

FROM 'GREENOVATORS' TO 'GREEN' MINDS: KEY OCCUPATIONS FOR THE GREEN TRANSITION

The nuances of defining 'green' occupations

Under the European Green Deal, (see Box) a greener future is the European Union's new growth strategy. The energy crisis caused by the conflict in Ukraine has intensified these efforts.

As Cedefop has shown, [new occupations are emerging and existing ones changing](#), which makes up- and reskilling essential across the board. Some occupations are readily linked to the green transition, such as solar panel installers, but identifying 'green' occupations is not always so easy. Once, the green transition was about reducing fossil fuel dependency, which made it easier to define and operationalise occupational change. However, the growing intensity of the climate crisis has broadened efforts to curtail CO₂ emissions. Cedefop's 2023 study [From linear thinking to green growth mindsets](#) stresses the need for sectors to shift from linear to circular production models to reduce consumption of natural resources. This wider approach is shaping skill demand.

There is a lack of consensus on what 'green' occupations are ⁽¹⁾ and how to define them. For example, should the criteria be work tasks ⁽²⁾ or the skills needed for the job? Should it be the workplace, [with engineers producing electric vehicles being 'green' jobs and those making combustion engines 'brown' jobs](#)? Or should it be something else?

As most occupations probably include 'green' and 'non-green' tasks or skills, a ['greenness' continuous scale](#) provides an occupational classification with a better understanding of changes in skillsets, but timely updates are imperative to capture emerging green jobs. For example, the International Standard Classification of Occupations (ISCO-08), last updated in 2008, classifies many jobs relevant to the green transition, such as biofuel production managers, and biomass power plant managers, as 'business servic-

es and administration managers not elsewhere classified'.

Box. The European Green Deal

The [European Green Deal](#), presented by the Commission on 11 December 2019, sets the goal of making Europe the first climate-neutral continent by 2050. The [European Climate Law](#) enshrines in binding legislation the EU's commitment to climate neutrality and the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.

In the transition to a net-zero economy, Europe's competitiveness will strongly rely on its capacity to develop and manufacture the clean technologies that make this transition possible.

Are financial analysts 'green'?

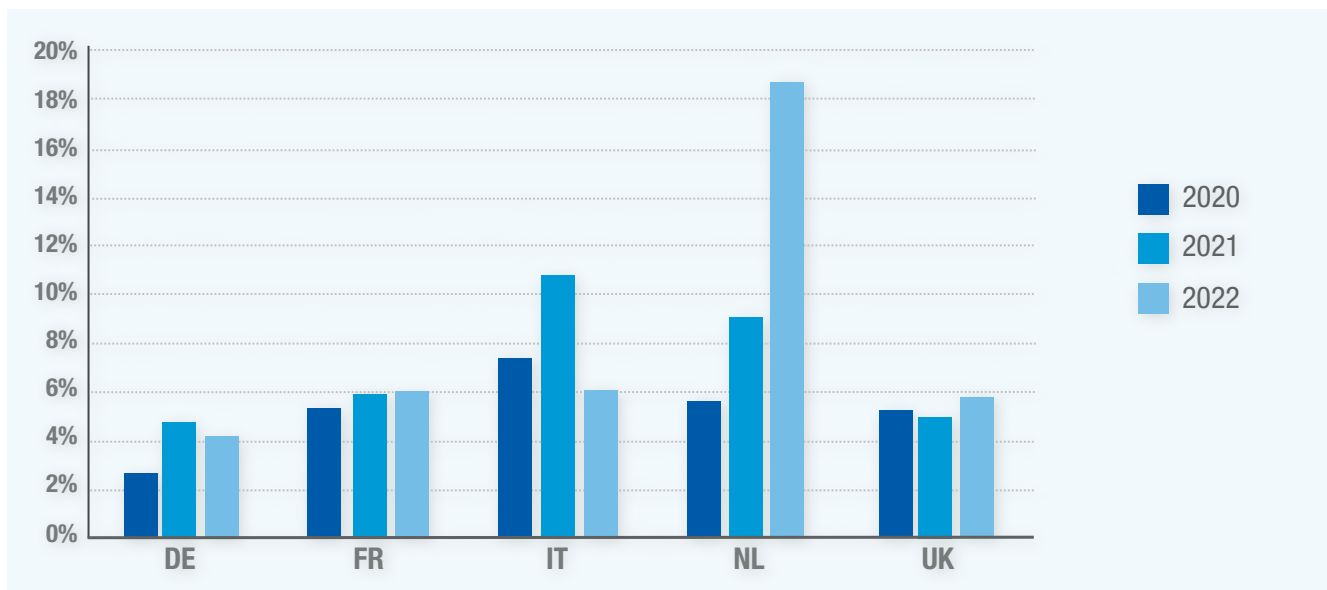
Given the difficulties of identifying 'green' occupations with outdated classifications, Cedefop has developed a data-driven approach: this extracts information from [online job advertisements related to skills associated with the green transition that are](#) asked for by employers. 'Greenness' is assessed by the job's skills and tasks, not only its title.

Financial analysts are a good case. They help companies evaluate opportunities arising from more sustainable and circular business models, products and services; and they support investment in green solutions. Yet, not all financial analysts need skills directly relevant to the green transition. In the Netherlands, for instance, more than 18% of job adverts for these roles mention 'green' tasks and skills, compared to 4% in Germany ([Figure 1](#)). Cedefop's feasibility study – covering France, Germany, Ireland, Italy, the Netherlands and the UK – shows employers looking for employees to be innovative, which requires a transversal skill whereby workers can create and adapt to any change, not only to the green transition.

⁽¹⁾ For example, see [Auktor, G.V. \(2020\). Green industrial skills for a sustainable future. United Nations Industrial Development Organisation.](#)

⁽²⁾ [Janser, M. \(2018\). The greening of jobs in Germany: first evidence from a text mining-based index and employment register data. IAB-Discussion Paper \(14\).](#)

Figure 1. Pervasiveness of 'green' terms in online job advertisements for financial analysts



Source: WIH-OJA.

Key occupations for the green transition

Implementing the European Green Deal can create about 2.5 million additional jobs across sectors and skill levels. Jobs in sectors crucial for the green transition, such as waste management, energy, construction and manufacturing, will see higher employment. The ensuing skills transformation calls for significant investments in up- and reskilling.

Greening of the EU economy goes hand in hand with technological development and innovation. Occupations driving innovation, particularly in engineering and R&D, will increase in importance. Such occupations may be small in terms of employment shares but indispensable in making the green transition happen.

These 'thyroid occupations', as Cedefop calls them – including existing occupations, such as waste treatment engineers and new ones – are linked to more sustainable product development.

Such occupations, like alternative fuels engineers, which can trigger innovation and 'green' solutions, demand high skills; they confirm the skills upgrading trend foreseen by [Cedefop's 2023 skill forecast](#). Medium-skilled occupations with more technical profiles, such as offshore renewable energy plant operators and biogas technicians, are equally critical.

Digitalisation, the other half of the twin transition, is a key driver of skill and job change. Significant growth is expected in ICT-related occupations, which will also boost the green transition. These include generic and sector-specific roles, such as waste sorting optimisation professionals and data scientists, but also e-commerce specialists.

Greater automation and a growing need for specialised roles linked to innovation may also shift the types of jobs in some companies, with [more people working in offices compared to production plants](#).

Reaching a more sustainable and circular paradigm signals the importance of many occupations, including those beyond 'greentech' design and implementation and those in response to digitalisation ([Figure 2](#)).

As highlighted by [Cedefop's skill foresights in four sectors](#), managerial positions, such as logistics and renewable energy managers, will need to guide companies towards circular production goals through the design and implementation of more sustainable products and services. 'Green hearts and minds' occupations will lead workers towards more sustainable behaviour. Most important, occupations like human resources specialists and sustainability trainers at sectoral level can ease the transition of workers and help tackle skill shortages.

Besides workplace developments, the green transition affects people's living spaces. Cities, home to most EU citizens, significantly shape and are being shaped by the European Green Deal. Green urban planners are essential for cities to become green(er) through resilient infrastructure, spatial planning, sustainable mobility and energy efficiency. Citizen engagement specialists can help implement the transition by translating policy goals and technical terms into convincing and meaningful messages for all.

Figure 2. Key occupations for the green transition (selected sectors, experts' assessments)



Source: Cedefop green skills foresights in [cities](#), [waste management](#), [agri-food](#) and [circular economy](#).

Greening VET for a greener future

Initial and continuing vocational education and training (VET) are important for meeting future skill needs arising from the green transition.

The European Commission's [Green Deal Industrial Plan](#) supports increasing the EU's manufacturing capacity to produce the net-zero technologies and products required. The plan includes a proposal for a Net-Zero Industry Act, to set goals for net-zero industrial capacity and to provide a predictable, simplified and fast-track regulatory process to help develop and expand net-zero technology production. The plan includes speeding up access to finance, developing resilient supply chains and, crucially, skills.

All sectors crucial for the green transition, as identified by the Green Deal Industrial Plan and including waste management, construction and energy, depend on intermediate skill jobs (at ISCED levels 3 and 4) to which VET typically provides access.

The entire range of skill needs within a sector can be met given the increased availability of higher levels of VET. For example, although tertiary education is the primary path for some 'thyroid occupations', such as waste management engineer, VET is increasingly used to train these professionals. This also links to differences in seniority and skills within occupations. While treatment engineers involved in the design and management of new technologies would require a university degree, waste plant operators and other relevant technical skill profiles will typically require

VET or higher VET qualifications.

Continuing VET plays a major role in supporting worker up- and reskilling. [Cedefop-led case studies](#) identified good practice in companies increasing the sustainability training they provide. Such training covers workers across departments and occupations, from those close to the company's core business to finance and legal teams, to help them understand and incorporate changing environmental requirements.

Targeted continuing VET can also help vulnerable groups to fill jobs in critical 'green' occupations: [microcredentials](#), to accredit continuing VET that does not lead to a full qualification, can be a powerful tool in this respect. VET must cover the range of skills needed in key occupations for the green transition. For example, green urban planners should not only understand biodiversity elements, but also master marketing, negotiation and outreach skills.

VET system adjustments may be necessary to serve better the current skills revolution. Stronger co-ordination, and collaboration between stakeholders – such as social partners and training providers – is crucial to designing and developing new courses and programmes that meet demand at local and regional levels. Existing VET programmes need updating and enriching to deliver job-specific and transversal skills relevant to the green transition. By systematically implementing principles and processes related to the circular economy across all curricula and courses, including in early years of education, VET can facilitate the change from linear to circular production. This then reinforces circularity mindsets.

Links between economic sectors and the drivers of change affecting them, place greater emphasis on interdisciplinarity in training for the circular economy. There is scope for including modules developed specifically for the green transition across a wide range of courses and programmes. More problem-based learning courses, industrial symbiosis training, higher EQF level initial VET programmes in key circular economy processes, and ICT-related module development are necessary to expand workers' learning potential and meet labour market needs.

Apprenticeships and other forms of work-based learning, provided through initial or continuing VET, can be effective in delivering skills conferring economic value on both learners and employers. A Cedefop study in 2022, showed how workplace learning can be particularly relevant in encouraging young people to enter [outwardly unattractive sectors important for the green transition](#), such as waste management.

Efficient VET provision highlights the importance of training VET school teachers and trainers in circular economy skills to provide learners with the skills to advance circularity practices. Increasing R&D co-operation with higher education, participation in partnerships such as centres of vocational excellence or 'hubs', promoting systemic thinking and entrepreneurial skills, are all important for [meeting the future skill needs of the circular economy](#).

Including information on repair, recycle and reuse jobs in career guidance, as well as expanding the validation of non-formal and informal learning, can help meet the circular economy's future skill needs.

The green transition is not limited to sectors such as energy, or specific occupations such as environmental engineers. The green transition permeates all sectors and occupations. For example, Europe's net-zero climate targets are influencing how products and technologies are designed and implemented. This affects the regulatory framework in which manufacturing and the administrative and finance sectors operate, which in turn will change what and how decisions are made in developing the circular economy.

This extends the types of skills needed to deliver the green transition: from 'green' skills, originally perceived mostly as technical and job-specific, aiming to reduce CO2 emissions, to skills for the green transition based on a green(er) overall mindset. Green occupations encompass not only those powering 'green' technological change and infrastructure, but also those that support the shift towards new, more circular sustainable EU economies and societies. The need for this shift emphasises the importance of VET and its role, not only in delivering the skills to produce and implement technologies, but also in developing green minds to innovate and implement the green transition.


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