content relevant to greening and environmental awareness. Since 2010, there has been considerable activity to create new VET diplomas and update existing ones with a focus on skills required for ‘green jobs’, affecting 17 of the 21 relevant diplomas. Estonia has also been updating training since 2010. Sectors with close links to the green economy and green skills experienced in 2017 many active changes and updates in occupational qualifications standards in architecture, geomatics, construction and real estate sectors, and several updates in the transport sector. Changes were also made in log house builder qualification standards and various engineering-related occupations. In 2016 there were many updates in the automation engineering, energy, mining and chemical industry sectors; several initial qualifications standards were confirmed in engineering and manufacturing, as well.

In contrast, several studies in Germany have confirmed that new vocational training trades or university programmes are not needed for a green transformation of the economy; and earlier requests for newly created specific IVET regulations, such as for the installation of solar panels, no longer apply. Instead, emphasis is placed on adjusting existing qualifications and programmes. Similarly in Denmark, there is no detailed analysis of what



changes in the numbers of green jobs might mean for skills supply and this is attributed to factors such as the flexibility of the training system, which makes it easy to incorporate new requirements (integrating energy saving in buildings into construction programmes) and the fact that Denmark was an early mover in respect of green technologies and took early steps to adjust its training programmes.

The sectoral, local and regional dimensions are often quite important in respect of training provision. Local and regional authorities frequently have scope to make provision tailored to local and regional needs, often in the form of projects funded from national or EU resources. Individual training providers may, according to national arrangements, have some autonomy with respect to the curricula they provide to adjust to local needs. Some examples are provided in Box 5.

#### Box 5. **Examples of local and regional training provision for green skills**

In 1997, the small island of *Samsø* became Denmark's renewable energy island after it won a competition organised by the Danish Ministry of the Environment. The island is now self-sufficient and meets its energy needs from sustainable sources like wind, sun and biomass. It has an Energy Academy, which runs exhibitions and workshops, which every year attract more than 5 000 politicians, journalists and students from around the world.

Denmark's local Vocational Education Centre South (EUC Syd) aims to provide green skills in all its 75 study programmes and has also organised a special adult education centre for construction workers that focuses on new energy saving techniques. The centre combines traditional classroom training with learning in its test facility where participants can use real energy-saving tools and materials.

In the UK, Liverpool City Region Local Enterprise Partnership has a development strategy focused on skills for the low-carbon economy. As part of this, the Partnership has sought to coordinate skills training in higher education colleges with the skill needs of local companies manufacturing products used in the production of energy from offshore wind. It has also played a central role in filling a skill gap reported by Scottish Power. The company faced an imminent shortage of labour, caused by an ageing workforce and lack of new apprentices: to tackle this, the Partnership created a strategy to help upskill the existing workforce and train new engineers.

#### 4.2.2. Institutional set-up for the supply of green skills

As with institutional arrangements pertinent to 'green skills' regulations and policies, there is also variation in the set-up regarding the supply of green skills. The institutional set-up includes bodies involved in education and training and, specifically, the design and provision of qualifications and programmes. Local and regional levels can be an important component of the overall institutional set-up in a country. Developing new programmes for new occupations related to green employment or (more commonly) making adjustments to existing programmes/occupations takes place within existing institutional arrangements: there are no specific arrangements for green skills. Specific activities, such as the production of skills anticipation intelligence through sector reports, ultimately feed into these existing arrangements.

The role of social partners in these arrangements varies according to the general situation for social partner engagement in the country concerned. Social partners tend to be less involved in higher education than in VET. In Germany, emphasis is placed on consensus, considered highly influential in the development of training programmes. Trades unions and industry associations participate in the advice boards of many programmes and projects, enabling compromise to be reached. In Denmark, there are 50 trade committees with representatives of employers and trades unions that determine the outcomes, assessment methods, durations and standards for each VET programme. In France, 14 professional advisory committees, managed by the Ministry of Education, play a key role in designing new programmes and adapting existing ones to labour market needs, reviewing programmes and proposing the creation of new ones roughly every five years. Each of the committees includes social partners. In contrast to approaches that balance the inputs from social partners, UK government policy has given business a pre-eminent position in skills policy, although trades unions also play a role.

Where trades unions are part of social dialogue processes they can play the type of role they play in Denmark: here the issue of the green economy provides a starting point for discussing the promotion of green jobs for both job creation and greening of the economy. They can also be involved in practical measures. For instance, the trade union *3f*, which organises mainly unskilled workers, has a special website focused on green jobs <sup>(17)</sup>. Even where social dialogue mechanisms are not so well-established or prominent,

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<sup>(17)</sup> [www.groennejobs.dk](http://www.groennejobs.dk)

trades unions can make significant inputs. In the UK, Unionlearn (run by the national union umbrella body the Trades Union Congress) has developed a range of activities on the green economy, supporting development of trade union policy, operational responses to the green economy and setting up green skills partnerships. It has engaged many different stakeholders using dissemination activities, awareness-raising events, partnerships and policy advocacy. The Greener Jobs Alliance has been formed by The University and College Union (UCU). This focuses attention on building trade union activities in localities and regions and influencing the curriculum of schools, further (post-16) and higher education. The alliance has also published a *Green skills manifesto* (2013) calling for a national 'green skills strategy' and improved coordination of relevant activities within central government and among sector bodies.

#### 4.2.3. Active labour market programmes and retraining measures

Active labour market programmes (ALMPs) are usually not specifically focused on developing skills for green employment. An important consequence of this is that, outside specific initiatives, participation by various groups of employees in retraining and other ALMP measures focusing on green skills or green occupations is not measured.

Public employment services tend to take the lead in the implementation of ALMPs and, across the six countries, there is a wide range of measures addressed to various target groups. Programmes focused specifically on green jobs generally need to be developed within existing general ALMP provision, and examples are scarce. Such an example is the German Power Saving – Check programme launched by the Federal Ministry of the Environment, Nature Conservation, Building and Nuclear Safety; this trains the long-term unemployed to instruct low-income households on power-saving opportunities, using funds available from various ALMP instruments. The programme provides support for supervisors and coaches, training, and administration. Since 2009, some 210 000 households have been visited, with another 125 000 being targeted up to 2019. In 2016, more than 900 previously unemployed people participated in the programme; in the same year almost 40% of previous participants had been integrated into the labour market.

The French public employment service, *Pôle Emploi*, differs in that it monitors and reports on developments regarding green occupations and skills. At territorial level, *Pôle Emploi*'s agencies play a role in identifying promising sectors and occupations, by recycling or sustainable building

jobs, and matching them with jobseekers. It has developed workshops to provide potential employees with the most up-to-date information possible; where immediate routing into employment is not possible, *Pôle Emploi* routes people into individual training or small internships in companies. In the Hauts-de-France region, 400 new jobs will be needed in the wind power sector by 2020, so the regional authorities and the *Pôle Emploi* direct job seekers towards specialised training in wind turbine maintenance.

Interventions targeted at green skills can also be implemented by governmental administrations outside the employment arena, although examples of this are rare. In Spain, several small initiatives are under the Spanish Office of Climate Change (*Oficina Española de Cambio Climático*, OECC, embedded in the Ministry of Environment): the development of training materials for VET programmes of forest agents; the coordination of research projects on the greening of sectors and subsequent dissemination of results; and providing expert support and guidance to training programmes organised by other bodies.

Aside from the government, sector organisations and charitable/not-for-profit organisations can also play a role in developing green skills. In the UK, the sector skills council for the energy and utilities sector works with a range of organisations to make the sector more visible to talented people and remove barriers to entry. For example, through the Career Transition Partnership they work to provide entry routes into the sector for people leaving the armed services. Also in the UK, the Groundwork charity, which helps local communities to carry out environmental projects (such as improving green spaces), provides skills training to unemployed people leading to recognised qualifications in green jobs. Their work is typically project-based and funded by special programmes, such as the European Commission's LIFE+ programme.

There are few examples of funds that support people already in work to retrain or update their skills specifically so that they can access green jobs or green existing skills. One example is the Spanish Green employment (*Emplea verde*) programme (Box 6).

### Box 6. The *Emplea verde* (green employment) programme in Spain

This programme aims to promote employment and competitiveness through environmental transformation and greening by, *inter alia*, improving workers' skills. Led by the Biodiversity Foundation, 1 900 courses in green skills were provided from 2007 to 2015, reaching around 60 000 employed workers in 24 000 organisations. Women, workers in rural and environmentally protected areas, older workers, people with low educational attainment, workers in declining sectors and people aged under 30 were among the groups prioritised.

Source: Cedefop (2018d). *Skills for green jobs in Spain: an update*.

#### 4.2.4. The role of the private sector in green skills training

The private sector and social dialogue are prominent across the process of designing and implementing VET provision. Private sector involvement in respect of green skills takes different forms in different countries, reflecting the general situation. This may include subsidies and incentives but those targeted specifically at green skills development are few and far between.

In Germany, the involvement of the private sector in skills training features strongly in VET, owing to the VET dual system. At the other end of the spectrum, the UK has increasingly since 2010 placed the emphasis on market forces in shaping the 'skills systems', coupled with attempts to encourage the private sector to take the lead role.

Between the poles represented by Germany and the UK, other countries use a variety of structures and processes to ensure the systematic involvement of the private sector in training provision. In Spain, company and social partner representatives are part of the working groups which define the changes and the skills needed in the Observatory of Professions of the National Qualifications Institute (INCUAL); they also make up part of the technical body of the General Council of Vocational Training, which is the main advisory body for the government for its VET related decisions. The private sector and social partners may communicate directly with the Ministry of Education to suggest the approval of new VET diplomas or the modification of existing ones. In France, the private sector is involved in training through several means: by companies directly financing training actions for their employees; by companies paying a 'training' contribution corresponding to a proportion of the payroll which is managed by State-

approved organisations (OPCAs); and by obliging companies with more than 300 employees to anticipate internal jobs and skills. It can be inferred that any training relevant to green skills and green jobs is being requested, confirmed and supported through these channels.

Subsidies and incentives targeting the private sector to stimulate the development of green skills are not a prominent feature of the landscape. Even where they existed, austerity measures introduced by governments in the wake of the financial crisis often led to their withdrawal after 2010. There are also instances where government funding was made available but was not deemed successful. For example, under the UK's Green deal, households were able to use loans to pay for retrofitting technology to make their homes more energy efficient. Public bodies in the construction industry could develop apprenticeship courses in retrofitting, targeted at people who would work on site, supervisors and project managers. Unfortunately, take-up of Green deal loans was much lower than expected and there was low demand for the newly trained workers; this led to the termination of the scheme in 2015.

There are other forms of private sector involvement outside the main established institutional arrangements. Sector bodies and individual companies, normally large corporations, often enter into partnership arrangements to develop green skills. Such companies can have a positive impact by acting as frontrunners in green production processes and green products and setting ambitious standards in green skills for their employees, which can act as an inspiration for other companies.

At sector level, the German chemical industry runs a sustainability initiative, Chemie, initiated jointly by the sectoral industry association VCI (Verband der Chemischen Industrie e.V.), the trade union IG BCE (Industriegewerkschaft Bergbau, Chemie, Energie) and the respective employer association BAVC (Bundesarbeitgeberverband Chemie). The initiative reflects the fact that in the industry there is a close relationship between green skills, workplace safety and improving resource efficiency.

One example from Spain at individual company level, is the environmental training programme operated by Acciona called Acciona University. In 2015, the programme provided 34 618 training hours to employees in green and environmental subjects arranged not only in short courses and one-day activities but also courses of longer duration, organised in cooperation with the University of Alcalá (Madrid). In the UK, the Skills Academy for

Sustainable Manufacturing and Innovation (SASMI) is based at Nissan's plant in the North East of England.

Collaboration between companies can also be used to meet training needs; this can be especially helpful for SMEs which may lack the time and resources to provide training on their own. Some inter-company vocational training centres (*Überbetriebliche Bildungszentren*) in Germany focus on environmental issues; some have developed into multifunctional education centres, being increasingly active in advanced training and continuing education, including master craftsman programmes. They play an important role in promoting green skills (and related technologies), especially in the absence of other support measures that might offer green skills training to SMEs. New advanced content for green skills programmes is often developed in such centres and brought to a large number of firms, especially SMEs.

#### 4.2.5. Higher education provision for green skills

Universities are involved in the provision of green skills courses but exercising their autonomy in assessing the demand for programmes and making decisions about their content. By way of illustration, universities in the UK have complete autonomy in respect of the ability to award degrees. In Denmark, individual institutions have some discretion in determining curricula and student intake: the Ministry of Higher Education and Science sometimes sets quotas for the number of students, and institutions must obtain accreditation for their programmes from the Independent Accreditation Council. In France, universities have some autonomy to launch new diplomas, but they have to be authorised by the Ministry of Higher Education.

Whatever the degree of autonomy, no evidence was found across the six countries of national governments launching policies to ensure the provision of green skills programmes at higher levels; however, they may have encouraged universities to do so in the context of wider policies on the green economy. For example, the Estonian environmental strategy 2030, *inter alia*, declares that environmental education should be an integral part of all higher education curricula. The extent of green skills provision in any country, however, depends largely on the aggregate of decisions by individual institutions, or even individual departments or faculties within those institutions.

Data on the extent of green programmes in higher education are scarce. As it is not often collected centrally, it is difficult to provide an overview of the types of programme that have come into existence since 2010.

Danish university provision includes three-year bachelor programmes in environmental technology, and energy technology and planning, along with two-year master programmes in water and environment, and environmental and natural resource economics. In France, the vocational licences (level II, *Licence professionnelle*) launched by universities on the basis of identified skill needs include new licences such as *Eco-design*.

Data collected in France shed light on the types of programme recently developed. Between 2008 and 2011, 100 vocational bachelor degrees (*Licence professionnelle*)<sup>(18)</sup> were created, one third of which were in energy (mainly sustainable construction and renewable energies) and one quarter in pollution prevention. There were also more than 120 new master programmes, especially in nature protection and the prevention and reduction of pollution.

Universities sometimes engage with individual or groups of businesses to set-up specific forms of provision. These may be stimulated by government action, though frequently they come as a result of close links between universities and their local business communities. For example, in 2017 the Estonian Ministry of the Environment organised specific training for experienced engineers and specialists in energy and resource management under a government measure for increasing the resource efficiency of enterprises: in cooperation with Tallinn University of Technology and ÅF-Consulting, training was offered to enable specialists to analyse resource use in an industrial enterprise. In France, universities are involved in ‘campuses of professions and qualifications’, 10 of which concern eco-industries. One campus in Normandy specialises in energy efficiency in a range of sectors including photovoltaics and bioenergy; another in the industrial Lorraine region is helping to develop new fibres and materials based on bio-source polymers and offers training in production, industrial maintenance and electro-technics. Other examples of university-business collaboration are provided in Section 4.2.4.

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<sup>(18)</sup> In France, a vocational bachelor degree (*Licence professionnelle*) is a national qualification issued by a university (Centre Inffo, 2016).



## CHAPTER 5.

# Conclusions

The scope of this report was to identify patterns and commonalities among six EU countries in fields pertinent to ‘green’ skills and jobs.

The report is based solely on the six reports and does not draw inspiration from or aim at comparative analysis of findings from other relevant exercises at national or EU level.

The six reports claim diverse economic structure, institutional set-up and policy priorities that all affect ‘green’ skills and jobs developments. Neither the findings presented in this report, nor the respective conclusions, are indicative of EU trends or representative of any other country but those examined. This limitation is acknowledged and reflected across the report.

The conclusions set out in this section should be used with caution in relation to countries beyond the six selected. It is hoped that they can be inspiring for other settings, both in relation to good practices and to challenges that the countries have faced since 2010.

## Countries vary in their approach to defining green jobs and green skills

Across the six countries there are different interpretations of the concept of green jobs and green skills: such lack of agreement is especially important for quantitative data analysis at an aggregate national level. Across the countries, methodologies are still under development or national estimates of the size and shape of green employment have only recently been produced for the first time. At the same time, existing categorisations of sectors and occupations in established data sets make it difficult to identify jobs that are specifically green. Work on reaching satisfactory definitions of green jobs and skills and extracting relevant data is in process. This poses a particular challenge for skills anticipation if a reliable picture is to be established across Europe regarding the supply of, and demand for, green skills. With that aim in mind, there is an opportunity for countries to share their knowledge and understanding about how to define and estimate green

skills; and subsequently about designing and implementing effective policy and training initiatives to foster green jobs and respective skill needs.

## Growth in green employment and in policy has been not been straightforward

In all six countries under analysis, the growth of green employment since 2010 and the policy responses associated with it have not necessarily been linear; they are affected by several factors both external and internal to relevant policy fields. The financial crisis and subsequent economic recession changed the general employment context. Governments' fiscal policies after the financial crisis often caused cuts in subsidies and incentives. In terms of factors more internal to green skills policy, countries such as Denmark took many of the largest policy steps before 2010. In subsequent years, green skills have been, in some senses, more 'taken for granted'; they are already woven into the fabric of skills policy and reviews of VET programmes and qualifications. Some observers in the UK think the impact of the green economy and green skills may have been overemphasised in the years up to 2010; since then, expectations of impact have not been fulfilled. There have also been some experiences of policy failure, leading to the withdrawal of policy instruments, such as the UK Green deal.

## Policies on green skills and green jobs would benefit from greater coherence

It is clear from all six countries covered that the topic of green skills and green jobs tends to be dealt with inside a framework of a range of different policies and strategies covering environmental as well as employment and skills issues. This is rarely an intentional framework; it tends to be formed de facto from policy decisions made in different policy fields. Green skills tend to be dealt with as part of existing policy-making processes. It is also unusual to find policy instruments such as subsidies or incentives specifically targeted at green skills. This is not necessarily a problem per se but there is often a lack of coordination between relevant sections of government in respect of green skills. In some cases a national overview is yet to be determined. There

is often scope, therefore, to improve coherence and coordination within policy-making processes around green skills.

## Anticipation of green skills tends to be ad hoc rather than regular and systematic

Green skills anticipation is typically covered as part of general forecasting and through one-off studies that might provide an overview of the demand and the corresponding consequences for training provision. Sector-based and regional/local approaches are also common and offer the possibility of being able to utilise the qualitative insights of stakeholders and experts. However, in all these cases there is a tendency for green skills to be dealt with ad hoc. Sometimes they are seen as one of several ‘horizontal issues’, like digitalisation or innovation. In such circumstances, it may be beneficial to weigh up the costs and benefits of putting in place permanent mechanisms, such as observatories, to ensure continuous monitoring of the demand for and supply of green skills.

## More monitoring and evaluation is needed to assess policy effectiveness and gender balance

Research for the six country reports found no continuous monitoring and evaluation of policies and/or activities relevant to green skills. More generally, it has not been possible to judge the effectiveness of the response to green skills in terms of VET provision or the extent to which they have been part of, for example, active labour market policies or higher education provision. Perhaps in some countries this is because it is considered sufficient for green skills to feature in established procedures for reviewing qualifications and programmes which have long served their purpose well.

There has been little or no consideration of the gender balance in occupations affected by the greening of the economy, even where requisite data are available. Given the importance of bolstering female employee presence across the labour market, and STEM occupations in particular, collection of relevant data and use in evaluation activities could prove beneficial.

# Abbreviations/Acronyms

<b>ALMPs</b>	active labour market policies
<b>Cedefop</b>	European Centre for the Development of Vocational Training
<b>GDP</b>	gross domestic product
<b>ILO</b>	International Labour Organization
<b>Onemev</b>	<i>Observatoire national des emplois et métiers de l'économie verte</i> (French National Observatory for Jobs and Occupations of the Green Economy)
<b>OSKA</b>	<i>Oskuste Arendamise koordinatsioonisüsteem</i> (system of labour market monitoring and future skills forecasting)
<b>PIMA</b>	<i>Plan de Impulso al Medio Ambiente</i> (plan to promote the environment)
<b>SSCs</b>	sector skills councils
<b>UKCES</b>	UK Commission for Employment and Skills
<b>VET</b>	vocational education and training

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## Websites

Cedefop – Skills for the green economy <http://www.cedefop.europa.eu/en/events-and-projects/projects/skills-green-economy>

Cedefop – Skills Panorama <https://skillspanorama.cedefop.europa.eu/en>

European Commission – Green economy [http://ec.europa.eu/environment/basics/green-economy/index\\_en.htm](http://ec.europa.eu/environment/basics/green-economy/index_en.htm)

ILO – Skills for green jobs [http://ilo.org/skills/projects/WCMS\\_115959/lang-en/index.htm](http://ilo.org/skills/projects/WCMS_115959/lang-en/index.htm)

ANNEX 1.

# Skills for green jobs: Denmark

## A1.1. Major changes in the economy and employment since 2010

Both the economy and employment in Denmark suffered from the great recession in 2008-09, with GDP falling by approximately 7% from 2007 to mid-2009. From 2010 however, the economy gradually recovered with GDP finally meeting the pre-crisis level in 2014. Private employment also began to increase in 2014 across all sectors. This included manufacturing, which had previously experienced declining employment before the crisis.

The green economy in Denmark is defined as covering goods and services that are produced to protect the environment, or save resources. Green employment includes jobs in the production of these goods and services. In 2015, the green economy amounted to 2.4% of total Danish employment; this has been relatively constant over recent years. In terms of sectors, key contributors to green production are renewable resources (49%), the saving of energy and heat (14%) and waste handling, including waste water (20%).

Post-crisis fiscal policy did not focus on the green economy or green employment, with the exception of the 2011 housing-job scheme. The scheme gave private households a tax deduction for expenses that covered energy-saving renovations. In 2015 the scheme became more focused and made only green renovations deductible. The overall employment effects were small however, with between 1 000 to 1 500 jobs being created.

## A1.2. Skills development regulations and policies

Denmark currently moderates its transition towards a green economy through an ambitious energy agreement (2012-20); one target of this is for Danish energy supply to be completely covered by renewable energy by 2050. Yearly reports are submitted to the Parliament on the overall status of the energy agreement but green skills and employment are not included in these reports. One explanation is that the monitoring and evaluation reports

are drafted by the ministry responsible for energy and climate, without any input from the ministries responsible for employment or education.

Gender also tends to be absent from policies concerning green skills.

To ensure the relevance of VET in Denmark, an advisory council for initial vocational training (REU) is appointed by the Minister for Education and provides guidance on the structure of programmes, framework for content and assessment, and accreditation of vocational colleges. The Council works with around 50 trade committees with representatives from trades unions and employer's organisations. The Ministry of Education has the capacity to establish ad hoc committees to investigate emerging occupations and, if appropriate, develop new standards. A separate Council for Adult and Further education (VEU) provides guidance on adult labour market training (AMU) and other forms of adult education. There is no such comprehensive system or council for higher education and it is the individual responsibility of the universities and university colleges to determine the intake of students and the curricula.

No particular forum for social dialogue has been established in Denmark to focus on green growth and employment. However, there are examples of initiatives discussing green growth from both trade unions and business organisations. For example, the *Fagligt Fælles Forbund* (3f) trade union, which mainly works with unskilled workers, maintains a green jobs dedicated website<sup>(19)</sup>. Many business organisations have integrated the issue of green skills into their overall strategy to gain workers with technical competences; however this is not always explicitly stated.

There are local and regional initiatives. Danish Gate-21 is an example of regional cooperation towards creating green change and growth in the Greater Copenhagen area. Project Zero, which covers the municipality of Sønderborg in Southern Jutland, directly aims to provide new graduates and adults with green skills. This particular project not only involves the municipality, but also trades unions, business organisations, individual private enterprises, and education institutions in its implementation.

The local Vocational Education Centre South (EUC Syd) integrates green skills in all 75 of its study programmes, irrespective of topic and cohort. Specific focus is on energy saving in this initiative, but also education around waste. EUC Syd similarly includes green skills in its adult education centre

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<sup>(19)</sup> [www.groennejobs.dk](http://www.groennejobs.dk)



for construction workers, with content on energy saving methods and techniques.

Regional growth forums have been put into place to promote green growth and green employment. Public Partnership for Green Public Procurement (2006) involves national, regional and local authorities and aims to promote green public procurement and the green economy across the country.

### A1.3. Skills development measures and programmes for the green economy

There is a wide range of activities to assess future demand for skills and any potential imbalances in the Danish labour market. These activities differ both with respect to purpose and methodology. There is no comprehensive national system in place for addressing skill gaps and the responsibility for vocational education and for higher education is divided between two ministries. Further, there is a lack of coordination between these ministries and the ministry responsible for environmental and energy matters.

There is no analysis of the relationship between green jobs and the demand for qualifications or skills mismatch in the labour market. This can be attributed to several factors:

- (a) the ambiguity of the concept of green jobs;
- (b) existing green activities in the country, making the deliberate promotion of such unnecessary;
- (c) the tendency to offshore lower-skilled green jobs, in areas such wind-turbine production;
- (d) Denmark's flexible VET system, which includes skills relevant for green technology;
- (e) the overall lack of jobs to employ existing qualified workforce post-crisis.

**Environmental technologist: two-year programme with internship**

This education programme provides further training to students with existing knowledge of environmental technology in water, soil and industry. Production, supply and development, energy optimisation and different energy forms feature on the curriculum.

In the environmental technology degree programme, students are trained to carry out technical professional tasks within the environmental field, such as planning and executing improvements, soil and air treatment methods and waste handling. Students can also choose to specialise in a specific business-relevant subject.

Read more on p.16 of the full report: Cedefop (2018b). *Skills for green jobs in Denmark: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportdenmark>

VET programme adaptations of existing occupations (including those relating to demand for green skills) mostly take place through recommendations from the Ministry of Education, advised by the 50 trade committees on the need for reform in the VET system. The box below provides examples of new VET in Denmark directly related to emerging jobs in the green economy.

Green skills are also developed through adult labour market training (AMU), which is business-oriented, has nationally recognised competences, and has centrally defined education goals. AMU is offered by around 100 institutions across Denmark, with roughly 3 600 programmes lasting from between one day to six weeks.

Danish active labour market policies (ALMP) also play an important role in this context, with training and education for the unemployed having a long tradition in the country. ALMP reform was implemented in 2015, aiming to ensure that low-skilled workers gained access to stable employment. Based on available data it is not possible to assess whether there was greater emphasis on green skills in ALMP during this reform, than was the case for other programmes.

### Examples of green skills offered in adult labour market training (AMU)

**Environment and energy in manufacturing:** participants can map environmental impacts and perform simple energy assessments in their own workplace in an industrial company in energy and climate/environmental technology (six days).

**Energy-saving driving techniques:** participants obtain knowledge including of the environmentally harmful substances and particles emitted through engine exhausts (one day).

**Environmental care for property caretakers:** participants learn to contribute to the implementation of both technical and behavioural preventative environmental measures in homes and institutions (four days).

**Waste handling in parks and other public green areas:** participants learn to carry out proper environmental management of waste in public green (three days).

Read more on p.17 of the full report: Cedefop (2018b). *Skills for green jobs in Denmark: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportdenmark>

There is a bottom-up approach to higher education (HE) in Denmark, in that institutions are able to offer new study programmes and change existing curricula on their own terms. This means that it is difficult to obtain a true picture of the 'greening' of programmes in HE. However, a new focus in green skills has been identified in the following courses:

- (a) a three-year bachelor programme (BA) in environmental technology covering technical solutions to issues with soil, water and air pollution (Aalborg University);
- (b) a three-year bachelor programme (BA) in energy technology and planning focused on the development of existing and new energy technologies (Aalborg University);
- (c) a two-year master programme (MA) in water and environment focused on the sustainable use and safe management of the world's freshwater resources (Aalborg University and University of Copenhagen);
- (d) a two-year master programme (MA) in environmental and natural resource economics, which considers how society can best use natural resources sustainably (University of Copenhagen).

The Danish Society of Engineers (IDA) is active in lifelong learning activities, and aims to upgrade graduate skills by publishing a catalogue of relevant training programmes and setting up peer-to-peer training opportunities. Both education institutions and companies are involved.

The private sector plays different roles in skills development, ranging from providing apprenticeships in firms as part of dual VET to AMU programmes. The specific inclusion of green skills in these activities is not known and there are no 'green skills' relevant subsidies for AMU programmes. Beyond the lack of relevant data, this may also reflect the view that green skills are defined in the present context as cutting across sectors and occupations, which prevents concrete actions and activities from specifically focusing on the green economy in many areas.

#### A1.4. Conclusions and recommendations

Green skills play an important role in the Danish skills agenda; however the process of greening of skills is generally conceived as cutting across occupations and sectors.

The cross-cutting nature of many green skills means that some training may fall between disciplines and so not be supplied. With this also come the risk of fragmentation and a lack of harmonisation (as shown by the lack of green skills and employment analysis in Denmark). Gender is also absent from discussions around green skills, which is especially relevant when considering the extent of gender segregation across occupations in the green economy.

Irrespective of these limitations there have generally been positive movements towards the inclusion of green skills in Denmark, as shown by the emergence of new VET programmes. Nonetheless, the high number of actors involved in designing and implementing changes in skill demands risks misalignment and lack of coordination. A national forum for skills analysis could work across existing institutional boundaries and overcome barriers. Similarly, partnerships between CVET actors can add value to existing and new programmes in terms of synergies. The advisory board for the circular economy recommends that public and private actors should jointly establish continuing education targeted at the circular economy with particular focus on SME needs.

# Skills for green jobs: Germany

## A2.1. Major changes in the economy and employment since 2010

Economic growth in Germany has remained steady since 2010. GDP on average grew by 1.6% per year from 2010 to 2016, after having contracted by 5.6% in 2009 compared to 2008. The German workforce increased by 2.6 million people in 2010, to 43.6 million in 2016. The unemployment rate decreased from 7.7% of total civil employment in 2010 to 6.1% in 2016. By the end of 2016 a total of 10 million foreign citizens were living in Germany, and specific programmes were set up to educate immigrants on sustainability.

According to the German Federal Agency for Labour (*Bundesagentur für Arbeit*; BA) there are no skilled labour shortages in Germany, but there are shortages in some technical related occupations, affecting the green economy <sup>(20)</sup>.

The structure of green employment is determined by the German Federal Agency for Labour which defines a set of environmental occupations in a total of 31 occupational types (*Berufsgattungen*). These occupations comprise six subgroups: conservation of nature and landscape; environmental technology and renewable energy use; water supply and waste water management; waste management; biology, geology, and meteorology; and environmental administration and consulting. In 2016, 107 377 people were employed in environmental occupations. The highest shares of green jobs (27.5%) were in water supply and waste water management, followed by 22.2% in environmental technology and renewable energy use. Jobs in waste management amounted to 17.9%, environmental administration and consulting 13.6%, nature conservation 12.1%, and in biology, geology, meteorology 6.7%.

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<sup>(20)</sup> Also referred to as the 'environmental sector and employment' in the full report (Cedefop, 2018e).

## A2.2. Skills development regulations and policies

Germany adopted its first national sustainability strategy (*Nachhaltigkeitsstrategie*) in 2002; since 2004 it has been updated every four years, with fundamental revisions made in 2016. Although the revised strategy promotes the inclusion of green and sustainable skills – as well as influencing different schemes and programmes in Germany – there is no clear strategy to target the needs of the green economy. Nonetheless, political activities have addressed the question of green skills supply at different qualification levels, linking to policies aimed at decarbonising the energy system, such as *Energiewende* (energy turnaround; energy transition). This initiative has two aspects: the expansion of renewable energy sources in the electricity and heating market; and increasing energy efficiency in all parts of the economy. Most activities have been focused on skill requirements in the context of *Energiewende*.

Activities to develop green skills in Germany are often embedded in the larger context of education for sustainable development. A national platform, Education for sustainable development (*Nationale Plattform Bildung für nachhaltige Entwicklung*; NP BNE) has been established. This brings together decision-makers from politics, business, and civil society. More recently, greater emphasis has been placed on integrating environmental objectives (as well as social) into education and training, in the hope of motivating people to become more actively engaged in the green economy. However, despite the increased focus on the greater integration of green skills into initial and continuing VET (IVET and CVET), there is no green skills development strategy in place.

Gender issues are not expressly addressed in policies and programmes related to green skills. Nevertheless, efforts have been made to increase the participation of female students in school classes and university courses with content related to mathematics and natural sciences.

In many policy fields there is a consensus-oriented policy process between Federal Government and the 16 federal States. Responsibility for education policy lies with the federal States and not with the Federal Government. Many policies and regulations relevant for the development of green skills require interaction and coordination between the federal level and State level. For overall TVET provisions, BIBB acts as the government's statutory advisory body. Specific to the development of green education in Germany, the national platform for education and development plays a central role

(*Nationale Plattform BNE*). It brings together high-level representatives of politics, science, industry and society and is supported by a scientific and an international adviser. Six expert forums are consulted by the national platform in developing a national action plan:

- (a) early childhood education;
- (b) school;
- (c) vocational education and training;
- (d) higher education;
- (e) informal and non-formal learning/youth;
- (f) local authorities.

Although there are no bodies for inter-ministerial coordination or for coordination between the federal and State level in green skills, the consensus principle is influential in the development of TVET (technical and vocational education and training) programmes. In many programme and project advisory boards, social partners (trades unions and industry associations) coordinate activities.

### A2.3. Skills development measures and programmes for the green economy

The German skill anticipation process and activities are well established: skill forecasts, skill assessments, and surveys (employer and employee). The primary institutions carrying out these activities are the Federal Institute for Vocational Education and Training (*Bundesinstitut für Berufsbildung*, BIBB) and the Institute for Employment Research (*Institut für Arbeitsmarkt und Berufsforschung*, IAB). Research institutions and government agencies are also active in this field.

Typically, green skills are not the focus of regularly produced data on skill anticipation. However, the green economy has featured in national political and scientific debate, often in relation to digitalisation and associated skill needs. For example, IAB regularly carries out a survey of firms to measure labour demand and analyse recruitment processes. In 2016, the survey addressed environmental employment for the first time; the results are yet to be published. The survey questions were directed to employers producing environmental goods, providing environmental services, and ensuring that energy and materials are used efficiently.

Various academic studies are also carried out, producing data on green skills and employment. From a 2016 BIBB study on vocational training in the labour market, employers reported problems in hiring skilled/qualified workers in the renewable energies sector. Other studies consider the growth of the green economy from a sectoral perspective, and relate this to future demand for green jobs, with a particular focus on renewable energy or increased energy efficiency, as shown by the examples in the box below. The aim of the exercise is to establish a methodological basis for monitoring the impact green occupations have on general skill requirements in Germany.

#### Examples of studies on green skills

In line with the importance of climate policies and the focus on *Energiewende* in Germany, most studies on green skills have concentrated on expansion of renewable energy or increased energy efficiency (especially in the housing sector), such as the two examples below.

The German Environment Agency (UBA) funded a study on skill requirements and the need for CVET for *energy-related building refurbishment*. The study concluded that there was a need for CVET to cope with new requirements in traditional occupations, given the complexity of energy-related refurbishment. The development of specific modules for CVET and the coordination of different occupations are seen as key elements, while the development of new VET regulations is not recommended.

A study of companies active in the renewable energy sector found that, although there is a long list of vocational skills in demand, *electronics technicians (Elektroniker/innen)* are especially required. Capacity for teamwork, a high level of independence, and computer skills are also sought. Companies are looking for experienced workers, often with high qualification levels.

Read more on p. 13 of the full report: Cedefop (2018e). *Skills for green jobs in Germany: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportgermany-1>

VET is the main provider of the green workforce; it is governed by regulations developed through the cooperation of employers' organisations, labour unions, regional administrations and the Federal Government (supported by BIBB). Several studies confirm that new VET courses and university programmes are not needed for the green economy. From 1988, regulations to include green skills in new or revised IVET and CVET



programmes have existed, including suitable learning materials, adequate teacher training, research, and cooperation between schools and firms. BIBB established a focus on VET for sustainable development (*Berufliche Bildung für Nachhaltige Entwicklung – BBNE*) in 2001.

Examples of training for green skills in Germany are shown in the boxes below.

### **BuildUp Skills programme**

Between 2011 and 2016 major activities in IVET and CVET were undertaken in the construction sector in the framework of the EU-funded BuildUp Skills initiative.

The project had two phases, the second of which focused on implementing actions listed in the German national skill development roadmap (NSDR):

- establishing a VET early warning system, which links existing training activities in different sectors and institutions;
- developing a six-month cross-trade CVET curriculum (including teaching materials), addressing the lack of overall understanding and resulting interface problems in building projects;
- implementing a ‘training of trainers’ one-day-workshop to raise awareness of existing problems between different crafts in building projects;
- providing support for human resource development in SMEs, such as guidelines for finding and retaining staff and for implementing career development measures;
- establishing a CVET database for the building sector which helps increase transparency in the CVET market (ZDH 2017).

As part of this, green skills and training for the construction sector were expected to be included (although not explicitly stated).

Read more on p. 17 of the full report: Cedefop (2018e). *Skills for green jobs in Germany: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportgermany-1>

### BBNE Programme

The BBNE programme (*Berufsbildung für nachhaltige Entwicklung befördern – Über grüne Schlüsselkompetenzen zu klima- und ressourcenschonendem Handeln im Beruf*) promotes employment and social integration and aids the transition between school and IVET.

In its first phase (2015 to 2018) 14 projects are being supported, with funding of EUR 19 million. The projects primarily address young people and young adults and cover two fields of action: information on green jobs and modes of production, through work camps, roadshows, courses; and development and testing of new training modules, inter-firm learning partnerships and exchange programmes, including the training of educators.

Read more on p. 18 of the full report. Cedefop (2018e). *Skills for green jobs in Germany: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportgermany-1>

CVET is the main source of retraining in the German context, and is publicly financed through the Federal Agency for Labour (*Bundesagentur für Arbeit*; BA). The German Federal Statistical Office publishes regular reports on CVET but not on specific courses such as programmes on green skills. Of the total 750 CVET advancement courses available, 13 were found to have environmental objectives, although nine of these had not issued certificates during 2010-13. To combat the low CVET take-up, experts have suggested that it is necessary to have more financial and regulatory incentives to increase participation.

Private employment services are provided by the BA for unemployed people. As part of this, the BA uses 10 different active labour market programmes (ALMPs) for different groups, including the long-term unemployed, the low qualified, and older employees. There are no ALMPs targeting green skills or the green economy overall. The latter can, however be harnessed by institutions in the framework of green initiatives. One example is the Power-Saving – Check (*Stromspar-Check*) programme launched by the Federal Ministry of the Environment, Nature Conservation, Building and Nuclear Safety. The programme brings together labour market, environmental and social objectives, through the training and qualification of long-term unemployed individuals as consultants to low-income households on power-saving opportunities. In 2016, more than 900 unemployed people participated.

The private sector plays an intrinsic role in the German ‘dual system’ in which VET takes place in two locations: at a vocational training institution and at a certified company in the form of an apprenticeship. Inter-company vocational training centres also exist, some of which have a special focus on environmental issues. Through Chambers of Commerce, private companies play a structural steering role in the dual system as well as individually by providing apprenticeship places.

Several studies have confirmed that new university programmes are not needed for green transformation of the economy. However, some inter-company training centres have become increasingly active in advanced training and further education, including master programmes. New advanced content for green skills programmes are often developed in such centres and brought to a large number of firms, especially SMEs.

## A2.4. Conclusions and recommendations

Despite policies such as the *Energiewende*, there is scope for greater focus on green skills in Germany, especially as part of the existing focus on sustainability. The economic benefits of green skills could be further promoted so that green skills development is better accepted in different contexts. At policy level, improved visibility of coordination activities in place, alongside stronger inter-ministerial coordination, could aid the development of green skills.

IVET and CVET are crucial to green skills development. However, the take-up of CVET is limited, with few incentives. Greater support (especially to SMEs) could increase awareness and boost participation in CVET overall and particularly in the green skills/green economy.

Although ALMPs are not specifically tailored to the green economy, they can be utilised to include initiatives with a green focus, as shown by the Power Saving – Check programme.

The dual VET system brings important input from the private sector. However, greater financial support for inter-company vocational training centres would allow more SMEs – who often lack the capacity individually to get involved in training – to participate in and benefit from VET. Within this, green skills could also be promoted.

ANNEX 3.

# Skills for green jobs: Spain

## A3.1. Major changes in the economy and employment since 2010

The Spanish economy suffered significantly as a result of the 2007-08 financial crisis. Unemployment rose from 8.2% in 2007 to a peak of 26% in 2013, after which the economy began to recover. However, unemployment remains high, and was still at 19.6% in 2016. The green economy did not escape the effects of the crisis; for example, the number of direct jobs in the renewable energy sector fell from 82 509 in 2008 to 56 204 in 2012.

There is limited information on the structure and trends of green employment in Spain. According to the Ministry of Agriculture, Fisheries, Food and the Environment, in 2010 the number of green jobs in Spain ranged from 411 284 to 530 947. Green activities have mostly developed in the transport, construction and waste management sectors, through mobility plans, energy efficiency measures, and recycling. The economic downturn was an opportunity for areas of the green economy to be explored and developed. For example, re-employment strategies were targeted in the heavily affected construction sector, with workers retrained as solar energy technicians.

However, trends have not always been expansionary in relation to green jobs. In the renewable energy sector, the system of incentives to encourage investment, that had existed since 2009, had created a bubble; in 2012 it was abolished with retroactive effects creating high legal uncertainty and a reduction in activity. The sector has struggled to survive, and the number of direct jobs fell from 56 204 in 2012 to 46 534 in 2015.

Alongside the general state of the economy, observed changes since 2010 can be attributed to several different factors: the growth of environmental awareness, which has made consumer culture greener; the prohibition of chemical substances used in a broad range of sectors; industry demand changes including the increased need for energy-efficient products, such as electric vehicles.

In terms of potential future trends, prospects might be shaped by the fact that the Spanish workforce is characterised by high shares of high- and low- skilled workers, and low shares of medium-skilled: this could create a shortage of skilled workers for green jobs in the near future, as green jobs are expected to demand more medium-skilled workers. The percentage of students in science, technology, engineering and mathematics (STEM) subjects is also shrinking (3.3% per year on average). Given the expected increased demand for STEM graduates in 'green occupations', in the medium and long term, shortages of workers with such graduate qualifications may be observed.

### A3.2. Skills development regulations and policies

Regulations relating to the green transition are promoted and implemented by national and regional authorities. Key green policy measures are put forward by the Ministry of Agriculture, Fisheries, Food and the Environment (*Ministerio de Agricultura, Pesca, Alimentación y Medio ambiente*). Under the Ministry of Environment, the Spanish Office of Climate Change (OECC) is responsible for defining and coordinating policies related to climate change; these are then collated in the Spanish National Climate Change Adaptation Plan (PNACC). The involvement of other stakeholders in these processes varies, with social partners holding a mostly consultative role.

The PNACC does not account for gender but gender segregated data are available for workers in green occupations. Such data are used to map skill gaps; however, more could be done to account for gender segregated data across occupations and programmes, such as the ERDF 2014-20 Operative programme of sustainable growth.

Green programmes and policies are mostly developed at the national level by the Ministry of Environment. The plan to promote the environment (*Plan de Impulso al Medio Ambiente, PIMA*), offers economic incentives to reduce the environmental impact of economic activities and promotes the use of alternative energy sources; CLIMA (Environment) projects subsidise activities to reduce greenhouse gas emissions in sectors which are not part of the European emissions trading regime.

### A3.3. Skills development measures and programmes for the green economy

There is no set procedure for green skills anticipation in Spain, though general skill identification measures account for aspects of the greening economy. This reflects the fact that many new green occupations are regarded as similar to traditional non-green occupations and the greening of traditional occupations in non-green sectors is seen as requiring only additional green-relevant aspects in terms of skills development.

Responsibility for these general anticipation measures falls on employment and education authorities; environmental authorities are not included. Other organisations from the public administration, such as social partners and experts, can also be brought into the skills anticipation mechanisms.

The processes governed by the Spanish employment administration are led by the Central Public Employment Service (SEPE) through the Observatory of Occupations (*Observatorio de las Ocupaciones*). The observatory selects 200 occupations for analysis each year; any skill gaps are then examined and compared regionally. This process includes employers, human resources managers, trades unions and business association representatives, high-skilled workers, excellence centres of technical vocational education training (TVET) and universities.

In the observatory 2017 report, skill gaps were identified in the following green occupations:

Green occupation	Skill gaps identified
Forest and environment agents	Prevention of forest fires; topography; use of compass; driving of vehicles
Qualified workers in hunting activities	Veterinary first aid, environmental protection, plants, wildlife, fire prevention and management
Forest fire workers	Use of specific radio networks (Tetrapol)
Qualified workers in forestry and natural environment activities	Occupational risk prevention, pruning, fabrication of biomass, natural environment, use of chainsaw
Prevention of labour and environment risks agents	Law, new chemical substances, nanotechnology
Waste classification workers	Differentiation of types of waste and treatment for each type of waste. In the future, training on new regulations, new materials and new waste management systems can be needed
Environmental and forest technicians.	Cost and process analysis of forest exploitation, forest certification (PEFC and FSC), forestry-related legislation, management and planning methodologies
Vehicle cleaners	Environmental background
Sweepers	Waste classification according to environmentally friendly criteria
Power plant technicians	Electric cogeneration in small power plants; wind turbines
Electricity technicians	Renewable energy; energy efficiency; electric and hybrid vehicles; LED lighting

Alongside these measures, *Fundae*, the government foundation for lifelong learning for people in employment, under the responsibility of the employment administration, also oversees skills forecasting and planning through studies and research. A total of 87 sectoral joint committees (*Comisiones Paritarias Sectoriales*), which are a traditional institution of social dialogue, have the task of producing training plans based on needs analysis. They play a key role in *Fundae*'s forecasting activities and include several committees of sectors relevant to green and greening activities.

The education administration's involvement in skills forecasting is via the National Qualifications Institute (INCUAL), which manages the Observatory of Professions; this defines the training responses to the skill gaps that have been identified. INCUAL is also the technical body of the General Council of Vocational Training, which brings together representatives from central and

regional governments and the social partners, but is governed by the Ministry of Employment and Social Security. There is, therefore, close cooperation between the education and employment administrations, including *Fundae* and these institutions have now started to use common methodologies for training needs identification and forecasting. The Observatory of Occupations recently carried out a project with INCUAL to create a common database embracing both the occupations and skill gaps identified by the observatory and the professional standards and TVET studies classified by professional families.

Chambers of commerce (86) assess the skill needs of their associated companies. This is achieved through interviews and surveys, and is coordinated by the National Chamber of Commerce. Universities and similar higher education providers also carry out their own skill gap identification processes for education programmes, via graduate surveys. Trades unions play a role in identifying skills in Spain, through direct contact with workers and ensuring that safety and working regulations are adhered to. As part of this, unions often increase awareness among workers of replacing substances with safer and greener alternatives.

There are limited data on green skills and employment but the growth of TVET diplomas with green content indicates the greening economy through education and training. Since 2010, there have been renewed efforts to update TVET diplomas and create new ones with skills for green jobs. In mid-2017, 160 TVET courses existed in Spain, all of which met some green jobs criteria <sup>(21)</sup>, as shown below.

TVET diplomas: categories in relation to green jobs	Number of diplomas
TVET diplomas for green jobs.	21
TVET diplomas that train for several occupations, some of which can be considered to be green jobs	26
TVET diplomas that include relevant training content that responds to green criteria, such as the application of environmental regulations	78
TVET diplomas that include transversal green content (NB all diplomas contain transversal green content)	35
<b>Total</b>	<b>160</b>

<sup>(21)</sup> The Ministry of Education, Culture and Sports provided a classification of these diplomas, specifically for this report.



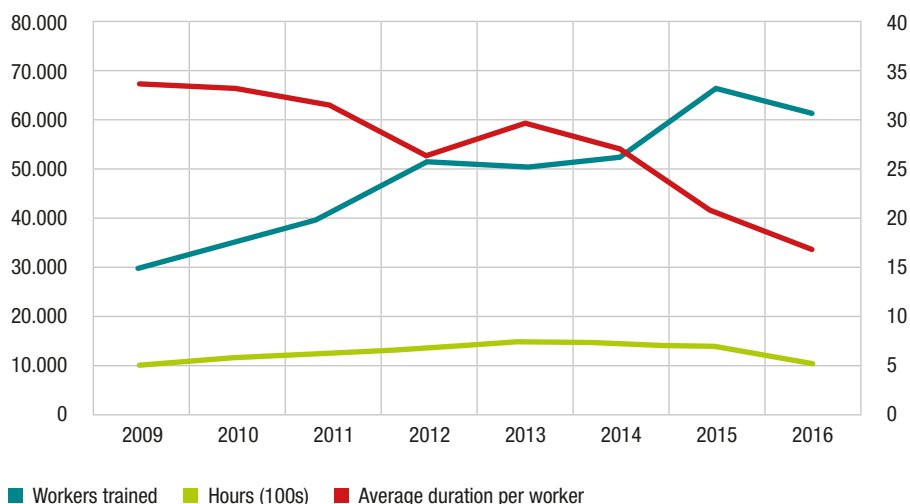
The 21 new TVET diplomas (12.6% of all available courses) were arguably created in direct response to the demands of green jobs since 2010. Some TVET programmes indicate higher education's response to green skill provision, with university relevant degrees in demand. Among university graduates, STEM programmes are the most in demand in green occupations, requiring high-level qualifications. One way in which universities operate is to develop programmes with individual companies. For example, Acciona, which in 2016 had 1 910 employees in renewable energy, runs an environmental training programme called Acciona University. In 2015, the programme provided 34 618 training hours to employees in green and environmental subjects. Training varies from short courses and one-day activities to environmental courses of longer duration, organised in cooperation with the University of Alcalá (Madrid).

The private sector is an important influence on green TVET provision. Collectively companies are able to motivate regional governments to invest in newly approved TVET programmes needed within the green sector. This was the case for the adapted Higher TVET Automotive Diploma (*Técnico Superior en Automoción*) in the *Castilla y León* region; investment was granted to cover the skills required for the production of electric cars.

Associated social partners and employers have the capacity to communicate directly with the Ministry of Education to suggest new TVET programmes or changes to existing ones. Communication between employers and education providers also occurs through apprenticeships, allowing for knowledge to be transferred and training gaps to be identified between the sector and the programme providers.

The provision of training by the private sector is also supported by economic incentives from the government. These incentives – which fund between 10% and 20% of training costs – are delivered through social security rebates, which are managed by *Fundae*. The number of employees attending training for skills relevant to green jobs (supported by *Fundae*) doubled from 30 382 in 2009 to 61 984 in 2016; however, during the same period, the average duration of each training action halved, from 33.9 hours per participant to 16.9 so that the total number of hours remained constant across the 2009-16 period.

### Number of workers trained and average duration per training in green skills/skills for green jobs (subsidised training actions), 2009-16.



Source: Fundación Estatal para la Formación en el Empleo Estadística y Gestión de la Información. Data provided 31.3.2017.

SMEs are also able to benefit from the incentives managed by *Fundae*, even more than larger companies. Companies with one to nine employees can benefit from up to 100% social security contributions paid for professional training: for those with 10 to 49 employees the benefit is 75%, for 50 to 249 employees it is 60%, and companies with over 250 receive 50%. Although SMEs benefit from these incentives, there are barriers: their lack of knowledge of the incentive system; the difficulties of making work and training compatible; and the complexity of administrative procedures.

Extensive retraining measures are in place for employees. In 2015, 327 actions trained 4 634 employed workers in skills relating to green jobs or the greening of existing occupations. The content of these retraining courses is diverse, with the most commonly covered topic being general environmental management, reaching 26% of workers trained, followed by photovoltaic and wind energy installations (17.5%), engineering and new technologies (11.7%), forestry works (11.3%) and installation of thermal solar energy (5.3%). The remaining 28.2% was distributed across 15 different minor categories. An example of retraining for the green economy is shown in the box below.

### The Emplea Verde (green employment) programme

This programme is led by the Biodiversity Foundation and has been jointly funded by the ESF since 2007. It aims to promote employment and competitiveness in the private sector through green transformation. One of its targets is to improve workers' skills.

Since 2007, 1 900 courses in green skills have been provided; around 60 000 employed workers (32% women) from 24 000 entities (94% SMEs, 3% large companies and 3% NGOs) received training between 2007 and 2015. *Emplea Verde* also prioritises the inclusion of women, workers from rural and environmentally protected areas, workers over 45, people with low education levels, migrants and, recently, young people under 30.

In addition, support to green entrepreneurs has been offered within the *Emplea Verde* programme framework.

Read more on p. 23 of the full report. Cedefop (2018d). *Skills for green jobs in Spain: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportspain>

Other small scale initiatives for retraining (provided by the Spanish Office of Climate Change, OECC) include:

- (a) the development of training materials, such as for TVET programmes of forest agents;
- (b) coordination of research projects on greening sectors or on the adaptation of sectors to climate change. These projects are developed by experts, disseminated through the OECC webpage <sup>(22)</sup> and presented in events and workshops;
- (c) expert support and guidance to training programmes organised by other entities.

Coordination of these measures by OECC does not formally include input from Spanish employment or education authorities.

Active labour market programmes (ALMPs) are implemented by regional public employment services. The national government coordinates ALMPs through the employment activation strategy (*Estrategia de Activación para el Empleo*) and the annual employment policy plans (*Plan Anual de Políticas de*

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<sup>(22)</sup> [www.adaptecca.es](http://www.adaptecca.es)

*Empleo*, PAPE). These plans set the budget for the different ALMPs and their regional distribution, including training actions.

In addition to the vocational training programmes managed by the education authorities, the Ministry of Employment and Social Security manages other vocational training programmes within the ALMP framework. Professional certificates (*Certificados de Profesionalidad*) are provided to unemployed workers who attend vocational training courses.

The content of the ALMPs is set regionally, taking into account skill gaps and developing skill needs. The training is exclusively offered by authorised private training centres. The private sector also plays a role through placement agencies – *agencias de colocación* – which offer placements to the unemployed.

There is a high number of workers with low education levels, many of whom are unemployed: in 2Q 2017, 3.9 million people were unemployed, 54.6% of which had a low education level. Green initiatives such as the *Emplea Verde* programme described in the box above, target this group. Nonetheless, in 2015 ALMP actions reached only 3.5% of unemployed eligible workers. The percentage of unemployed people who participated in alternative training actions is higher, but still accounted for only 16.7% of the unemployed.

#### A3.4. Conclusions and recommendations

Spain's transition towards a green economy has not been hindered by a lack of available green skills, although green policy developments have been reduced since the economic crisis. Nonetheless, the outlook for Spain is still optimistic, as clear progress has been made in public awareness of environmental issues, greening TVET provision, and new green technologies. In some cases, 'greening' systems has worked as an alternative to post-crisis employment losses, which could be further exploited to create jobs.

Despite the lack of a specific green skills anticipation process, there is growing awareness of the importance of green jobs and greening of occupations. General skills anticipation takes into account green jobs and greening existing occupations. Investing additional resources in green skills anticipation would be beneficial to long-term planning and overall improvements to the general economy. Improving skills anticipation overall

would require expansion and advancement of the methodological approach, covering methods used, frequency and time horizon.

In the Spanish context, the greening of occupations is often subtle, and the line separating green and non-green jobs is blurred. Therefore, green skills anticipation would benefit from including the environmental and energy authorities. This would allow direct contact between employment and education authorities on relevant measures, such as new regulations or promotion plans, which are likely to have an impact on green jobs. As no significant barriers are identified for the direct participation of environmental authorities, improving cross-departmental work and collaboration among stakeholders could be the most enabling factor.

Following the adverse impact of the economic crisis, resources dedicated to ALMPs were reduced. The recent recovery has again focused attention and resource allocation on such programmes, which should be further strengthened. ALMP resources for training reach a small and diminishing percentage of the unemployed population. Coverage among employed workers is much higher, although mainly due to incentives for lifelong learning actions in companies. It is important to improve the outreach of ALMP provision for all relevant workers.

ANNEX 4.

# Skills for green jobs: Estonia

## A4.1. Major changes in the economy and employment since 2010

The financial crisis had a dramatic impact on employment trends and the economy in Estonia. Decreasing by 14.2% from the previous year, Estonia's GDP was at its lowest point in 2009. As a consequence of the crisis, the unemployment rate of males, young people, and non-natives rose dramatically, particularly in the agricultural, construction, and manufacturing sectors. The government froze public sector expenditure, with greater reliance on support from EU Structural Funds. This allowed for the post-crisis recovery to be quick – with labour market indicators improving since 2010 – although the situation is still deemed unstable.

The importance of green jobs is unclear. Although the number of green jobs is increasing, their share in total employment is modest and some experts regard green employment as 'niche', affecting only a small part of the economy. Increasing green employment mostly affects the public sector (responding to new regulations) and larger industrial enterprises and those most affected by the environment. At the same time, the demand for green jobs continues to outweigh the supply of skilled workers, leading to labour shortages.

The following sectors have the greatest needs for green employment and skills: agriculture, forestry, renewable energy, transport (including public transport), recycled crafts and design, and education. Forecasts for these sectors predict that employment will decline in agriculture, clothing and retail, and growth is expected in forestry and in the production of electronic and electrical equipment.

## A4.2. Skills development regulations and policies

The Estonian green economy is more often referred to as the sustainable economy or the bio-economy. There is no separate strategy comprehensively addressing green employment and skills; most green measures are implemented under the general environmental policy framework. National development plans are coordinated horizontally, as in the following initiatives:

**Sustainable Estonia 21:** a horizontal national strategy on sustainable development up to 2030, which covers the most prevalent challenges in education and future skill demand (although no specific reference to green skills or jobs is made). The long-term development of the natural environment is governed by the strategy's 'ecological balance' goal; accounting for the use of natural resources, reducing pollution, and conserving nature.

**Estonia 2020:** the central reform programme, which aims to improve the nation's competitiveness – including labour supply. The programme stresses the importance of upskilling employees, but does not specifically refer to green skills. It also promotes the construction and reconstruction of energy efficient buildings, green transport, the use of renewable materials and recycling of waste, as well as the circular and bio-economy.

Read more on p.13 of the full report: Cedefop (2018f). *Skills for green jobs in Estonia: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportestonia>

Both of these initiatives are supported by the Estonian lifelong learning strategy 2020, which is the core strategic document for skills development and lifelong learning. The overall goal of this strategy is to provide people in Estonia with tailored lifelong learning opportunities, although green skills are not explicitly mentioned. The strategy highlights obstacles in Estonia including skills mismatches and lack of collaboration between education institutions and employers in developing a lifelong learning system. Environmental education is also mentioned in various strategy documents (such as Sustainable Estonia 21, the Estonian lifelong strategy 2020, the forestry strategy for 2011-20 and the recently adopted general principles of climate policy 2050).

There is no single organisation that specifically focuses on green skills, green jobs or the green economy; consequently there is no broad vision for these issues. Instead, such topics are covered by bodies with a broader focus, such as committees that focus on sustainable development. Sector bodies may also take account of green skills and jobs but they are mainly interested in their own areas. The fragmented and sector/area-specific approach of the government structure accounts for this situation.

OSKA – the newly launched system of labour market monitoring and future skills forecasting – is seen as the solution to this lack of institutional collaboration and will address skills mismatches across the labour market as a whole. It will take into account developments in the green economy and sustainable development through the advice and knowledge of its sector skills councils. Expert bodies in the labour market also act as social partners for the Ministry of Education and Research in deciding the content of qualifications, as well as in informing stakeholders of developments in their sector.

Employer and worker representatives are also present in the Estonian unemployment insurance fund (*Eesti Töötukassa*) councils and in the Estonian qualification authority councils. Social partners in Estonia are generally involved in the decision-making process and in the development of strategy documents, regulations and policies. Government authorities engage interest groups, social partners and the general public in decision-making according to the Good public engagement code of practice. Both representative organisations and individuals can take part in the development of regulations and strategy documents.

In 2013, as part of the strategy for the bio-economy 2030, which is still being drafted, the Estonian gender equality and equal treatment Commissioner advised how to take gender issues into account and develop equal opportunities for men and women. The importance of equal opportunities for women in technical and vocational education and training and retraining opportunities was emphasised. Acknowledgment of gender issues in the green economy is important, as women are underrepresented in typically 'green' sectors covered by the strategy (agriculture, fishery and forestry). Despite this, actions need to be more systematic in practice. For example, the European Union structural funds support for 2014-20 features no specific measures for developing gender equality in the green economy. Other activities include the Estonian Women's Studies and Resource Centre



(ENUT) putting together an event with the Stockholm Environment Institute in 2016 on the gender wage gap in the bio-economy.

### A4.3. Skills development measures and programmes for the green economy

Until 2015, skills anticipation in Estonia was conducted through the annual employment forecast by the Ministry of Economic Affairs and Communications (*Majandus- ja Kommunikatsiooniministeerum*). More recently, however, greater investment has been made in skills anticipation with the introduction of OSKA. OSKA now has the responsibility of producing skills forecasts and carrying out anticipation activities, generating information on skill needs and mismatches. Due to OSKA's structure, emphasis lies on skill needs at sectoral level <sup>(23)</sup>.

No specific green jobs or skills data are collected in OSKA's annual forecasts, although using ISCO codes makes it possible to detect some occupations which are linked to the green economy and green jobs, such as environmental protection specialists and environmental engineers.

Notwithstanding current data limitations, a variety of sectoral green skill needs have been identified, as shown in the box below.

#### Green skill needs in Estonia: sectoral examples

**Agriculture:** there are skill needs related to the growth of automation, bio-energy, and biomass. Also required are support for environment-friendly management (such as the growth of organic farming) and more green jobs which consider environmentally friendly soil use.

**Forestry:** new green jobs in forestry are considered to be those where various skills are combined together in a different, more interdisciplinary way. Forestry workers are required to have additional knowledge in chemistry, biochemistry, and economics of engineering, product and technology development, which should be taken into account when designing future curricula. According to the recent skills forecast,



<sup>(23)</sup> Additional information about the general skills anticipation system is available on the Cedefop Skills Panorama website. [http://skillspanorama.cedefop.europa.eu/en/analytical\\_highlights/skills-anticipation-estonia](http://skillspanorama.cedefop.europa.eu/en/analytical_highlights/skills-anticipation-estonia)



around three quarters of the forestry workforce need to be provided with vocational education, and a quarter with higher education. Industry partners argue for greater vocational focus and a more holistic training approach, to include economics, entrepreneurship and forest management.

**Construction:** construction curricula need to include more courses on environmental impact evaluation, energy certification, environmental management systems and sustainable construction across all occupations. This would be in line with the Renewable energy implementation plan that includes the construction of example low-energy houses.

**Transport:** skill requirements are mostly related to the use of environmentally friendly technologies and procurement: it is suggested that the public sector could contribute by demanding the use of sustainable, green technologies and giving them preference in procurement.

**Energy:** 40% of workers in basic energy occupations are currently aged 50 or older, so new employees will be needed to replace retired workers. The growth rate in mining, heat energy, gas and electricity engineers is considered inadequate, given that the number of applicants for energetics and mining specialisation is stable in higher education. It is essential that professional knowledge and skills are promoted for the sector. In addition to professional skills, employees across the sector are expected to have general skills such as communication, management and collaboration skills.

Read more on p. 21 of the full report: Cedefop (2018f). *Skills for green jobs in Estonia: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportestonia>

The green economy will create jobs across competence and management levels. Relevant scientific and engineering knowledge will be needed to support green energy and technology development. Technical specialists such as mathematicians and physicists will need knowledge and skills in economics and entrepreneurship to improve their chances of finding a job in different sectors. Technical knowledge and skills will also be needed to support a reduction in the exploitation of non-renewable resources, and to increase the availability of clean drinking water. Competences in the management and planning of complex ecological and technological processes will also increase in importance to support, for example, increases in the efficiency of production processes that reduce the ecological footprint of products.

The implementation of OSKA has increased the involvement of stakeholders by creating a systematic process for them to provide input into skills anticipation and give recommendations to upgrade competence standards. Employers and trades unions sit on both the OSKA coordination council and its sector skills councils. Representatives of education institutions influence the process through the OSKA panel of advisers. Input is also given by expert sectoral panels; these can offer advice and suggestions regarding developments in the green economy, such as on the efficient use of resources, education reform or green transport.

There is no coherent approach to relevant technical vocational education and training (TVET): green jobs and green skills are spread between different economic sectors and policy areas. The Estonian lifelong strategy 2020 has stated that the results of OSKA's projections will be used to establish qualifications and a career counselling service, which will also inherently cover green occupations. Additionally, the data will contribute to curriculum development for education institutions, as well as different authorities that finance learning activities.

The institutional set-up in TVET is directly linked to the OSKA skill needs anticipation mechanism. Each sector has been explored and suggestions have been made to ensure that training corresponds to labour market needs. Focusing on sectors linked to the green economy, many changes have occurred to occupational standards, as shown below.

### Number of occupational qualification standards confirmed 2016-17

Sectors:	2017		2016	
	Changes	Updates	Changes	Updates
Architecture, geomatics, construction and real estate	15	5	2	2
Energy, mining and chemical industry	-	4	3	8
Forestry	-	-	1	-
Engineering, manufacturing and processing	-	4	2	-
Food industry and agriculture	-	2	-	1
Transport and logistics	-	8	5	3

Earlier changes were also made in 2013, such as amendments to qualification standards for energy auditors, energy efficiency specialists and solar heating system installers, along with small-scale wind turbine installers and technicians. These amendments included competences that promote knowledge and consideration of the environment as well as environmental regulations. From the changes in the occupational qualification standards, it appears that the sectors least affected by the green economy have been transport and logistics, food, agriculture and forestry.

There are no active labour market programmes (ALMPs) for green jobs. The Estonian unemployment insurance fund (*Eesti Töötukassa*) does not explicitly engage and support the green economy and green jobs; nor do employment service providers. According to experts, lack of interest from policy-makers in filling the green skills data gap has hindered the collection of relevant data by the fund. To combat this, experts have argued for green data to be classified and developed, taking into account the needs of ministries and Statistics Estonia. From May 2017, however, the fund began to offer additional services to prevent unemployment; this can include green skills, though it is not specifically designed as such. Services include: a degree study allowance, either for an employed person or a person registered as unemployed, for obtaining vocational, professional higher education or bachelor studies; labour market training for the employed at risk of unemployment; qualification support for those who have undergone labour market training, in which the costs of formal qualifications are reimbursed for the employed person; and a training grant for employers to upgrade new recruits' skills and knowledge.

Employers are able to apply for funding for workforce training from the public sector, but there is no information on specific training schemes for green skills in this process.

Environmental skills and training are gradually being promoted in higher education, but there is currently a lack of programmes specifically concerned with environmental issues.

The private sector is involved in the skills development process: employers identify, design and develop skills training, retraining, and in-service training. At present, no special incentives are offered to employers to provide training specifically on green skills, as these are not specified as a separate priority field.

Although no specific funding exists for employers who choose to provide green skills training, Enterprise Estonia (*Ettevõtlike Arendamise Sihtasutus* –

EAS), and the Environmental Investment Centre (*Keskkonnainvesteeringute Keskus* – KIK) fund projects which raise awareness of sustainable development, environmental care and management, and greening of the work environment. The EAS has supported tourism enterprises to introduce environmental management systems; it has also supported sustainable and environment-friendly product development in some sectors through the use of information and communication technologies (Green IT).

#### A4.4. Conclusions and recommendations

Green jobs and skills are most prevalent in agriculture, forestry, and industry, although they are also important in waste, energy, transport, crafts and education. However, there is no comprehensive approach to the provision of systematic green skills training in these economic sectors, and all existing measures have been implemented ad hoc.

Greater coherence between skills development and environmental and climate change policies could improve the link between labour market systems and the green economy. Experts suggest that this could be better achieved through cooperation between social and environmental ministry officials and stakeholders. A clearer approach on what constitutes green jobs and skills would also allow for comprehensive mapping and assessment of all the relevant measures in place (across education, training and policy), promoting targeted social dialogue and improvements.

The relatively newly launched OSKA system is expected to benefit skills development across the board, while also taking into account developments in the green economy and sustainable development through sectoral expertise. However, the development of a mechanism specifically for green skills in the near future is considered unlikely, so it is essential that green jobs and skills become more visible in the OSKA system. Cooperation between the public and private sectors would greatly promote this goal.

The OSKA system could also be used as a platform to develop a shared vision on green skills and jobs by engaging stakeholders. This would promote collaboration between environmental and labour policies and skills development processes.

ANNEX 5.

# Skills for green jobs: France

## A5.1. Major changes in the economy and employment since 2010

France has been active over the past 15 years in its transition to the green economy: from the first National Sustainable Development Strategy Act of 2003, to the Energy Transition Act in 2015, and the more recent Climate Plan of July 2017 presenting the national strategy for the next five years.

The National Observatory for Jobs and Occupations of the Green Economy (*Observatoire national des emplois et des métiers de l'économie verte – Onemev*) found 440 000 full-time jobs classified as eco-activities in 2015; during 2010-14 green occupations amounted to 144 000 jobs in the French labour market, representing 0.6% of total employment. In 2013, nearly half of green jobs were in eco-activities (32% in environmental protection, 15% in resources management), while around 40% were in sectors not specifically related to the environment.

Progress has been observed in energy use in housing, which is attributed to the combined implementation of various policies, regulatory measures and incentives, as well as to technical innovations from companies. At the heart of this is housing renovation and energy performance improvement. Ambitious plans have been launched at national level but their effectiveness remains limited. Several financial aid options have been offered to households for housing renovation, but the level has varied from year to year and so may have discouraged consumers over time. Although interest in greener consumption is increasing, putting this into practice remains difficult, often for economic reasons.

## A5.2. Skills development regulations and policies

Since 2003, environmental policies have been defined in the context of two national sustainable development strategies (NSSDs). The second of these encompasses the UN Millennium Development Goals (MDGs). As part of

the goals, a plan to mobilise territories and sectors (*plan de mobilisation des territoires et des filières*) was established with the aim of enriching green growth by supporting the development of new activities and skills. In 2010, a fully fledged skills development strategy was also set up, in which Onemev was created and a mobilisation plan for green jobs was established.

Onemev became responsible for outlining the criteria of green and ‘greening’ occupations. Green occupations are the jobs which counteract and prevent damage to the environment, while greening occupations integrate environmental competences into their work rather than having a direct environmental purpose.

More recently, two laws have been implemented. First, the Energy Transition for Green Growth Act 2015 (*Loi sur la transition énergétique pour la croissance verte*) aims to achieve the country’s energy reduction targets. The employment effect of this legislation alone has been estimated at 100 000 short-term jobs and 200 000 long-term by 2030, mostly in the energy efficiency and renewable energies sectors.

The second law adopted was the adaption of the Biodiversity of Nature and Landscapes Act in 2016 (*Loi pour la reconquête de la biodiversité de la nature et des paysages*). It aims to support the development of green jobs, especially those in the circular economy. Following this the French Agency for Biodiversity was created. This law also includes a EUR 50 billion Future investment programme (PIA) over the decade 2010-20, which supports relevant activities: SMEs developing innovative projects that preserve biodiversity; education, research, innovation in industry, transport, energy; and investment in vocational training.

The green economy and its impact on jobs and skills is considered by various institutions in France: the National Statistics Institute (INSEE), the Department of Studies of the Ministry of Employment (DARES), the General Commissariat for Sustainable Development of the Ministry of Ecology, and the national employment agency (*Pôle Emploi*). These are gathered together with other partners as part of Onemev. Social dialogue is structured at several levels, including sectoral.

Onemev plays a coordinating role and relies on other organisations which have their own networks and anticipation and skills foresight strategies. At sectoral level, the organisations involved benefit from observations which allow well-informed skills anticipation; such studies can lead to public funding to develop skills through training. Public-private partnerships are implemented at different levels.

The green economy in France is mostly dominated by men. In 2012, women were represented in only 17% of green and 16% of 'greening' jobs. This represents an improvement from 2008, however, with figures previously being 13% and 15% respectively. Some skilled green occupations have undergone a notable increase in the share of jobs accounted for by women, such as in the production and distribution of energy and water (from 15% in 2008 to 21% in 2012).

Policy and regulation around skills in France are not sufficiently coordinated to identify the development of green skills, and initiatives are mostly at the national level. There are also no evaluations of the effectiveness of recent laws, nor is there a specific approach through which new green policies, programmes and regulations may include gender issues in new green skills.

### A5.3. Skills development measures and programmes for the green economy

Skills anticipation in France is characterised by strong stakeholder and social partner engagement. Anticipation activities often run in parallel (covering assessment, forecasting and foresight) and are carried out by actors at different levels: ministries, public authorities at national or regional levels, chambers of commerce, social partners, and sector organisations.

Recently, skills anticipation activities for green jobs have grown in France. Three organisations are involved in this process:

- (a) sectoral committees: following the mobilisation plan for green jobs launched in 2010, these committees have promoted the active participation of employers, social partners and decision-makers at government level. Part of their mission has been to research green occupations and skill needs in the French economy. Today, the anticipation of new skills in relation to this transition has largely been integrated into the prospective work of many sectors;
- (b) Onemev: one part of Onemev's work is to analyse and share the impact of ecological and technological transitions on jobs, skills and training needs. This work enables learners and policy-makers to identify new needs, specific to certain occupations;
- (c) the Jobs and skills network: this was created by the State and social partners in 2013, and is run by *France Stratégie*. The network brings together: organisations which produce skills and job forecasts (such as



State services and regional observatories for employment training), public and economic decision-makers in economic development, employment, guidance and vocational training (State, regional councils, branches and social partners, business representatives), and other relevant actors.

### **Regional cooperation on green skills: the ECECLI project**

In the Greater Paris region, the ECECLI (*Evolution des compétences emploi climat Ile-de-France*) project identified activities that would lead to employment and skills development towards ecological energy transition. The project brought together actors such as regional representatives of the ministries of employment and ecology, the regional authorities, as well as the Seine Normandie Water Agency (AESN). It encompassed 35 professions, such as ecologists who wished to specialise in the restoration of natural environments.

Read more on p.19 of the full report. Cedefop (2018a). *Skills for green jobs in France: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportfrance>

Regions also play an important role in skills anticipation, as they are able to work with professional branches, social partners and local authorities on training adapted to local economic needs. An example of this is shown in the box below.

TVET features heavily in the French green economy. The national education system plays a role in defining and adapting training measures, although responsibility for vocational training has been decentralised to the regions. Most green education and training qualifications are issued by the Ministry of Education and the Ministry of Agriculture, which manages agricultural education.

Branches (companies grouped generally in the same sector of activity and covered by a collective agreement) have the power to create specific professional qualification certificates (*certificats de qualification professionnelle*, CQP). CQPs are flexible and can be created quickly in line with emerging skill needs, which is relevant in the context of adapting or creating new training curricula to cater for developing green skills.

According to data provided by stakeholders and evaluation reports, new green skill needs are well integrated into training, thanks to the various mechanisms of identification, adaptation and consultation. Comparative analysis of the period 2007 to 2015 highlighted two approaches: awareness

of environmental issues wherein courses (mostly lower secondary and upper secondary VET diplomas) were changed to account more generally for environmental issues; more advanced and specific adaptations wherein changes in professional practices were found.

There were significant training course developments from 2007 to 2015 in some sectors, with less progress in food, fashion, applied arts and tourism:

- (a) from 2007, the professional advisory committees (*Commissions professionnelles consultatives*, CPC) – managed by the Ministry of Education with a central role in meeting industry skill needs – have directly covered occupations in eco-activities or concerning green occupations, such as in chemistry, bio-industry and environment, the wood industry and agriculture. Other committees have taken charge of sectors that are becoming greener, such as metalwork, construction and transportation;
- (b) in 2013, 40 vocational diplomas fell under the remit of the committee for chemistry, bio-industry and environment, many of which were new/adapted programmes. Level IV vocational diplomas included water and paperboard processes (2012), hygiene, cleanliness, sterilisation, pollution management and environment (2012); Level III vocational diplomas included nuclear environment (2011) and environmental services (2013);
- (c) between 2009 and 2013, 30 of the 113 diplomas existing in the automotive and agricultural equipment industries were revised or created with a greener focus. For example, the level V diploma Production conductor evolved to state that preserving property and the environment are both of importance.
- (d) diplomas in agriculture have also fully integrated green issues into their structure. All courses include a week dedicated to health, safety and sustainable development education, during which health issues, and occupational risks related to the use of materials or chemicals are addressed. Course standards have also been adapted to include the new agroecology approach which underpins French agriculture.

The French employment service, *Pôle Emploi*, is a key player in monitoring green jobs and skills within the economy, and implementing active labour market programmes (ALMPs). The various agencies of the service identify growing sectors and match the needs of employers with jobseeker profiles across the regions. To provide jobseekers with relevant skills and training, *Pôle Emploi* conducts workshops and individual training sessions in collaboration with employers, in sectors such as recycling or sustainable

building; this can also include internship opportunities. However, there are no data available on the impact of these measures on the green economy.

Other players in public employment are the so called 'employment houses' (*Maisons de l'emploi*) which coordinate vocational guidance and training for unemployed people. The employment houses work within the *Alliance Ville Emploi* network, which participates in the work of Onemev and also participated in the 2012-13 EU-funded *Build-up skills* project which was designed to tackle green skill gaps for construction workers, mainly hired by small businesses or craftsmen.

In France, higher education providers have some say in the development of new skill provision but any new diploma must be approved by the Ministry of Higher Education. Qualifications such as vocational licences (*Licences professionnelles*) are also adapted, based on skill needs identified by professionals on the ground. Between 2008 and 2011, approximately 100 new training courses were marked as being environmental, with around 50 covering energy, 20 pollution and 15 the management of environmental issues. Most of these courses belonged to professional qualifications or master programmes.

Provision in higher education is adaptive to professional needs in other ways. For example, 78 campuses of professions and qualifications exist, which include education institutions (secondary and higher education, initial or continuing education) and enterprises; 10 of these campuses directly cover eco-industries, such as that for energy and maintenance in the industrial Lorraine region which develops new fibres and materials using bio-source polymers.

The private sector plays a multifaceted role in French training provision. Companies directly contribute to continuing vocational training financially, and State-approved organisations (OPCAs) play a central role in the distribution of funds and targeted training for employees. Companies with more than 300 employees are also obliged by law to anticipate internal jobs and skills (*gestion prévisionnelle des emplois et des compétences*, GPEC).

Large companies in the energy, construction, waste management and transport sectors have introduced in-service training programmes to transition to greener ways of working, such as the Enedis in-house training.

### Enedis in-house training

Enedis, the electricity grid operator, has developed an ‘intelligent’ electrical network by installing intelligent, connected electricity meters, whose management requires more skilled support.

As part of the upskilling process, more than half of Enedis’ 39 000 employees were identified as having a need for training in energy transition, notably to develop renewable energies. Up to August 2017, 15 000 employees had been trained. Such training was adapted to people from different professional backgrounds and with different levels of knowledge or awareness of green issues.

Read more on p. 27 of the full report: Cedefop (2018a). *Skills for green jobs in France: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportfrance>

Another way in which the private sector plays a role in green skills provision is through professional branches, which participate in the joint consultative committees (CPCs) that have the power to influence the content of diplomas in a bottom-up approach. Employees in companies can also benefit from branch vocational diplomas that may lead to certification (for example, those offered by the Professional Federation of Recycling Companies (*Fédération professionnelle des entreprises du recyclage*, FEDEREC). However, although bottom-up approaches may help to identify skill needs, they do not necessarily lead to change at national or sectoral levels.

## A5.4. Conclusions and recommendations

The French transition to a greener economy relies on several factors: good social dialogue at all levels; the development and improvement of new and existing training methods; training based on identified skill needs; and education and vocational training programmes being monitored and evaluated.

Since 2010, France has continued to involve stakeholders in the green economy, produced innovative and adaptive anticipation mechanisms and made key changes to its TVET system. However, several issues persist: ensuring that quality training is developed; having trainers with sufficient knowledge of new skills and new training methods; and fostering the

adaptability of skills standards to the ever-changing needs of the overall economy. The possible consequences of good practices could be examined, such as the trend of developing inter-sectoral qualifications; while this, allows for adjustment to green skill needs, it hinders labour mobility.

To ensure that 'eco-friendly training' adds value to professional environments in the country, good business practices and awareness-raising exercises at managerial levels could prove beneficial.

For both education providers and employers, declining interest in certain areas (such as in crafts or traditional manufacturing industries) can be combatted by integrating ecological issues in either jobs or education programmes.

ANNEX 6.

# Skills for green jobs: UK

## A6.1. Major changes in the economy and employment since 2010

Economic and employment trends in the UK have generally been positive in terms of labour market indicators. GDP has remained stable, with a 2% increase between 2016 and 2017; the services sector has been the driving force for this growth. The employment rate has also been on the rise, and in June 2017 it reached its highest since 1971 (75.1% for those aged 16 to 64). Changes to the UK labour market are attributed by the CIPD to long-term trends, such as the rise in knowledge-based services, innovative technology and globalisation, changing workforce demographics, and the decline in collective workplace institutions. However, the UK labour market is expected to face challenges during Britain's exit from the European Union (Brexit). Based on the uncertainty that Brexit brings, it is difficult to predict the impact this will have on the overall economy.

The structure of green employment in the UK is expected to change, as shown in employment forecasts for 2014-24. For example, employment levels in the mining and quarrying sector are predicted to decrease as the economy moves away from coal-fired energy generation to low-carbon alternatives, while such alternatives to energy generation are likely to increase employment levels in other sectors. Energy-intensive sectors, such as manufacturing and transport, have become more energy-efficient. It is expected that up to 70 000 extra direct jobs may be generated between 2013 and 2023 in the wind and marine energy sectors, and that construction growth in the lead-up to 2024 is likely to be positive as technologies are developed to address environmental concerns. For example, from 2012 attempts were made to promote greener construction methods by the government, as part of the growing green economy. New standards included the Code for sustainable homes, which was later revised in the national Building regulations and standards in 2015.

Energy policies and environmental legislation are a major cause of such employment changes. For example, the revised Building regulations and

standards issued in 2015 have increased the emphasis on green building methods and techniques. The overall shift towards a green economy has also been partly attributed to the influence of green entrepreneurs, who are driven by environmental concerns and ideals and aim at developing relevant skills that will ensure their businesses are in synergy with the green economy.

## A6.2. Skills development regulations and policies

Environmental policies, such as the UK 2020 target to reduce carbon emissions by 2050, have influenced policy for a green transition. The Energy Act 2013, for example, sets out low emission targets and the ways in which these can be achieved to address climate change. Additionally, the Infrastructure Act 2015 set out regulations for carbon measures and local renewable electricity generation facilities. Generally, the act supports measures for zero carbon homes and renewable heating systems.

Environmental policy in the UK has historically been led by the European Union (EU), which has had a positive impact on the UK environment. Now that the UK plans to exit the EU, there are concerns that environmental policies will become less rigorous and that focus on the green economy will feature less. The recent publication by the Committee on Climate Change (an independent, statutory body established under the Climate Change Act 2008) suggests that the UK may change its plans to reduce carbon emissions after Brexit, as meeting EU targets will not be required. However, carbon emissions targets and the need to cut emissions are set in UK law, so there are unlikely to be significant changes.

Green skills and employment have not typically been prioritised in UK policy. The Skills for sustainable growth strategy 2010 planned to improve skills for sustainable growth, by setting out funding commitments for training and apprenticeships as part of an 'environmentally sound economy'. However, there have also been fluctuations in subsidies and incentives that might stimulate green employment growth; there are dependent on the extent to which national governments have prioritised the environment in a time of constrained public finances and wider political philosophies about the role of the State. In 2015 for example, many green subsidies – such as plans to make all new homes carbon neutral – were withdrawn, a change justified as encouraging businesses to invest in construction rather than relying on government action. The more recent green paper on building an industrial

strategy (2017) focuses on increasing skills and productivity, but it is not yet known whether or how this will translate to green skills.

Another important feature of government strategies on green employment is that they tend to devolve responsibility to sectors and regions. No UK policies, programmes or regulations include gender issues in developing green skills.

While employers, social partners, workers and trades unions can usually contribute to skills strategies through national consultations, there is no official coordination of this process. In 2017 the closure of the UK Commission for Employment and Skills (UKCES) which was a publicly funded, industry-led organisation providing advice on skills and employment issues, further weakened the role of social partners. Sector skills councils (SSCs) and sector skills bodies – some of which are relevant to the green skills agenda – develop, maintain, and update occupational standards and job competences. Many SSCs have also become members of relevant industrial partnerships. Local enterprise partnerships (LEPs) make decisions on training provision at the local level, to create links between employers and training providers wishing to transition to a greener economy. An example of such a local initiative is shown in the box below.

#### **Liverpool City Region: skills for the low-carbon economy**

The Skills development strategy adopted by the Liverpool City Region (LCR) LEP concentrates on skills for the low-carbon economy. LCR has developed a Low-carbon economy action plan and a Sustainable energy action plan to ensure the region is at the forefront of the transition to a low-carbon economy. To meet the demand for skills in offshore wind, the LEP has worked to coordinate skills training in higher education colleges with the demands of local companies that manufacture products used in the offshore wind sector. The LEP has also played a central role in filling a skill gap reported by the company Scottish Power, whose central office is in Liverpool

Read more on p.27 of the full report. Cedefop (2018c). *Skills for green jobs in the UK: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportuk>

Strategic decisions about occupational standards and the content of green jobs are also taken by organisations that award qualifications. One example of such an organisation working in the green sector is the Waste Management Industry Training and Advisory Board, which covers those



working in the waste and resource management sector. This board certifies approximately 7 000 candidates per year in qualifications ranging from level 1 (EQF level 2), to level 4 (EQF level 5) diplomas.

### A6.3. Skills development measures and programmes for the green economy <sup>(24)</sup>

There are no UK-wide anticipation activities for green skills or jobs. The lack of focus in this area has been attributed to the limited number of obvious green jobs available in the UK. There are several relevant skills anticipation initiatives, however, such as one carried out as part of RenewableUK's report *Working for a green Britain and Northern Ireland*. It estimated that 34 373 full-time equivalent jobs were supported directly and indirectly by wind and marine energy in 2013 (18 465 directly) as part of the green economy. Over the period to 2023 substantial employment growth was also forecast (with around 70 000 additional direct and indirect jobs being created).

Analysis of skills implications stemming from technological change, changes in government policy and legislation and other socioeconomic factors affecting the UK labour market is offered in the *Working futures* series. The latest forecasts (2014-24) also offer predictions for changes in employment at sectoral level.

There is no coordination of social partners in skills policy-making and programme design; this also applies to skills anticipation. A typical example of social partner involvement in skills anticipation is in the 2011 government report *Skills for the green economy*, wherein the Department for Business, Innovation and Skills engaged with the trade union organisation Unionlearn during the preparation phase to explore how the workforce could engage with the green economy.

Many of the currently available data on green employment in the UK are provided by SSCs, through sector-based skills anticipation assessments and forecasts, although green skills and jobs are not always explicitly mentioned in such research and data. For example, research carried out in 2014 found

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<sup>(24)</sup> The skills landscape described in this section primarily refers to the situation in England. The devolved administrations in Scotland, Wales and Northern Ireland have different skills policies and governance arrangements. See the full definitions of green skills and occupations in England and Scotland respectively at the end of this report.

that the construction and service sector would see employment increase by up to 108 000 net jobs a year over 2020-30, due to a major infrastructure investment programme to improve the Energy performance certificate (EPC) of UK homes by 2035. The research also suggested that, even as the initial investment stimulus wears off, there would be a net increase of 70 000 jobs in the UK up to 2030. In the waste management sector, data provided by the 2012 SITA assessment reported that up to 36 000 new jobs could be created directly by 2020 <sup>(25)</sup>. Most of these positions were predicted to be in operator and manual positions.

The 2010 national skills strategy set out various measures to support green skills. This included a new 'skills for a green economy' group of sector skills councils. This group was introduced to cover the following: to help businesses understand and address skill needs; to improve information quality, as well as available advice and guidance on the green economy through the new National Careers Service; to improve green skills training programmes in the further education and skills system; set up a renewables training network, with 2 000 places on training courses specifically tailored to the renewable energy sector; send STEM ambassadors into schools; and make funding available for up to 1 000 Green deal apprenticeships. Discussing the implementations of these measures, the Environment Audit Committee (EAC) of the House of Commons argued against government-led initiatives and called for the government to do no more than provide a stable long-term policy framework on the green economy, in order to afford the certainty that businesses need to make long-term investment in a skilled workforce.

Development and updating of occupational standards and qualifications in the UK is generally sector-based and rather fragmented; this complexity is increased by the different institutional arrangements applying in England, Northern Ireland, Wales and Scotland. The precise mix of training providers also varies substantially from locality to locality, even within the UK's constituent nations. Providers are responsible for the more detailed tasks of designing curricula and delivering training; the main focus is on further education colleges, though private training providers can also be significant

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<sup>(25)</sup> SITA (2012). *Driving green growth: the role of the waste management industry and the circular economy*. Maidenhead: SITA UK. <http://www.sita.co.uk/wp-content/uploads/2017/08/DrivingGreenGrowth-SITAUK-120423.pdf>

For more information see full country report (Cedefop, 2018c).

stakeholders in certain sectors and localities. National skills academies, and national colleges, many of which are relevant to green skills, are designed to enable industry stakeholders to set training standards and to develop the learning opportunities needed most by their industries. Selected examples of sector bodies supporting the development of skills for the green economy are shown in the box below.

### Examples of sector body activity relevant to green skills

**Power generation:** RenewableUK (and its member organisations) run the Renewables training network (RTN). The network is developing 'RTN assured' courses, which meet the needs of employers. Two courses (blade repair and inspection awareness and basic training) were launched in 2014 and further courses are currently being developed. RenewableUK has also launched its career mapping tool.

**Construction industry:** the Construction Leadership Council (CLC) works between industry and government to identify and deliver actions supporting UK construction in building greater efficiency, skills and growth. The CLC published a free sustainable building training guide in 2017 and the UK Green Building Council has also developed training in sustainability known as the Sustainability training and education programme (STEP).

Businesses in the **waste and recycling industry** signed up to the Energy and Efficiency Industrial Partnership. The partnership aims to solve skills shortages by filling critical gaps with a younger, more diverse and productive workforce. By 2016, 1 500 learners had received training, including upskilling programmes and apprenticeships. Industry-specific training programmes, including for 'utilities engineering technicians' and 'maintenance engineering operations technicians' were developed to meet the industry's skill needs.

Read more on pp. 25-26 of the full report. Cedefop (2018c). *Skills for green skills in the UK: an update*. <http://www.cedefop.europa.eu/en/uploads/dfu/countryreportuk>

There are no national active labour market programmes (ALMP) that focus on developing skills for the green economy. Similarly, retraining measures are usually developed at the sector level; as such no data are available for either of these areas. Further, employment service providers – public and private – do not play a role in planning green skills retraining measures. However, several charitable and not-for-profit organisations across the UK

offer ALMP supporting vulnerable groups and people into education, training and employment. One is the charity Groundwork, which offers skills training that leads to recognised qualifications in green jobs for the unemployed. Their work is typically project-based and funded by special programmes, such as the European Commission's LIFE+ programme.

Based on the multi-national set-up of the UK, it is difficult to gain a clear picture of the response of universities to green skills and the challenges that come with this.

The private sector plays a fundamental role in the UK skills system. Employers are positioned in leading sector bodies (such as SSCs) and in local economic partnerships (LEPs). Such sector bodies play a key part in shaping the development of occupational standards and the content of VET courses, including apprenticeships. Some employers also have direct links to higher education training institutions; for example, Siemens is a strategic partner of the University of Sheffield on wind power. There have also been initiatives to give employers more control over the design and delivery of training to address skills shortages, including green skills, through measures such as the Employer ownership and skills fund. While there is a clear policy shift to increase employer ownership of the skills system, employer-led bodies in several sectors relevant to the green economy have called for stronger government intervention in the skills system.

Although the involvement of the private sector means that labour market and skills assessments are more focused on the direct needs of employers – to cover issues such as skill gaps – it has also reduced the influence of trades unions.

#### A6.4. Conclusions and recommendations

Overall, the economic situation in the UK is currently buoyant, with evidence suggesting that there is significant activity in relation to the green, low-carbon economy. Since 2010, employment growth in low-carbon and environment jobs across the UK has been significant and it is anticipated to continue to grow.

The Energy Act 2013 and the Infrastructure Act 2015 have had an impact on the development of green jobs. However, some green subsidies put in place by these legislative changes have been subsequently withdrawn by government, along with plans to make all new homes carbon neutral.

The *Working futures* forecasts report that the transition to a low-carbon economy will have an impact on employment levels to 2024. This highlights the need for skill anticipation exercises to be undertaken – utilising appropriate methodologies – so that skills shortages can be addressed before they become a barrier to the green economy. Devolution of responsibilities and activities regarding the focus on green skills (to SSCs, trades unions and charitable organisations) also stresses the importance of taking stock of periodic anticipation exercises on green skills, as well as producing comprehensive reports on the demand for, and supply of, green skills.

The private sector plays an important role in shaping VET provision for new green occupations and for greening established jobs. However, it is difficult to assess how important new green occupations (and the related competence standards) are in the UK, because the development of standards, curricula and training are sector-based, fragmented, and undergoing change.

Some not-for-profit organisations offer labour market programmes for particular groups linked to green jobs and the development of green skills. However, it is not clear what the employment outcomes of incorporating a green skills component in ALMPs might be in the UK, or what green skills should be delivered under the umbrella of an ALMP. This highlights an area for further investigation.

High levels of private sector involvement are generally perceived to be positive. Nevertheless, there is also a risk that skills supply under the UK employer ownership agenda is overly focused on meeting current rather than future demand. Therefore, policy-makers, employer groups, and sector bodies should aim to ensure that both current and future green skill needs are being met.

## Official definition of skills for a green economy in England, 2011

Skills for a green economy	Skill needs
Skills supporting resource efficiency	<ul style="list-style-type: none"> <li>• Strategic business management to build resource-efficient business models leading to bottom line benefits and in preparation for new regulations</li> <li>• Business/financial accounting services around carbon and natural environment accounting</li> <li>• Skills to design and adopt technologies, products and processes increasing resource efficiency, including lean manufacturing</li> <li>• Project management skills with clear understanding of resource efficiency</li> <li>• Operator level actions to maximise resource efficiency (e.g. reducing waste in production)</li> </ul>
Skills supporting low-carbon industry	<ul style="list-style-type: none"> <li>• Scientists and engineers with training or transferable knowledge for nuclear and renewable energy (including wind and marine)</li> <li>• Technicians with training or transferable knowledge to install energy efficiency measures and retrofit at a household and business premises level</li> <li>• Skills to design and adopt technologies, products and processes to minimise carbon emissions</li> <li>• Operator level actions to minimise carbon emissions (e.g. driving in a fuel efficient manner)</li> </ul>
Skills supporting climate resilience	<ul style="list-style-type: none"> <li>• Scientific and technical skills such as modelling and interpreting climate change projections</li> <li>• Risk management such as assessments of future resource availability</li> <li>• Skills to design and adopt technologies, products and processes to improve climate resilience</li> <li>• Operator level actions to improve climate resilience (e.g. retrofitting water efficient technologies in households and business premises)</li> </ul>
Skills to protect and manage natural assets	<ul style="list-style-type: none"> <li>• Accounting services for the natural environment</li> <li>• Understanding of environmental impact assessments</li> <li>• Understanding and interpretation of environmental legislation targets, ecosystem services design and management and land use planning</li> <li>• Skills to design and adopt technologies, products and processes to manage natural assets</li> </ul>

## Categories of green occupations in Scotland

- (a) **New and emerging green occupations:** represent unique work and worker requirements, which result in new occupations. These new occupations could be entirely novel or 'born' from an existing occupation. For example, solar system technicians who must be able not only to install new technology, but also to determine how this technology can best be used on a specific site.
- (b) **Green enhanced skills occupations:** a significant change to the requirements of an existing occupation. An example occupation is an architect, with a requirement of increased knowledge of energy-efficient materials and construction.
- (c) **Green increased demand occupations:** an increase in the employment demand for an existing occupation, without significant changes in the work and worker requirements of the occupation. The context of the work may change, but the tasks themselves do not. An example is the increased demand for electrical power line installers and repairers related to energy efficiency and infrastructure upgrades.



# Skills for green jobs

2018 update

## European synthesis report

Preparing for sustainable growth within the context of a circular economy is an accepted policy aim across the globe. The implications for economic sectors, and consequently for occupations, skills and relevant policies, are undeniable. In 2010 Cedefop collaborated with the International Labour Organization and reviewed the state of play regarding 'green skills' and 'green jobs' in six EU countries (Denmark, Germany, Spain, Estonia, France and the UK). A European synthesis report built on the six country reports.

In 2017, the collaboration was repeated to ascertain progress made since 2010: this report provides a synthesis of the six new country reports. It examines the major changes in green jobs and employment since 2010, and analyses the regulations and policies supporting green skills and employment, including the surrounding institutional set-up and the role played by social partners. It also highlights good practices, including green skill anticipation mechanisms, relevant vocational education and training and higher education, active labour market policies and retraining measures, and the role of the private sector.

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