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Social and Labour Market Impacts of the Green Transition in the European Union

One of the key challenges of the decarbonisation process to mitigate climate change is how to maintain labour market balance and safeguard social welfare policies during the green transition linked to digitalisation and demographic change. While many jobs in carbon-intensive sectors are being lost or transformed, there is an increasingly obvious shortage of skilled workers in green sectors. An overview of the social and labour market impacts and trends of the green transition is hampered by the fact that a generally accepted approach and conceptual framework for the concept of green jobs has not yet been developed, and its embeddedness in the labour market is assessed based on different methodological measures. Drawing on the relevant literature, surveys and databases, the paper argues that the EU's 'just transition' initiative is an essential tool and precondition for the green transition, which requires both the mapping of processes that facilitate the adaptation of labour market mechanisms and the tailor-made use of surveys that underpin evidence-based approaches.

Keywords: green transition, European Green Deal, green job, green skill, just transition

Introduction

As with the effects of industrial revolutions and globalisation, the decarbonisation process, which mitigates the effects of climate change, has a major impact on the economies and workers of countries, regions and sectors worldwide. One of the key challenges for both the European Union (EU) and the OECD Member States is how to preserve the traditional welfare state and social security systems during the decarbonisation of the labour market – the green transition – which is also closely linked to the changes brought about by the digital and the demographic transition.[2] Balancing climate action with a predictable and stable labour market involves a number of economic, political and social tensions, due to the loss and transformation of some jobs in carbon-intensive sectors, the weakening of the sustainability of social protection and welfare policies,

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[2] Petmesidou–Guillén 2022.

and the challenges of meeting the new skills required by the emergence of green jobs that contribute to preserve or restore the environment.[3] At the same time, there is an increasingly evident shortage of suitably skilled labour in the so-called green sectors such as renewable energy and energy efficiency, which poses further complex problems and challenges in terms of education, training and labour market integration in the whole of the EU, with special regard to the Central and Eastern European (CEE) and Western Balkan countries.[4]

The social and labour market impacts of the green transition have been the subject of numerous surveys, policy papers and studies, but a generally accepted conceptual framework for the green transition has not yet been developed. In particular, diverging interpretations of the concept of green jobs have been an obstacle to common action by Member States.[5] As a consequence, the data available from the various databases do not necessarily refer to the same phenomenon and are therefore of limited use in describing the impact of the green shift on the labour market, in particular with regard to its territorial, economic and social aspects, the characteristics of jobs and changes in the living conditions of the groups of workers concerned. These phenomena, like the effects of digitalisation and demographic change, present risks and opportunities, which call for both a mapping of the processes shaping the environments that are at the forefront of the adaptation of current labour market mechanisms and an understanding of the content and methodological specificities of the surveys that underpin evidence-based approaches.

Although addressing the impacts of climate change has been on the policy agenda of EU and OECD countries for decades, the assessment and management of the labour market impacts of changes brought about by green policies and stricter environmental regulation has only recently come to the fore. Addressing these increasingly pressing challenges has given rise to the EU's 'just transition' agenda, which has recently become a dominant narrative in policy discourse, strategy documents and academic research.[6] The policy framework for the just transition is the European Green Deal (EGD), which aims to kick-start the green transition in the EU and ultimately ensure the achievement of the 2050 climate neutrality target.[7] The EGD is in fact a package of policy measures that initiates a series of economic reforms that will undoubtedly change the way we produce and consume and thus affect both the redistributive (protective) social policy systems of the Member States and the economic (productive) social policies pursued by the EU. In response, the EGD underlines that the green transformation must take into account social justice aspects alongside climate protection.[8] In order to reduce economic inequalities and social tensions, the EGD seeks to link Europe's green transformation to an inclusive growth strategy for ecological modernisation. The Just Transition Mechanism (JTM), one of the main pillars of the EGD that underpins the concept of

3 ILO 2023: 4; OECD 2023; OECD 2024.
4 RÖSCH–EPIFANIO 2022; IGNJATOVIĆ et al. 2024.
5 OECD 2023; URBAN et al. 2023.
6 GALGÓCZI 2020; SABATO et al. 2023; DING–HIRVILAMMI 2024.
7 European Commission 2019.
8 ZIMMERMANN–GENGNAGEL 2023: 540.

just transition with concrete programmes, plays a key role in creating the supportive environment needed to make the transition a reality.

Another cornerstone of a green and just transition is the creation of green jobs. Reliable and informative data is essential to assess the need for jobs and to define their roles. This provides the basis for ensuring a green workforce with the right knowledge, skills and qualifications, the lack of which is a major impediment to the green transformation. In the European Union, for example, in the second quarter of 2022, nearly 30% of firms in the sectors and services concerned reported labour shortages and skills mismatches, making it difficult to fill vacancies or create new ones. However, the data on jobs created by green policies varies widely, mainly due to a lack of consensus on how to measure green jobs.[9] This is because different studies and institutions use different approaches, which makes it difficult to assess the impact of green policies consistently across and between countries.

While the concept of green and just transition has attracted increasing interest, including research on the sustainability of the welfare state and on eco-social policies, relatively less attention has been paid to identifying and analysing aspects that influence the labour market impacts of the transition. Against this background, the paper seeks to answer the question of how the sustainability of social-welfare policies and labour security are affected by changes in labour market processes in the process of green and just transition. The paper argues that the EU-initiated just transition is an essential instrument and precondition for green transition. It highlights that within the complex and integrated framework of green transition, green jobs are seen as an employment opportunity, green skills as a training and retraining objective and a supportive environment as a comprehensive framework for social inclusion.

The analysis is based on the current literature on the subject, the EU and other international organisations (OECD, International Labour Organisation), influential public policy institutes and international statistical data.

The green transition environment: Competing paradigms and trade-off effects

Different approaches to green transformation are born out of different interpretations of the causes of the climate crisis, ranging from market-embracing green growth to radical anti-capitalism. At the same time, these debates have significantly broadened the interpretative frameworks of both green and just transformation, including, among others, the main elements of degrowth, the post-growth alternative advocating the decoupling of economic growth and welfare, and doughnut economics, situated between the minimum of consumption and the planetary environmental maximum.[10] Critics also point out, however, that in fact many socially beneficial and environmentally beneficial post-productivist forms of work – such as care and voluntary work – have emerged over

[9] OECD 2023: 21.

[10] Antal 2021: 186; Mandelli 2022: 13.

the past decades outside the formal labour market, but are ignored or even discouraged by employment services and social security systems.[11] This in turn means that a balance must be found between employment based on economic growth and decarbonisation.

The different concepts and paradigms clearly show that the goals and means of the green transition should reconcile with the achievements of social security and welfare policies based on social redistribution.[12] Since the end of the 19th century, welfare states have developed redistributive and protective social systems based on social rights, which have been able to manage social conflicts, create social security and ensure the well-being of their citizens. The most important instruments are health, pension, family and unemployment benefits and minimum income schemes.

In contrast to the protectionist approaches of the traditional nation state framework, the EU is pursuing a different, productive, i.e. economy-oriented social policy, based on the responsibility of citizens and promoting active participation in the labour market. Its main instruments are supply-side measures, such as demand-driven training schemes and employment support services. This paradigm shift is also reflected in the EU's Lisbon Strategy, announced in 2000 and renewed in 2020, which sees active labour market participation as a right to different levels of social benefits, as opposed to rights-based social protection.[13] In other words, the work–welfare nexus depends on the level of growth and the labour market demand it generates.

The two social policy models have created a division of labour between the EU and the Member States.[14] Despite the fact that national welfare systems have taken over many elements of productive social policy, this does not mean that the position of protective social policy systems has been weakened. Preserving the latter is also necessary because, in the context of the green transition, both social policy models are facing serious challenges, against the background of demographic and digital transition.

Demography, and particularly the ageing of the population is a major challenge for almost all European countries. The phenomenon of an ageing society is a complex problem, based on a persistently low birth rate on the one hand and an increase in the number of older people, the average life expectancy and the old-age dependency ratio on the other. The European Commission forecasts that the population of the European Union (EU) will peak around 2026 and then gradually decline in the decades thereafter. As a long-term consequence, the EU working-age population will be 57.4 million fewer by 2100, while the dependency ratio of older dependants will start to rise sharply (from 33% to 60% by 2100).[15] This trend is supported by medium-term projections that over the next 30 years, the number of people aged 65 and over will increase by 41%, while the number of people aged 80 and over will increase by 88%.[16]

11 DUKELOW–MURPHY 2022: 512.
12 GRAZIANO 2024: 33; ZIMMERMANN 2024: 59.
13 TÓTH 2018.
14 ZIMMERMANN–GENGNAGEL 2023: 528.
15 European Commission 2023.
16 European Commission 2022.

In this context, the translation of the "green and digital transition" into practice cannot do without considering and adapting the synergies and trade-off effects of demographic change.[17]

Demographic changes will also have a negative impact on the human resources and competitiveness of Member States, as ageing and declining working age populations are expected to exacerbate labour shortages, increase the pressure on public budgets and contribute to further widening disparities between regions. Consequently, more and more older people will be dependent on the financial and social care of a declining working age population.[18] This will be exacerbated by a deepening polarisation of jobs and widening wage gaps, linked to the spread of non-traditional forms of employment (e.g. online work) and the decline of traditional jobs requiring medium pay and intermediate skills.[19] These trends are linked to a steady widening of the generational gap in social security: young people in non-traditional employment find it much more difficult to access social security benefits than older people.

A typical example of trade-off effects is carbon pricing, which is seen by many as an effective tool to reduce GHG emissions, and which would lead to significant and lasting reductions in GHG emissions, but also to increases in energy and raw material prices. The associated costs would disproportionately affect vulnerable groups in society (especially the elderly) and low-income households who need offsetting measures. Homes left unheated could have serious health impacts, which would increase social costs, while the additional costs could be covered by revenues from various carbon taxes. As a further example, the ageing of the workforce may be partly offset by the job-creating effects of digitalisation and automation,[20] while new digital technologies may improve access to health and social care in ageing societies. At the same time, technological change may increase the digital divide, as older people–workers find it harder to adapt to new skills and competences. Only 28% of people aged 65–74 have basic digital skills, compared with 70% for both 16–24 and 25–34-year-olds, a figure exacerbated by macro-level and regional differences between Member States.[21]

This indicates that technological innovation and digitalisation have the potential to be an effective tool to address the challenges of the green transition, but 44% of European citizens currently lack basic digital skills, which is a barrier to using digital technologies for everyday tasks and accessing services offered online.[22] Based on current trends, if the EU does not engage a much wider range of target groups in education and training than in the past, only 59% of the population will have at least basic digital skills by 2030, compared to 56% today.[23] Developing the digital skills of the population is therefore one of the EU's biggest challenges, affecting all its strategic objectives.

In terms of employment, the projections are mixed: the International Labour Organization (ILO) estimates that the decarbonisation process, supported by digitalisation,

17 European Commission 2023a: 1.
18 Tóth 2024: 128; Szűcs 2024: 95.
19 Petmesidou–Guillén 2022: 321.
20 Fási 2022.
21 Eurostat 2023b.
22 Eurostat 2023a.
23 Eurostat 2023a.

will create 24 million new jobs and only 6 million job losses by 2030, while the OECD projects a more modest increase.[24] The OECD also warns that the digitally enabled jobs created by the transitions may not necessarily require more highly skilled and better paid workers than at present, and that less stable forms of employment are likely to emerge compared to traditional employment.[25]

Green skills are essential to fill green jobs that match the needs of the sector. This means not only skills, but also a conscious attitude towards green professions and skills such as systems thinking and empathy. In contrast, only one in eight workers worldwide have some form of green skills. According to the World Economic Forum, nine out of ten jobs will need digital skills by 2030, while in 2020 only 44% of the EU population had basic digital skills and only one in five had digital skills beyond basic.[26] Consequently, as things stand, labour market supply is not matching the requirements of the growing number of jobs requiring green skills. In practice, this means, for example, that more than one third of the EU workforce will need to be retrained in the near future, while 80% of European workers have already left the education system and entered the labour market.[27] However, this implies the possibility of a further trade-off between the dynamic effects of labour market demand and the potential added value of green growth on the one hand, and the costs of further training and the additional expenditure needed to replace the incomes and labour force of active workers (typically adults) who temporarily drop out of the labour market on the other. All of this, in a difficult global economic environment and the associated socio-political tensions, could significantly slow down the green transition.

All in all, the green transition is a complex problem, made up of factors that often involve conflicting goals and ambitions. Among these, the work vs. environment dilemma is of particular importance, framed from the perspective of labour market change by the combined impact of green, demographic and digital transitions.

The green transition and the just transition

The origins of the just transition go back to the workers' movements of the 1970s, which sought to respond to the problem of how to reconcile interventions to mitigate the effects of climate change with their social and labour market consequences. This situation is best expressed in the dilemma of work versus environment, which has become increasingly acute as a result of the acceleration of climate change, the effects of which are increasingly felt in everyday life.[28] In response to this complex set of problems, the European Commission launched the European Green Deal (EGD) in December 2019, with the explicit aim of making Europe the world's first carbon neutral continent by

[24] ILO 2018: 35; BOTTA 2019: 7; VANDEPLAS et al. 2022: 5.
[25] OECD 2021: 33.
[26] World Economic Forum 2020.
[27] McKinsey 2022.
[28] HOFFMANN–PAULSEN 2020; ZIMMERMANN–GENGNAGEL 2023: 525.

2050. The European Climate Law, adopted in 2021, also set a sub-target in the form of a "Fit for 55" package to reduce emissions by 55% by 2030 compared to 1990 levels.[29]

The EGD sees the green transition as an important stimulus for economic growth but also wants to reflect the socio-economic impacts of climate change and the ecological transition. This is reflected in the ILO's earlier concept of just transition, which is based on the premise that social justice and economic stability must be achieved through the radical changes needed to achieve ecological goals.[30] The EGD is built around 10 target areas that express specific aspects of the transition. Eight of these specifically cover economic sectors, with the remaining two target areas "Financing the transition" and "Leave no one behind" (Just Transition). The latter area is being implemented through the Just Transition Mechanism (JTM), which together with the Social Climate Fund (SCF), part of the Fit for 55 packages, forms the social dimension of the EGD. The main objective of the JTM and the SCF is to mitigate the negative social and labour market impacts of the green transition.

The JTM is a funding mechanism under Cohesion Policy to support the regions and communities most affected by the transition to a low-carbon economy, based on three pillars: the Just Transition Fund (JTF), the InvestEU Just Transition Scheme and the Public Sector Loan Facility.[31]

The Territorial Just Transition Plans (TJTPs) are the key governance instruments of the JTM. In the TJTPs, Member States were required to develop plans outlining how they will ensure a just and inclusive transition to a low-carbon economy. These plans had to identify the regions and communities most affected by the transition and define measures to support them, while ensuring social dialogue and stakeholder involvement. The introduction of both the JTM and the TJTPs demonstrates that territorial cohesion, a key pillar of cohesion policy, is increasingly linked to the implementation of the strategy for a "smarter and greener Europe".[32]

The PPA is essentially an economic instrument that prioritises regional development, job creation and the implementation of active labour market policies (ALMPs), and from this perspective it continues the EU's productive social policy approach. The EGD declares that it "protects citizens and workers most vulnerable to the changeover by ensuring access to retraining programmes, employment in new economic sectors or energy-efficient housing".[33] Typically, it sees addressing energy poverty – which occurs when

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29 Official Journal of the European Union 2021.

30 The concept of a just transition was first highlighted by the International Labour Organization (ILO) in its 2015 "Guidelines for a Just Transition". According to the ILO, the aim of a just transition is to ensure fair working conditions, social inclusion and the eradication of poverty in the transition to ecological sustainability. The EU has adapted this approach in the Paris Agreement. In practice, the just transition was first put into practice in the framework of the Energy Union in 2017 and became part of the EGD in 2019.

31 The JTF provides financing support to fossil fuel-dependent regions and communities, for example in the areas of coal mining and oil and gas extraction, the Invest EU programme supports long-term sustainable investments, for example in renewable energy and clean transport systems, and the Public Sector Loan Facility focuses on infrastructure and public services. See in detail European Commission 2020; European Union 2021a; European Union 2021b.

32 Kaiser 2023: 19.

33 European Commission 2019: 16.

a household must reduce its energy consumption to a degree that negatively impacts the inhabitants' health and wellbeing – not in the form of direct financial payments, but in the form of subsidies for retrofitting or insulation for poorer households.

In contrast, the SCF offers financial compensation to vulnerable households, micro-enterprises and public transport users in the form of direct income support to offset rising housing, transport and energy prices. Noteworthy that together with the 25% co-financing by Member States, the SCF will mobilise a total of €86.7 billion, more than one and a half times the amount of the JTM for the period 2021–2027. This is certainly a new element in EU social policy, which moves away from the ALMP towards the traditional protectionist approach of Member States.

The introduction of the SCF is a milestone, as the EU has explicitly recognised that social inclusion can be achieved in the context of the green transition. Overall, the JTM is based on productive social policy, while the SCF is based on protective social policy, so that in essence the division of labour between the two models is now also being implemented at EU level. However, this integrative approach does not in itself resolve the underlying problem of the work vs. environment dilemma at the heart of the just transition, which requires a review of the conceptual framework and measurability of green jobs as a key element of the production chain.

Green jobs

Current trends and forecasts show that green growth could generate significant demand in the labour market, especially in the clean energy, clean technology and digital industry segments. Over the last ten years, employment in the EU's environmental goods and services sector has grown faster than the overall employment rate. Between 2010 and 2021, the employment rate in the sector will increase from 2.1% to 2.5%, representing around 5.2 million full-time workers.[34] Green industries and related sectors not only create new jobs, but also absorb large numbers of new workers, including those coming from traditional fossil fuel industries. Consequently, green job creation has the potential to offset the negative effects of decarbonisation on employment.

The labour market implications of the green transition are expected to manifest themselves in multiple ways and generate multiple changes. New types of jobs are expected to emerge in newly created occupations that did not previously exist, while at the same time there will be occupations and jobs that will disappear, particularly in high-emission activities such as coal and gas extraction, and finally the green transition will also be accompanied by changes in the skills required – from construction to fashion and scientific research.[35]

The EU has also responded to global trends, both in the form of the EGD mentioned above and the Net Zero Industry Act (NZIA), which aims to create 2.5 million jobs by 2030, resulting in an overall increase in employment of 1.2% to promote clean technologies and green jobs in Europe. And the Net Zero Industry Act calls for an increase in the

34 Eurostat 2024.
35 OECD 2024: 14.

production of technologies that facilitate the transition to clean energy and that have very low, zero or negative greenhouse gas emissions.[36]

Although green jobs are found in all sectors, they are currently most numerous in manufacturing, construction and transport. Other services, which account for a larger share of total employment worldwide, are mostly made up of occupations that are neither green nor GHG-intensive (green-neutral, the so-called white sector). According to Deloitte, emerging sectors such as hydrogen also offer opportunities for job creation. They estimate that globally, the hydrogen sector could create up to 10,000 new jobs by 2030 and up to 100,000 by mid-century.[37]

The interest in green jobs is also boosted by the fact that wages in this sector are higher than average worldwide. However, given the obvious large disparities between wage categories across countries, the multifaceted nature and scope of green jobs have to be duly taken into account. Middle-aged workers (35–54 years old) are slightly more likely to be in green jobs, and men are more likely to be in green jobs. For women, this is both an advantage and a disadvantage: on the one hand, their concentration in services puts them at less risk of job losses due to the green transition, and on the other hand, it raises questions about their ability to take advantage of the growing employment opportunities in the highest paying, expanding sectors.[38]

In order to measure the differences in more detail, the OECD introduced the concept of "green-driven occupations" which includes both jobs that directly contribute to reducing emissions as well as those that provide products and services required by green activities.[39] Taking this broad but operational definition which departs from the task-based approach to green jobs, the OECD published an overarching report in 2024 with an aim of measuring the effects of climate policies on the changes of the labour market.[40] By considering the percentage of green-driven occupations in wage and salary employment, by country and hourly wage category, the report found that in the 26 countries surveyed by the OECD, the prevalence of green occupations is higher among higher-paid workers than in lower wage categories. In the Nordic and Anglo-Saxon countries, there is a large bias in favour of green jobs: in Norway, 31% of higher-paid workers and 15% of lower-paid workers worked in green jobs, while in Denmark the corresponding figures are 23% and 9%, respectively. In Canada the difference is 24 vs. 12, and in the UK 22 vs. 12%. By contrast, in Hungary, Italy, Luxembourg, Slovenia, Portugal, Belgium and the Netherlands, green jobs are more common among lower paid workers. In our country, 36% of lower earners, 22.2% of middle earners and 20.5% of higher earners worked in a "green" job during the period[41] (Figure 1).

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36 European Commission 2023b.

37 Deloitte 2022.

38 Erdélyi 2024.

39 OECD 2024: 68.

40 As regards the methodology used, the report's estimates relied on the latest version of the O*NET database and the selected country-specific sources. See in detail OECD 2024: 94.

41 OECD 2024.

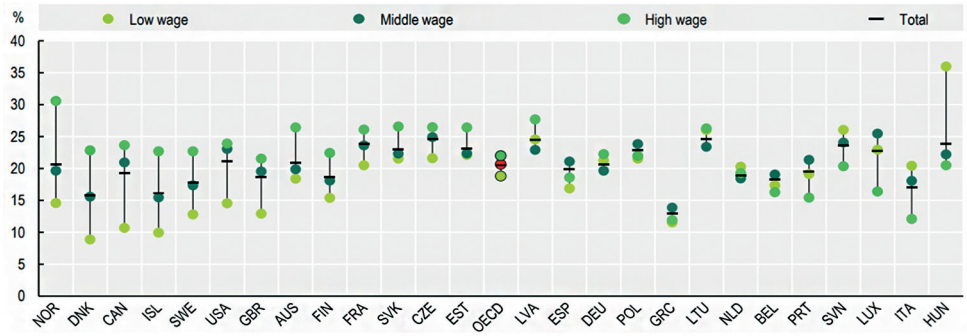

Figure 1: Incidence of green-driven occupations by country and wage category 2018

Source: OECD 2024: 94

Despite the OECD's report clearly justifying the significant labour market impacts of the green transition, there is currently no generally accepted definition of what we exactly mean by green jobs. International organisations and national governments define green jobs in different ways. According to the ILO definition, a green job is a decent job, whether in the agricultural, industrial, service or government sectors, that contributes to preserving, restoring and improving the quality of the environment.[42] The European Centre for the Development of Vocational Training (Cedefop), for example, defines green skills as "the knowledge, skills, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society".[43] Thus, while the ILO defines the essence of a green job as its simultaneous role in mitigating environmental impacts and creating social security, the OECD–CEDEFOP focuses on skills.

However, these definitions are relatively broad and not operationalised, i.e. they are not applied systematically to the data available worldwide. This has led to the need for an empirical approach to green jobs based on surveys and analyses, which are divided into two main strands.[44]

Top-down approaches consider green any job within specific sectors, such as the renewable energy sector, facilities or activities that contribute significantly to preserving or restoring environmental quality, keep emissions low or reduced, and minimise waste and pollution. Bottom-up approaches, on the other hand, start from the characteristics of jobs and occupations, regardless of the sector of the economy in which they operate.

Linked to this division are surveys and evaluations using methodologies with different interpretative frameworks. The top-down approach includes the regular report based on the International Renewable Energy Agency (IRENA) survey of the number of full-time equivalent green jobs in the renewable energy sector.

The other Eurostat database often cited for its top-down approach is the environmental goods and services sector (EGSS). The EGSS, also referred to as "eco-industry" or "environmental industry", includes all organisations that are engaged in environmental

42 MKIK 2020: 4.
43 OECD–CEDEFOP 2014: 20.
44 OECD 2023: 22.

production, i.e. economic activities that result in products for the environment and natural resource management. Examples of the former include electric vehicles, catalytic converters and filters that reduce pollutant emissions, wastewater and waste treatment services, noise insulation works or restoration of degraded habitats. Examples of the latter include renewable energy production, energy-efficient and passive buildings, desalination of seawater or rainwater recycling and materials recovery. The EGGS also measures employment in full-time equivalent jobs but covers a wider area than IRENA.

The advantage of top-down approaches is that they are relatively easy to interpret and analyse, and they allow for a more nuanced analysis by identifying jobs that support green activities in otherwise non-green sectors and firms. The latter is also a major drawback, as there may be jobs in a green sector or firm that are not related in any way to green activities or the production of green products.

Bottom-up measurements are based on the characteristics of each job, mainly the extent to which it supports green goals, requires green skills and competences, and is decent in terms of wages, safe working conditions, job security, career opportunities and workers' rights. This group includes the task-based approach used by the OECD, which is an excellent tool for assessing the labour market effects of structural transitions (demography, digitalisation).[45] It has the advantage of providing direct information on the needs of the green labour market, irrespective of sectors, and on how workers can transition to new jobs or sectors through retraining or upskilling. Its disadvantage is that it basically provides a snapshot of green jobs, while the nature and components of tasks may change over time and the levels of data collection (national, regional, local) are not all the same across countries.[46]

The latest OECD Labour Market Survey adds new perspectives to task-based approaches. Rather than looking at how the functioning of the labour market contributes to achieving the green transition, it focuses on the impact of climate change mitigation policies on employment and incomes. The survey considers all jobs (green-driven occupations) that are likely to be affected by the transition to net zero, not just those that are considered green per se.[47]

The impact of the green transition on the labour market in figures: The situation of Hungary in international comparison

According to EGGS estimates based on a top-down approach, employment in the EU green economy grew from 3.2 million FTE in 2000 to 5.2 million FTE in 2021, accounting

45 OECD 2023.

46 The most widely used resource is the Occupational Information Network (O*NET) of the U.S. Department of Labor, which provides information on a wide range of occupations, the tasks they entail, and the skills needed to perform them through direct surveys, expert consultations and case studies.

47 OECD 2024: 78.

for around 2.5% of total EU employment.[48] The growth in green employment between 2010 and 2021 was largely driven by an increase in the number of jobs related to energy resource management by 525,000 FTE (full-time equivalent). The second largest contributor to the growth in green employment was waste management, where the number of jobs increased by 259,000 FTE (+24%) over the period. Employment in all other sectors grew by varying degrees. Smaller increases were recorded in water management (+4%), wastewater management (+10%) and other environmental protection (+22%).[49]

The share of employment in the EU green economy compared to the total EU economy will increase by 0.4% (or 1.1 million full-time equivalents) between 2010 and 2021. This represents an increase of 25%, compared to an increase of only 7% for the EU economy as a whole over the same period. Steps taken to support the green transition will create more green jobs in the EU by 2030, notably by applying the principles of the circular economy and moving towards a low-carbon economy. It is therefore expected that policies, measures and investments will increase the share of green employment in total EU employment by 2030.

In most EU Member States, the share of green employment in total employment increased between 2014 and 2021. However, there were exceptions, such as Malta (–13%), Hungary (–13%), Romania (–12%), Finland (–8%), Latvia (–4%) and Cyprus (–1%). The most significant increases were recorded in Bulgaria (104%), Luxembourg (70%) and Poland (52%).

In 2021, the highest shares of green employment as a share of total employment were recorded in Luxembourg and Estonia, where sustainability employment exceeded 5% of total employment. Finland and Austria also recorded shares close to 5%. In contrast, the lowest rates of 1.5% or less were recorded in Hungary and Malta.[50]

Overall, the number of people employed in environmental management in Hungary is below the EU average and has been slowly declining in recent years.[51]

The impact of the green transition on the labour market in the renewable energy sector is measured by IRENA and the ILO, which also take a top-down approach. The latest figures show that by 2021, 12.7 million jobs will have been created thanks to the expansion of renewable energy.[52] A year later, the ILO and IRENA have already registered 13.7 million jobs, of which about one third are linked to the solar industry, creating one and a half times as many jobs as if the same amount of money were invested in fossil industries.[53]

In terms of types of renewable energy, Hungary has traditionally performed well in biofuel and biomass production.[54] The biomass biofuels and biomass production sector

48 This indicator is directly based on data published by Eurostat, and the underpinning methodology can be found in Eurostat. EU-level data are based on Eurostat estimates. A detailed discussion of statistics on the environmental goods and services sector can be found in Eurostat 2016.

49 Eurostat 2024.

50 European Environment Agency 2024.

51 While 46,778 people were employed in the sector in 2020, this figure fell to 42,969 in 2021 (Eurostat 2024).

52 IRENA–ILO 2022: 3.

53 IRENA–ILO 2023.

54 Hungary is highly suitable for biomass production, which accounts for more than 80% of all renewable energy sources (MKIK 2020: 12).

accounts for the largest share of green jobs in Hungary. This is confirmed by IRENA's latest report, published in 2023, which shows that the number of jobs in the renewable energy sector in Hungary is as follows: biogas 1,000, wind 1,000, geothermal 1,000, silica biomass 12,000, biofuels 20,000, solar and other solar 23,000. These figures show that the solar sector employs the second largest number of workers. This is in line with European trends, as the sector employed only 1,500 people in 2017, but has seen a large expansion from the following year onwards.

If we look at the share of people working in the total renewable energy sector in the active population compared to the other countries of the Visegrád Four (V4), we get the following figures (Table 1):[55]

Table 1: Share of renewable energy workers in the active population 2017–2023

	2017	2023
Hungary	0.8%	1.2%
The Czech Republic	0.5%	0.8%
Poland	0.4%	1.1%
Slovakia	0.6%	0.6%
Total V4 countries	0.5%	1%

Source: compiled by the author based on MKIK 2020, IRENA 2023

The data shows that in 2017, Hungary had the highest share of people working in the renewable energy sector in the total active population. It was followed by Slovakia and then the Czech Republic. Poland closes the gap, with half the share of Hungary.[56] By 2023, Poland will have grown the most, almost three times its 2017 value, but still lags behind Hungary, where, after a 50% increase, the share of people working in the renewable energy sector in the total active population is the highest in Hungary. The Czech Republic also saw a 50% increase, while Slovakia stagnated. For the V4 countries as a whole, the share of people working in the renewable energy sector in the active population doubled between 2017 and 2023.

According to the third bottom-up survey, 21% of workers in OECD countries worked in green-driven jobs between 2015 and 2019.[57]

Of these, the proportion of new and emerging occupations is 14%; the proportion of existing jobs that have increased in demand because they produce goods and services needed to make the green transition is 40%; and the proportion of existing occupations for which the skills needed have increased because of the green transition is 46%.[58]

[55] IRENA publishes detailed statistics on renewable energy capacity, power generation and renewable energy balances. This data is collected directly from members using the IRENA Renewable Energy Statistics questionnaire, official statistics; industry association reports and other reports and news articles. These resources are supplemented by desk research where official statistics are not available. MKIK builds on the detailed dataset of EGGS.

[56] MKIK 2020: 14.

[57] OECD 2024.

[58] OECD 2024: 68.

According to the survey, Hungary had a higher share of green jobs than the OECD average (23.1%), which is in line with regional trends. In Poland the share of green jobs is close to 24%, in the Czech Republic 24.3% and in Slovakia around 25%. It is also worth noting that in Germany and Slovenia, neighbouring the V4 countries, the rate is 21%, and in Austria 20% (Figure 2).

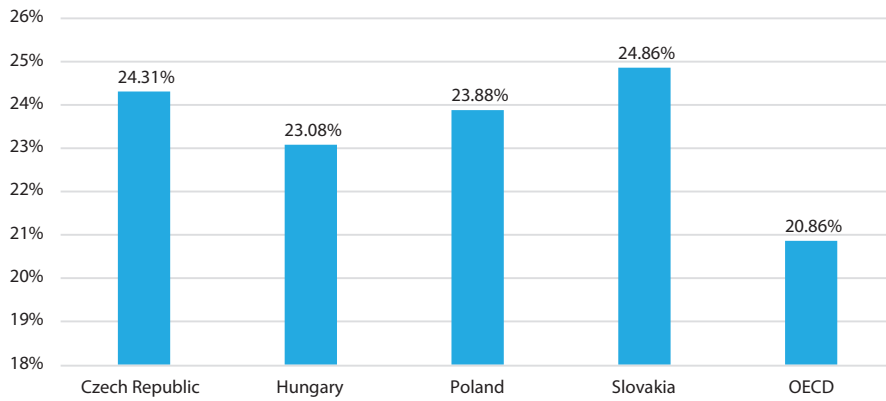

Figure 2: The average share of green jobs in V4 and OECD countries 2015–2019
Source: compiled by the author based on OECD 2024

In contrast to green jobs, the share of jobs in carbon-intensive sectors is significantly lower at only 6.1%. However, the share of these jobs is relatively high in Poland (10.5%), Lithuania (8.7%) and Portugal (8.4%). In the Central European region, Hungary comes next after Poland with 7.5% exposure, followed by Slovakia with 6.8% and the Czech Republic with 6.4%. Of our region, only Slovenia (5.3%) had a rate below the OECD average in the period under review (2015–2019).[59]

Hungary, therefore, is performing well in green-driven jobs, above the OECD average and just behind the V4 countries. However, it has the second highest number of jobs in carbon-intensive sectors among these countries.

Conclusions and recommendations

Today's societies face serious challenges from the impacts of climate change: carbon-intensive industries threaten emission reduction targets, exacerbate mass immigration that causes socio-political tensions, social and economic inequalities, and concerns about the sustainability of energy security.

The inevitable green transition is based on three interlinked labour market approaches: creating green jobs; defining green skills and developing the necessary training structures; and striking a balance between protective and productive social policies.

[59] OECD 2024.

The development of green jobs has a key role to play in this process, but the diversity of methodologies to develop a common understanding of the concept and to measure its presence on the labour market requires fine-tuned and tailor-made assessments, planning and interventions adapted to the specificities of each country or sector. This is particularly relevant in the case of Hungary, where the statistical data show a diverging picture in terms of the number of green jobs related to the green economy, renewable energy and the wider green jobs, including direct and indirect activities. However, more qualitative research activities are needed to identify the different regional and local potentials and drivers in detail, which could form the basis of a "tailor-made" green and just transition.

Importantly, the available evidence shows that achieving the objectives of the green transition can create jobs in the EU. Although most workers in green jobs were not in new jobs, the uptake of green jobs could continue to grow, as more than a quarter of jobs will be heavily influenced by the green shift in the coming years.

The main concerns for the creation of green jobs are accessibility, quality and the provision of the necessary competences. In the latter case, it is of paramount importance to motivate trainees to use the knowledge and skills they acquire to make green jobs a real alternative to carbon-intensive industries. In the absence of this, training is often a form of hand-out for workers, after which they return to carbon-intensive sectors that offer better conditions. This leads to the paradoxical situation whereby the costs of developing green skills are in fact used to strengthen the human resource capacities of traditional industries.

For the regions and groups of workers most exposed to the green transition, the support mechanism for a just transition under the EGD is of particular importance. Indeed, in the context of green growth, the question of "who should be compensated" is inescapable, where both a narrower approach focusing on specific target groups and a broader approach covering all workers may have a justification. The former argues that valuable and scarce resources should only be made available to the most affected groups of workers, as their exposure can be a source of scepticism and resistance to the green transition. The latter, on the other hand, argues that all workers deserve income support and a climate-responsive environment, as the wider social impacts of the green transition, such as rising energy prices or increased vulnerability of low-income households, need to be considered.

The reception of the EGD has so far been mixed. While many argue that the implementation of the EGD can accelerate the creation of green jobs and help "green" polluting industries, others believe that its growth-oriented approach means that the strategy cannot be a very effective counterweight to the effects of the climate crisis. Another criticism is that the JFW does not offer direct income support to workers who lose their jobs, focusing instead on the development of new skills. Although it refers to the European Pillar of Social Rights as an integral part of EU social policy, its practical application remains limited. Moreover, there is a lack of social participation in the preparation of national fair transition plans, which makes it difficult to involve local stakeholders and citizens. As a result, decision-making is largely centralised and does not provide sufficient opportunities for citizens to participate.

Overall, a fair transition is a key element of the green transition, but further reforms are needed to achieve it. The development of a supportive environment will play a key role in this, including a balance between the active labour market policy advocated by the EU and the rights-based protective social policy that is a cornerstone of national welfare policies, addressing inequalities in the triple transition and strengthening social rights alongside financial support for economic development.

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