Climate change and greening

Strategic Foresight – driver 7

#EURESjobs

eures.europa.eu

ELA
EUROPEAN LABOUR AUTHORITY

EURES

The present document has been produced by Fondazione Giacomo Brodolini Srl SB. This task has been carried out in the context of a contract between the European Labour Authority and the authors,

awarded following a tender procedure. The document has been prepared for the European Labour Authority, however, it reflects the views of the authors only. The information contained in this report does not reflect the views or the official position of the European Labour Authority.

Definition

Climate change refers to long-term alterations in temperature, precipitation patterns, and other atmospheric conditions on Earth. Primarily driven by human activities, such as the burning of fossil fuels and deforestation, climate change has far-reaching consequences, including rising global temperatures, extreme weather events, and shifts in ecosystems. To address the multifaceted challenges posed by climate change, a comprehensive approach involves climate adaptation, mitigation, and greening policies.

Climate adaptation focuses on minimising the adverse impacts of climate change by adjusting societal, economic, and environmental practices. It involves implementing strategies to enhance resilience and reduce vulnerability to the changing climate. Adaptation measures include building resilient infrastructure, developing early warning systems for extreme weather events, and promoting sustainable land-use planning to reduce exposure to climate-related risks.

Mitigation aims to reduce or prevent the emission of greenhouse gases (GHGs) that contribute to climate change. This involves transitioning to cleaner energy sources, improving energy efficiency, and implementing sustainable practices in various sectors. Mitigation efforts are crucial for limiting global temperature rise and mitigating the severity of climate-related impacts. International agreements, such as the Paris Agreement, set targets for countries to collectively reduce GHG emissions.

Greening tends to have a broader understanding than climate change, including prevention and an active approach to tackle, or at least not further aggravate, climate change and environmental degradation. Accordingly, greening policies encompass a range of measures aimed at promoting environmental sustainability and reducing the ecological footprint. This includes initiatives to increase the use of renewable energy, enhance energy efficiency, and promote sustainable agriculture and forestry practices. Greening policies also involve the conservation and restoration of ecosystems, such as forests and wetlands, to absorb carbon dioxide and enhance biodiversity.

Developments to date

Emissions of greenhouse gases (GHGs) contribute to climate change, leading to more frequent extreme events and an elevated risk of irreversible changes. These changes negatively affect human health and well-being, as well as economic activities and infrastructure, incurring significant financial costs (OECD, 2023). Responding to growing concerns and public pressure, in 2015, 196 Parties adopted the Paris Agreement, an internationally binding treaty aiming to 'limit global warming to well below 2 degrees Celsius, preferably to 1.5 degrees Celsius, compared to pre-industrial levels' (United Nations Framework Convention on Climate Change, 2015). Since the adoption of the Paris Agreement, numerous countries globally have enacted policies to reduce GHG emissions, committing to achieving carbon neutrality - where carbon emissions do not surpass carbon sequestration - by mid-century.

Europe has been a frontrunner in adopting ambitious climate goals. The urgency is underscored by rising temperatures, extreme weather events, and observable shifts in ecosystems. Mitigation policies, aimed at reducing greenhouse gas emissions, form a crucial pillar of this strategy. The European Union (EU) has set forth far-reaching targets, encapsulated in initiatives such as the Fit for 55 policy package, which aims to achieve a 55% reduction in net greenhouse gas emissions by 2030 compared to 1990 levels. These policies not only signal a commitment to the Paris Agreement but also drive a fundamental transformation in energy, transportation, and industrial sectors. Simultaneously, Europe recognises the inevitability of climate impacts already in motion. Adaptation policies, designed to enhance resilience to changing climatic conditions, have become imperative. Coastal regions fortify against rising sea levels, agricultural practices evolve to mitigate drought and floods, and urban planning incorporates climate-resilient infrastructure.

The European Union's labour market faces a dual influence from climate change and the concerted policies aimed at combating its effects. On one hand, the escalating frequency of extreme weather events, such as heatwaves, floods,

and storms, and environmental degradation poses direct challenges to various sectors, social groups and regions within the EU. Agriculture, tourism, and infrastructure may experience disruptions, impacting employment patterns. Coastal regions are particularly susceptible to rising sea levels, affecting living conditions, transportation and posing risks to jobs in different industries and sectors. On the other hand, the EU's commitment to combat climate change through stringent policies and measures also reshapes the labour landscape, through employment impacts and changing skills requirements. The transition to a low-carbon economy, characterised by increased reliance on renewable energy and sustainable practices, has the potential to create new employment opportunities in green industries. Simultaneously, sectors heavily reliant on carbon-intensive practices may witness job losses or require adaptation to meet evolving regulatory standards, or may be phased out. Finally, growing environmental awareness may result in a gradual greening of jobs and the whole labour market. This shift consists in integrating sustainable practices and habits in various jobs. As these changes permeate the labour market, it is likely that new hard and soft skills will become more and more important.

Thus, the EU labour market finds itself at the intersection of climate change impacts and transformative policies, navigating a complex landscape shaped by both environmental challenges and proactive measures aimed at building a sustainable future. Overall, in the context of a green transition, the demand for labour during the green transition is shaped by a confluence of factors, reflecting the intricate interplay of environmental, geopolitical, regulatory, and economic and social influences.

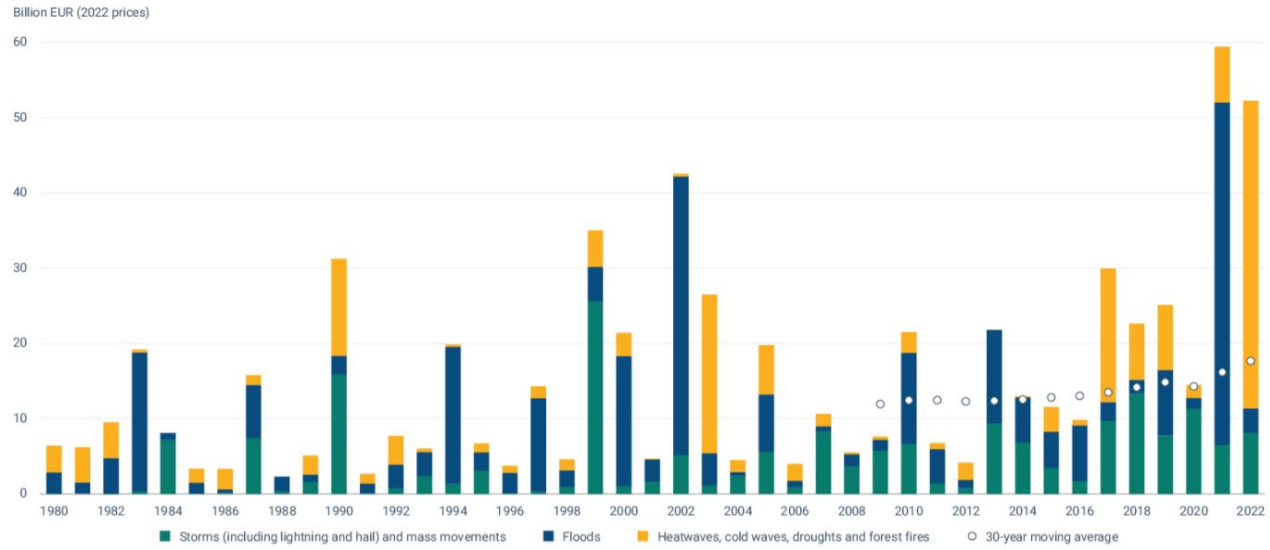
- Regulatory change is a pivotal driver, as the EU and governments worldwide implement environmental regulations and sustainability standards. While there is no consensus on how stringent environmental regulations should be, overall this compels industries to adopt green practices, resulting in an increased demand for skilled workers in renewable energy, energy efficiency, and eco-friendly technologies. Linked to this, the shift towards sustainable products and services, in the broader context of a circular economy, also fosters demand for labour in green jobs. In doing so, the transition addresses environmental concerns while simultaneously promoting economic growth and job creation.
- Necessity, driven by pressing environmental concerns – especially, but not limited to the south of the EU – contributes to the demand for labour in sustainable practices. Combatting climate change and preserving ecosystems require the development and implementation of green technologies, fostering jobs in areas like reforestation, water conservation, and sustainable agriculture. Warming temperatures in the global north, on the other hand, may positively impact some sectors (e.g.: new tourism or agricultural opportunities), whilst also requiring new/additional skills (e.g.: increased need of firefighters in Nordic countries).
- Geopolitical events, exemplified by the Russian aggressions in Ukraine, influence the demand for labour in the green sector. The imperative to reduce dependence on fossil fuels, particularly those associated with regions of geopolitical instability, incentivises investment in renewable energy sources. This shift enhances energy security and stimulates job creation in the renewable energy sector.

A comprehensive approach that considers these diverse drivers is essential for a successful and sustainable transition towards a greener future. Furthermore, to successfully achieve ambitious climate goals while fostering economic growth and maintaining high-quality working conditions, EU Member States must complement climate policies with substantial investments in employment, social, skills, industrial and regional policies. Therefore, the green transition will need to be supported by multisectoral policies across governance levels (ESPON, 2023).

Climate change in Europe

Between 1980 and 2020, total economic losses from weather- and climate-related events amounted to EUR 650 billion (in 2022 prices) in the EU. Hydrological hazards (floods) account for almost 43% and meteorological hazards (storms, including lightning and hail, together with mass movements) for around 29% of the total. For the climatological hazards, heat waves cause around 20% of the total losses while the remaining +/-8% are caused by droughts, forest fires and cold waves together (EEA, 2023).

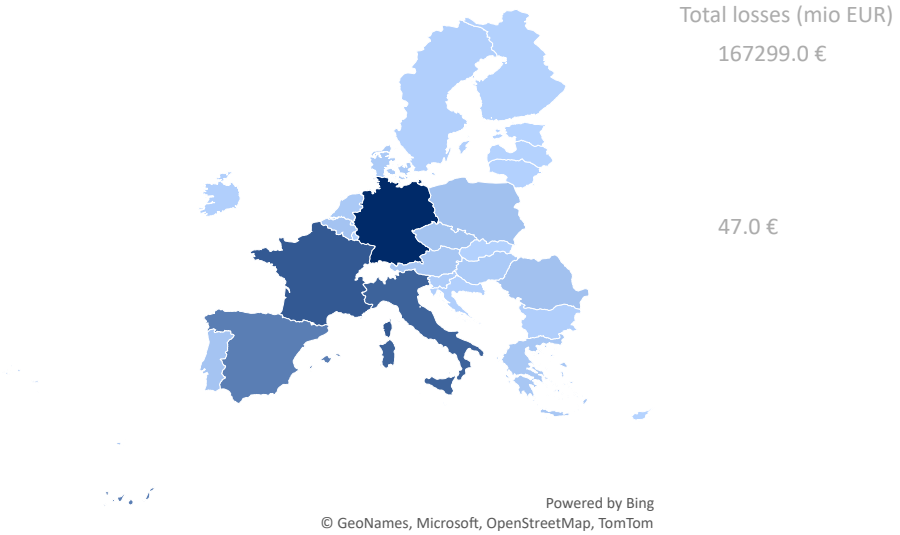
Figure 1 Annual economic losses caused by weather - and climate - related extreme events in the EU Member States, 1980-2022



Source: EEA, 2023

The economic impact of climate-related extremes varies considerably across countries. In absolute terms, the highest economic losses in the period 1980-2022 (Figure 2) in the EU were accrued in Germany (around EUR 167 billion) followed by France (around EUR 120 billion) and Italy (around EUR 111 billion). Economic losses linked to climate-related extremes continue to increase decade by decade: the average annual (constant prices, 2022) losses were around EUR 10.4 billion in 1981-1990, EUR 12.2 billion in 1991-2000, EUR 14.7 billion in 2001-2010 and EUR 15.9 billion in 2011-2020. With EUR 59.4 billion and EUR 52.3 billion, 2021 and 2022 have the highest annual value of economic losses through the whole period (followed by 2002, 1999 and 1990) (EEA, 2023).

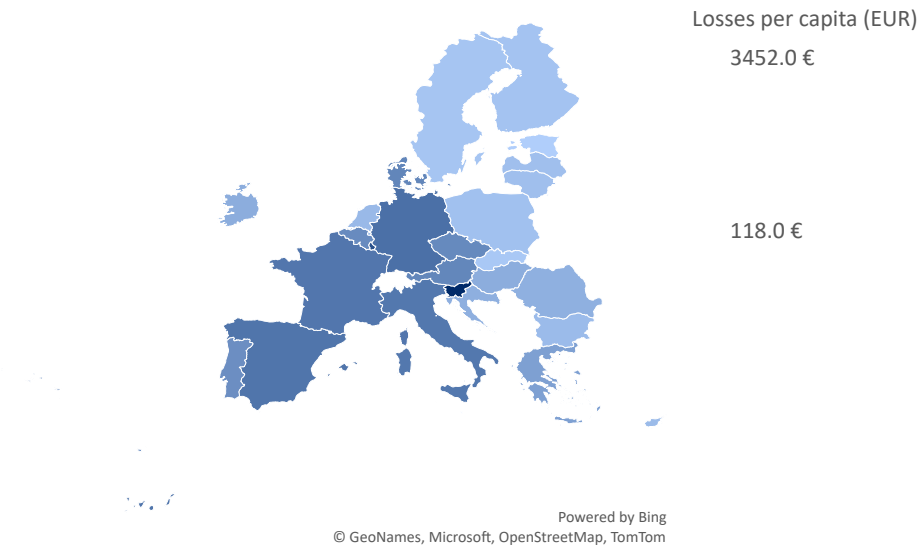
Figure 2 Economic losses from caused by weather - and climate - related extreme events in EU Member States, 1980-2022 (million EUR, 2022 prices)



Source: authors, based on EEA data (EEA, 2023)

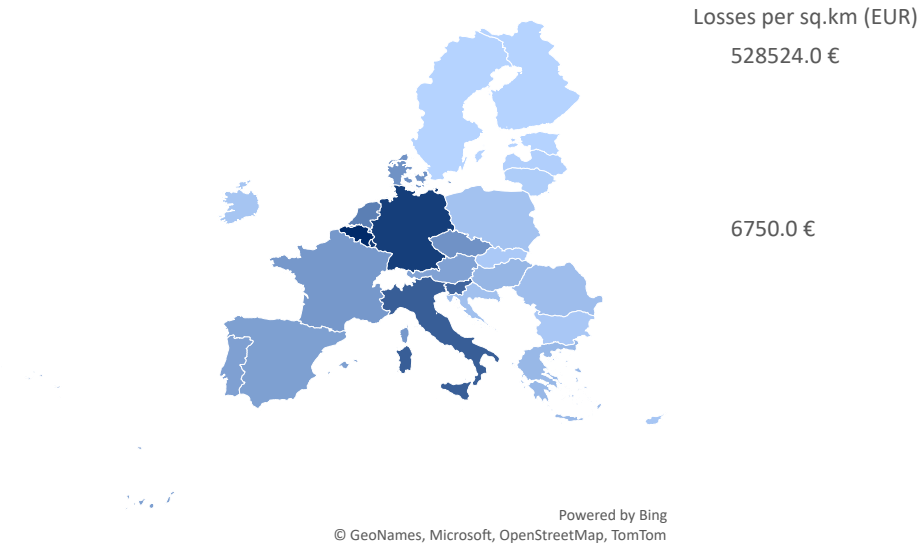
The highest losses per capita (Figure 3) were reckoned in Slovenia (EUR 3,452), Luxembourg (EUR 2,700) and Germany (EUR 2,065). Another way of assessing economic losses linked to climate change is to measure the damage in a specific area. The highest losses per area (in km^2) (Figure 4) were in Belgium (EUR 528,524) Luxembourg (EUR 482,413) and Germany (EUR 467,879).

Figure 3 Losses per capita in EU Member States, 1980-2022 (EUR, 2022 prices)



Source: authors, based on EEA data (EEA, 2023)

Figure 4 Losses per square kilometre in EU Member States, 1980-2022 (EUR, 2022 prices)



Source: authors, based on EEA data (EEA, 2023)

Climate change and related extreme events do not only result in economic losses, but most importantly also in higher morbidity, mortality and displacement of affected groups within and across countries. The vulnerability of people across Europe to extreme weather events, and in particularly to heat, is strongly linked to individual factors and socio-economic characteristics. Elderly people, children, pregnant women, outdoor workers, people with pre-existing health conditions and marginalised or under resourced people are among the most vulnerable to extreme heat (EEA, 2022).

Morbidity: Rising temperatures in Europe impact occupational health and safety, resulting in an average annual loss of 16 hours per worker from 2016 to 2019 compared to the period from 1965 to 1994, particularly in highly exposed sectors such as agriculture, tourism (EEA, 2022) and construction. Southern Europe is identified as the region facing the greatest and fastest-growing risk of high temperatures affecting human health (EEA, 2021). Notably, regions in Bulgaria, Croatia, Greece, Italy and Spain, experiencing extreme heat, also rank among the EU regions most affected by long-term unemployment and overall low socio-economic status (EEA, 2022).

Moreover, the climatic conditions across Europe have broader consequences for the entire population. There is a growing body of evidence indicating that extreme weather events, especially heat, have adverse effects on mental health (European Climate and Health Observatory, 2022). Additionally, rising temperatures and more frequent heatwaves contribute to the emergence and spread of climate-sensitive infectious diseases, posing a particular threat to those in agriculture, forestry, or emergency services due to higher exposure, as well as the elderly, young children, and individuals with compromised immune systems due to increased vulnerability (EEA, 2022).

Mortality: Rising temperatures, floods, and natural disasters have the potential to result in an increased number of fatalities. Notably, heatwaves stand out as the leading cause of death among weather- and climate-related events in Europe (EEA, 2022). The 2022 summer heatwave in Europe is estimated to have been responsible for 60,000 heat-related deaths (ECB, 2023). From 1980 to 2022, the cumulative number of fatalities linked to extreme weather events reaches 220,038, with notable variations among Member States. Germany holds the highest recorded number of fatalities at 101,334, followed by France with 45,260 and Italy with 21,570.

Looking ahead, the anticipation of more frequent and severe heat episodes, coupled with an ageing and expanding population, is expected to lead to a significant rise in morbidity and mortality in the coming decades unless prompt and effective adaptation measures are implemented.

Displacement: There is growing evidence – globally – indicating that climate hazards linked to extreme events serve as both direct factors, such as the destruction of homes by floods, and indirect drivers leading to involuntary migration and displacement, such as losses in rural income during prolonged droughts. The majority of climate-related displacement and migration occurs within national borders, while international movements are predominantly observed between countries with contiguous borders. Since 2008, the global annual average of over 20 million people has been internally displaced by weather-related extreme events, with storms and floods being the most prevalent factors (IPCC, 2022).

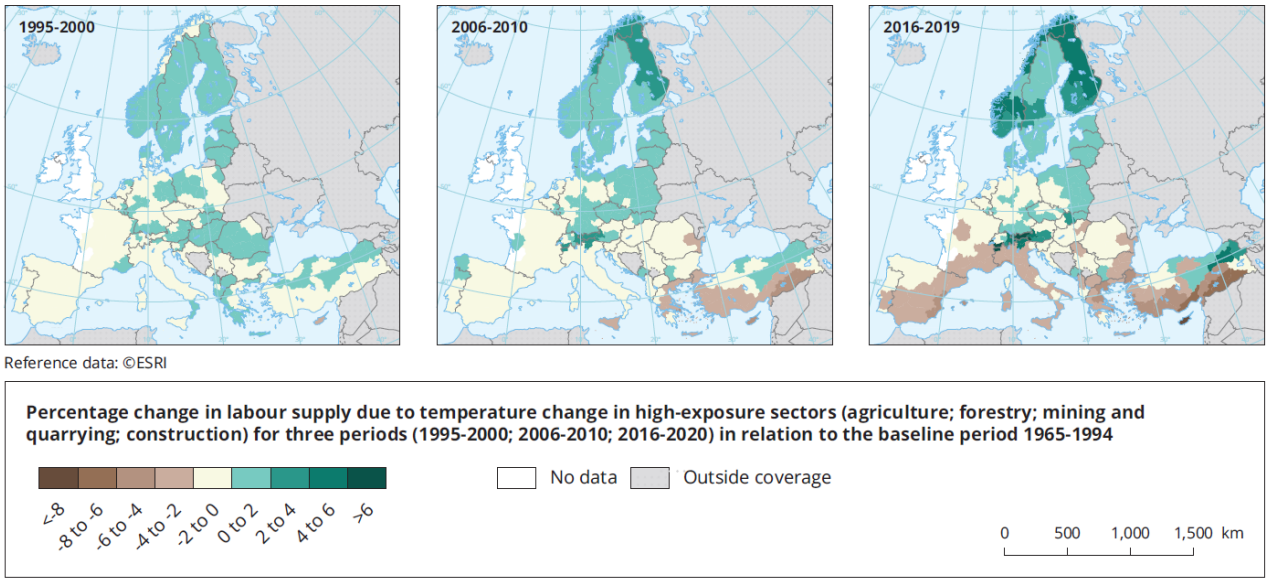
The outcomes of climate-related migration exhibit considerable variability, influenced by socioeconomic factors and household resources that impact the success of migration. The more the migrants are in control of their situation (e.g.: income availability, a new place to stay), reflected in their voluntary relocation and the ability to freely choose where to relocate, the higher are the expected potential benefits for both countries of origin and destination resulting from migratory flows. Conversely, displacement or low-agency migration is associated with adverse health, well-being, and socioeconomic outcomes for migrants, offering fewer advantages to the communities involved in sending or receiving migrants (IPCC, 2022).

The impact of weather- and climate-related events – and particularly heatwaves – on morbidity, mortality and displacement deeply affects the global and EU labour market. Elevated temperatures in Europe have already had detrimental impacts on the European workforce, particularly affecting individuals employed in highly exposed sectors such as agriculture and construction (van Daalen et al., 2022; OSHA, 2023). Workers engaged in physical labour, using protective gear, toiling outdoors in sunlight, or working in inadequately cooled buildings with heat-generating machinery face a disproportionately high risk of exposure to elevated temperatures (Pogacar et al., 2018; WHO Europe, 2021). Agricultural workers, in particular, often find themselves performing tasks on a fixed schedule, leading to the execution of physically demanding duties during the hottest part of the day or the warmest time of the year. Of course, heatwaves are just one risk factor; others exist for workers in exposed sectors, including for instance exposure to UV radiation and air pollution.

Similarly, construction workers in urban areas contend with the Urban Heat Island (UHI) effect. Low-income workers, experiencing heat stress in their occupations, also face heightened exposure during their commute (e.g., walking or using non-air-conditioned transportation), at home (due to inadequate insulation, lack of air conditioning, and financial constraints on mechanical cooling), and in their neighbourhoods (urban areas being particularly susceptible to the heat island effect) (Narocki, 2021).

Figure 5 shows the decline in the number of working hours in four high-exposure sectors (agriculture, forestry, mining and quarrying, construction). The increased temperature caused a 0.23% decline in the number of working hours in the period 1995-2000, compared with the reference period of 1965-1994. This amounts to just over four hours per worker per year. In the period 2016-2019, a 0.98% decline (equivalent to 16 hours per worker per year) was observed in comparison with the same baseline. The largest declines in working hours are estimated to be in Cyprus, the South Aegean in Greece and the Balearic Islands in Spain. Northern European countries generally show small gains in working hours (van Daalen et al., 2022).

Figure 5 Percentage change in labour supply due to temperature change in high-exposure sectors (agriculture; forestry; mining and quarrying; construction) in relation to the baseline period 1965-1994



Source: EEA, 2022

While the primary impact of heatwaves is evident in high-exposure occupations, their effects also extend to office work. Rising temperatures significantly influence the cognitive abilities of office workers, leading to a negative impact on concentration and decision-making capacity. Consequently, this temperature increase directly affects labour supply, reflected in the number of working hours individuals allocate to their work, and diminishes performance during working hours (labour productivity). Workers facing heat stress must slow their pace and take additional breaks for hydration and cooling (Dasgupta et al. (2021), Ioannou et al. (2021), and Szewczyk et al. (2021)).

Estimates regarding the potential future impact of climate on labour migration exhibit substantial variation. Historically, only a fraction of those affected by climate events choose to relocate (ECB, 2023). Research indicates that migration within Europe is primarily linked to economic disparities rather than climate-driven impacts. Climate-induced displacement within Europe typically occurs on a small scale and in the short term, especially in the aftermath of flood and drought disasters and over short distances. The unequal distribution of future climate risks and adaptive capacity across European regions may, however, elevate the pressure for internal migration (IPCC, 2022).

Climate change response in Europe

The European Green Deal (EGD) is designed to transform the EU into a resource efficient and competitive economy and bring about net zero emissions from greenhouse gases by 2050. Implicit in the EGD is a substantial degree of regulatory and technological change linked to changes in production systems which are likely to have an impact on the sectoral structure of employment and the types of jobs people carry out. Employment in some sectors might be expected to increase (e.g. waste management) while in others it might decrease as demand for their goods falls (e.g. processing of fossil fuels). The green transition brings with it a number of drivers that are reshaping – and are expected to continue to do so – the EU labour market.

Clean electrification: Green power and provisioning of renewable energy will be the dominant sector to provide new green jobs (e.g. in the upgrade of the electricity system to 100% RES with smart grids, storage, decentral renewable energy production, provisioning of energy technologies, bioenergy, decarbonisation of mobility). The installation of distribution grids and the transition to renewable energy is already ongoing.

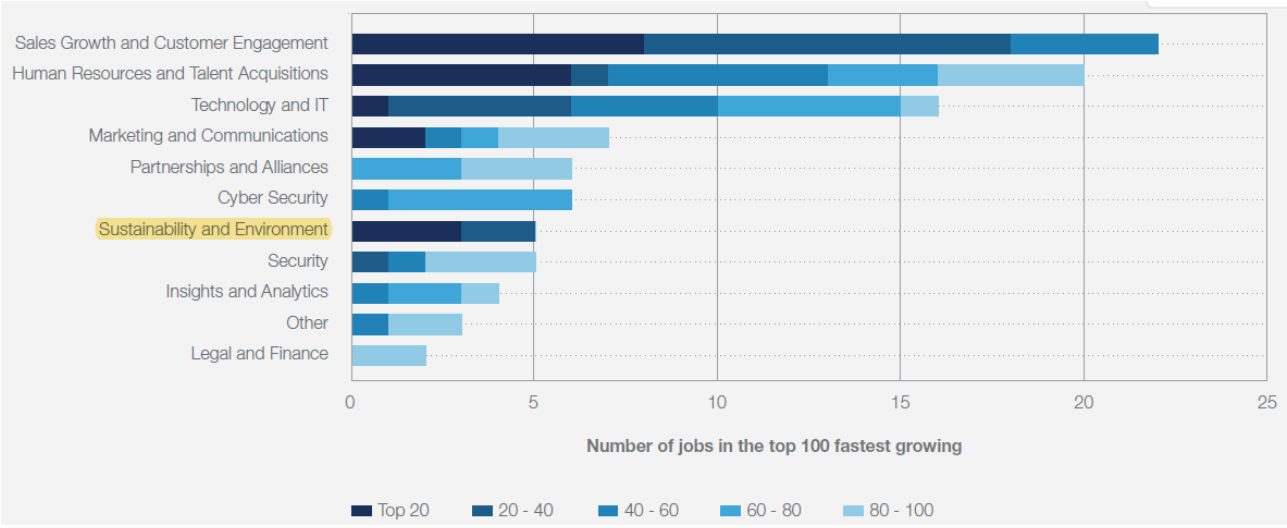
Resource efficiency: Achieving energy efficiency is increasingly important to ensure a sustainable society and economy for the future. Energy efficiency improvements across sectors are already underway. Jobs and tasks cover issues such as improving energy, material, resource and land-use efficiency, reducing negative environmental and social impacts. New jobs emerge to monitor the footprint and manage improvements and innovations.

Purpose-driven work: Organisations and employees are increasingly value-driven: they are aware of the impact of their activities, conscious of their consumption choices and the impacts these may have on the environment.

Source: adapted from Asikainen et al., 2021

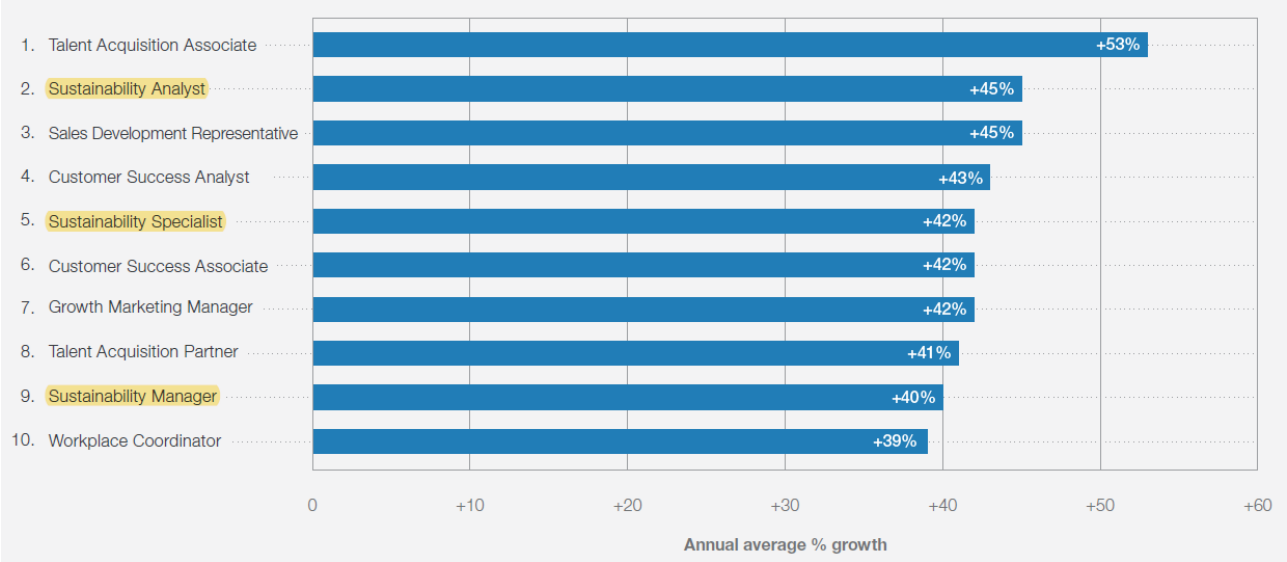
The above current drivers are already producing impacts in the global labour market. Employers have increased green job hiring rates, with year-on-year green job growth exceeding the overall hiring rate growth every year since 2019. Meanwhile, the proportion of the labour force reporting green skills is rising to meet the increased demand, growing by almost 40% since 2015, from 9% to 13%. In fact, more and more green jobs are being advertised online. Sustainability and environment-related roles are notable for all being in the top 40 jobs on the rise between 2018 and 2022 (Figure 6). This has resulted in sustainability jobs making up three of the top 10 fastest growing roles on the LinkedIn platform over the last four years (Figure 7), including Sustainability Analysts, Sustainability Specialists, and Sustainability Managers (WEF, 2023).

Figure 6 LinkedIn jobs on the rise, 2018-2022



Source: WEF 2023, based on LinkedIn data

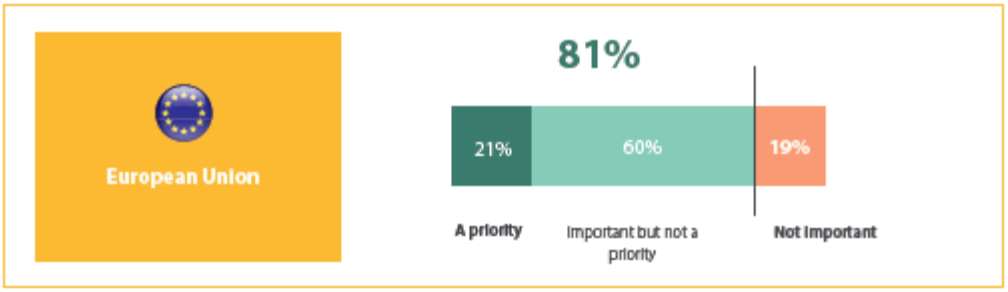
Figure 7 Fastest growing job postings on LinkedIn, 2018-2022



Source: WEF 2023, based on LinkedIn data

As anticipated above, value-driven jobs will rise and become more and more popular, even becoming a standard for all jobs. Indeed, the recent European Investment Bank climate survey (EIB, 2023) highlights that for 81% of EU respondents (surveyed in 2022), sustainability is an important factor when seeking a job (see Figure 8).

Figure 8 Importance of sustainability when seeking a job for EU respondents, 2022



Source: EIB, 2023

Apart from creating new jobs, the green transition is also contributing to a significant decline in employment in traditionally polluting sectors and activities, such as coal-related ones. Brown jobs are set to face a contraction in labour demand and in some cases, such as coal and lignite mining, even a full phase-out, or significant structural change related to the greening of these sectors. At present, these jobs are estimated to cover around 5% of employment in the EU (Vandeplas et al., 2022). The table below shows the evolution between of direct jobs in coal mines and coal-fired power plants, respectively between 2015-2018 and 2016-2020. Nonetheless, most green jobs share many skills with brown jobs, while most of the unique skills are obtainable through on-the-job training. In this respect, the International Energy Agency estimates that more than half of the workers with the most carbon-intensive jobs in the energy sector in Europe have already transferred to greener jobs (WEF, 2023).

Table 1 Direct jobs in coal mines and coal-fired power plants in the EU, 2015-2020

	Coal mines	
	Number of mines	*Direct jobs*
2015	127	174,270
2018	90	159,267

	Coal-fired power plants	
	Number of plants	*Direct jobs*
2016	196	51,706
2018	179	49,102
2020	166	42,640

Source: adapted from Kapetaki, Z. et al. (2021)

Finally, the increased awareness about climate change and the necessity to address it also leads to the greening of the labour market. This goes beyond the creation of new jobs and the decline in polluting professions. The concept of greening of jobs, in fact, involves integrating principles of environmental sustainability into various occupations and sectors to reduce negative impacts on the environment and promote a more sustainable and resilient economy. As reported by Eurofound (2023a), although there is already a body of research on greening jobs and the necessary skills, further efforts are required to distinctly delineate the evolving job responsibilities, the corresponding requirements for both generalist and specialised skills.

Future perspectives

The prospective short- and long-term consequences of climate change on the EU labour market hinge on a multitude of factors. Foremost among these is the efficacy of the EU's planned climate adaptation and mitigation policies driving the green transition. The green transition represents a structural overhaul of the economy, involving the movement of capital and workers between sectors, companies within the same sector, within individual companies, as well as within and across countries. The overall impact is contingent upon various structural and technological factors, encompassing barriers hindering the entry and growth of new, innovative firms (and the exit of inefficient, carbon-intensive ones), obstacles to worker mobility (both spatial and occupational), and the pace of green innovation.

A well-managed transition, characterised by substantial technological progress and clear communication leading to predictable carbon price increases and other government policies, allows for the replacement of carbon-intensive capital with new, green capital at a relatively modest additional cost once depreciated. Conversely, an abrupt transition or one occurring before equivalent green technology is available renders carbon-intensive capital obsolete before the end of its usable life, diminishing the overall capital stock (WEF, 2023). Consequently, estimates regarding labour market impacts in the upcoming years exhibit significant variations depending on the underlying assumptions.

It is crucial to differentiate between the effects of climate change itself on the EU labour market and the impacts of climate change measures (mitigation, adaptation, greening) that are implemented. The following figure summarises the channels through which climate change and extreme weather/climate events, on one hand, and climate policies, on the other, may influence capital stock, labour supply, and total factor productivity.

Figure 9 The impact of climate change and climate change responses on the components of potential output

	Capital stock	Labour supply	Total factor productivity
Long-run climate change	Shifts in tourism flows. Loss of agricultural land from higher temperatures, water stress and salinification of soil due to rising sea levels. Disruption of economic activity in coastal areas from higher sea levels. Loss of biodiversity and ecosystem services.	Higher rates of mortality and sickness. Higher regional structural unemployment from changes in tourism, for example. Climate-induced migration.	Reduced labour efficiency from higher temperatures, including fewer hours worked. Capital invested in adaptation is less productive in aggregate and diverts resources away from innovation.
Extreme weather and climate events	Destruction of capital stock in disasters. Opportunity to replace old, destroyed capital with newer, more technologically advanced capital. Greater uncertainty and volatility reduce willingness to invest over long run.	Higher rates of mortality and sickness. Disaster-induced migration. Loss of education and skills.	Disaster-induced bankruptcies and localised reductions in access to finance cause reallocation between firms, for better or worse. Rebuilding process distracts management, reducing overall productivity.
Climate policies and green transition	Increase in stranded assets. Higher energy costs from carbon taxes reduce funds for investment.	Skills mismatches increasing structural unemployment.	Reallocation of output between firms within sectors may prove more or less efficient. Environmental regulation reduces productivity, perhaps (more than) offset by innovation. Reduced impact of supply shocks arising from fossil fuels.

Source: ECB, 2023

Climate change in Europe

Anticipated long-term shifts in average temperatures and precipitation patterns are likely to have adverse effects on specific sectors and regions throughout Europe. Tourism stands out as a prime example, where the prospect of warmer winters is expected to diminish the availability of snow for skiing in northern regions. Additionally, many Mediterranean regions, currently attractive for summer tourism, may face reduced suitability due to higher average temperatures and decreased availability of fresh water during peak seasons. Coastal areas in the Mediterranean are also at an increased risk of flooding from rising sea levels. These evolving conditions are expected to diminish the value of capital associated with tourism, such as hotels, in affected regions, leading to a contraction in future investment rates. Estimates on associated job losses in tourism and recreational activities range between 400,000 and 650,000 by 2025 (Eurofound, 2023a). Agriculture is another sector poised to be impacted, particularly in southern Europe, where lower crop yields are anticipated (ECB, 2023; Eurofound, 2023a). Given that low-income countries or regions often have warmer climates and specialise in climate-exposed sectors like agriculture and tourism, the rise in global temperatures is likely to exacerbate income inequalities between countries and regions. Within Europe, a marginal increase in temperature could initially enhance labour productivity growth in cooler countries. However, the impact turns negative once the average historic temperature exceeds 14°C, approximately that of Italy and France (ECB, 2023). Projections from the International Labour Organization (ILO, 2019) suggest that by 2030, approximately 0.03% of total working hours in Europe and Central Asia could be lost due to heat stress, equivalent to around 103,000 full-time jobs. In a worst-case hypothesis, European labour productivity losses could reach around 0.3%, 0.8%, and 1.6% by the 2020s, 2050s, and 2080s, respectively, with southern Europe experiencing the most significant losses (Szewczyk et al., 2021).

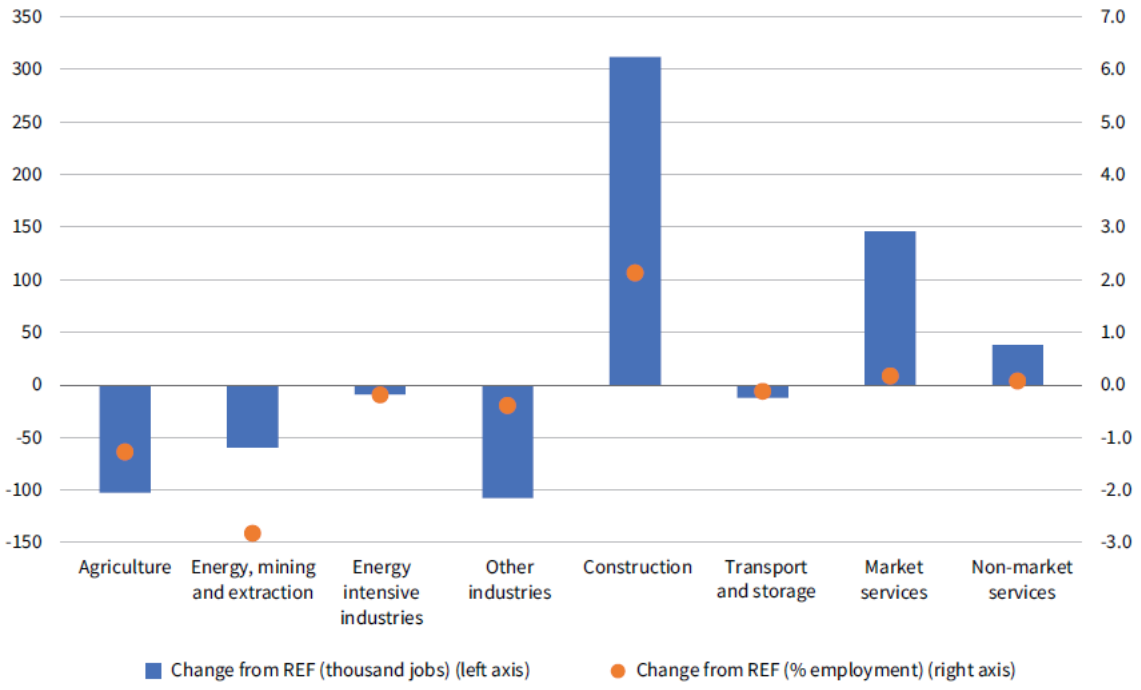
The economic and labour market consequences associated with the compositional effects of climate change may bring about either favourable or unfavourable effects on employment and career opportunities, income potential, and the need for training. In the immediate term, these effects might be seen as unfavourable, as individuals may need to transition between geographic areas, industries, job types, or responsibilities, potentially resulting in temporary periods of unemployment. Despite the potential short- and medium-term adverse consequences, there is currently limited information on how climate change impacts the labour market within specific subgroups (Eurofound, 2023a).

Climate change response in Europe

In general, the available evidence indicates a net positive – yet mild – impact of the green transition on the EU labour market. The small effect on total employment is explained because most jobs in the EU are in so-called 'white' sectors, with low GHG emissions (Vandeplas et al., 2022). As reported by Eurofound (2023b), a 0.1% increase in employment is expected in Europe by 2030 as a result of the implementation of the Fit55 package. Recent estimates within the EU suggest that the EGD could lead to the creation of approximately 2.5 million additional jobs in the European Union, contingent upon the achievement of its targets (CEDEFOP, 2023). Furthermore, the circular economy is expected to boost economic growth and contribute to the creation of around 700,000 jobs in the EU by 2030 (European Parliament, 2020).

While the overall expected impact is positive, the policies implemented as part of the green transition will necessitate a restructuring of the sectoral composition of the workforce (WEF, 2023): employment in green jobs is projected to increase, while certain other sectors may witness jobs disappearing or experiencing significant declines. From a sectoral perspective, the implementation of the FIT55 policies by 2030 is expected to positively impact the construction and services sectors, while all others are expected to face negative impacts (see Figure 10) (Eurofound, 2023b).

Figure 10 Expected impact of FIT55 on sectoral employment, 2030



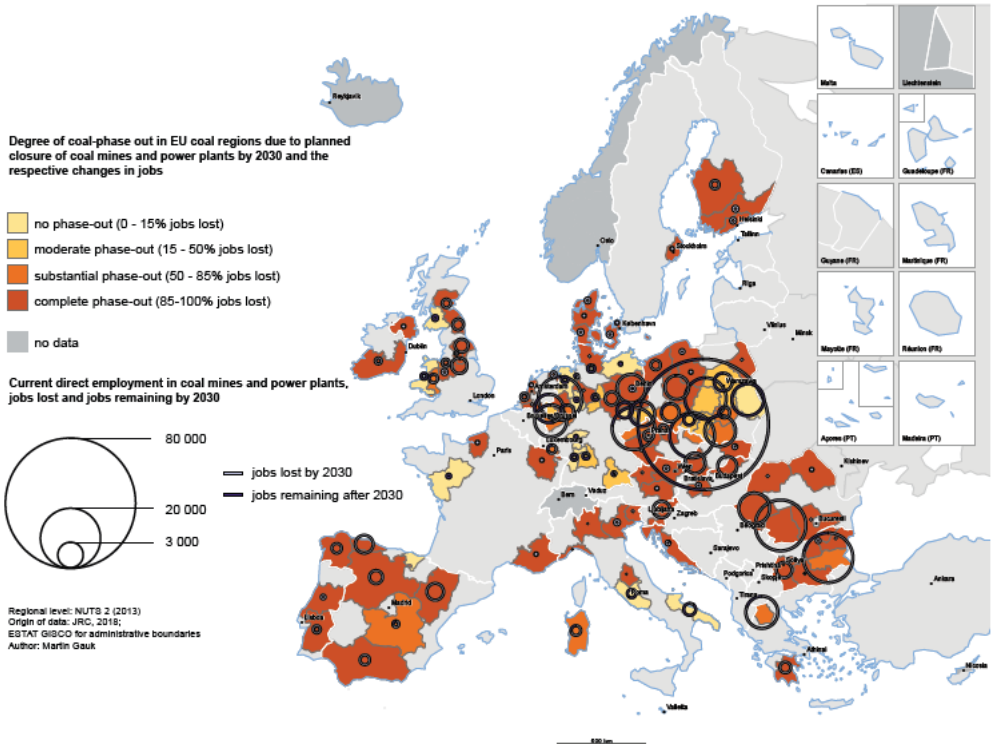
Source: Eurofound (2023b), from Fragkiadakis et al (2022)

Substantial investments are required to reduce GHG emissions, particularly in areas such as green energy generation, transmission and storage, the construction and transport sector, as well as manufacturing and metallurgy (Giacometti and Salonen, 2022). These investments are likely to generate new jobs and present development opportunities, particularly benefiting individuals in rural and remote regions that have lagged behind in economic development in recent decades (ESPON, 2023). Key occupations expected to play a crucial role in driving the green transition include those directly involved in frontline green activities, individuals developing green technologies, and managers tasked with adjusting or developing new business models.

Additionally, certain occupations, though modest in terms of employment shares, are indispensable for realising the goals of the green transition. In fact, the emergence of new employment opportunities is anticipated not only in high-skilled jobs but also in middle-skilled occupations with technical profiles, such as offshore renewable energy plant operators and biogas technicians, as well as low-skilled roles, for instance, in the waste management sector (CEDEFOP, 2023).

However, as previously discussed, the green transition will eventually lead to the elimination of some jobs in traditionally carbon-intensive sectors, rendering specific skill sets obsolete in the long run (ESPON, 2023). This is particularly evident in regions committed to decarbonising their economies, signifying a paradigm shift, especially in coal-dependent areas (ESPON, 2020). Figure 11 shows the regions were a coal phase out is foreseen (and to what extent), and the expected job losses by 2030. The regions that likely will be most affected by 2030 are located in Poland, Germany, Czechia and Bulgaria.

Figure 11 Estimated job losses in coal phase-out regions by 2030



Source: ESPON, 2020

Associated with the emergence of green jobs and the phasing out of brown occupations are anticipated qualitative shifts in demand, necessitating the acquisition of new competencies. The skills demanded by emerging green jobs encompass a blend of technical and soft skills, related to both job-specific expertise and transversal skills. Given the imperative to develop and utilise new technology in support of the green transition, most emerging green jobs will also necessitate strong digital competencies (Cedefop, 2023). Recent findings offer encouragement, suggesting that the required upskilling and retraining can predominantly occur through on-the-job learning, thereby facilitating job transitions (Bowen et al., 2018). Nevertheless, there will persist a need for an unskilled/low-skilled workforce, even within the green transition sector, both in the rural regions of northern Europe and other European regions (NSPA, 2022). As new job opportunities emerge in regions hosting and fostering green industries, there is potential to curtail outmigration from rural parts of these regions, and in some cases, migration dynamics may even be reversed. However, this reversal may be applicable primarily to rural areas within commuting distance of these green industries; for more remote rural areas, the changes could, in fact, lead to increased outmigration (ESPON 2023).

Hypotheses about the future

H1: Ongoing adverse effects of climate change

Current climate mitigation and adaptation policies have proved insufficient to halt the impacts of climate change on the EU labour market and the whole society. Extreme climate and weather events persist and the adverse impacts extend beyond environmental concerns.

Extreme climate events unfold with varying intensity across European regions, deepening existing economic divides. Southern regions face recurrent heatwaves, adversely affecting agriculture and outdoor industries. Meanwhile, northern areas contend with increased flooding, disrupting transportation and infrastructure. Crop failures become more frequent, impacting both employment and income for agricultural workers and pose a nutritional challenge to the society. Extreme weather events disrupt travel plans and damage infrastructure in coastal regions. Floods and extreme weather events take a toll on infrastructure and construction activities. Rebuilding efforts become a recurring necessity, diverting resources from new projects. The green sector experiences a surge in demand for climate resilience measures. Renewable energy, disaster preparedness, and sustainable infrastructure projects become focal points for job creation.

H2: Successful adaptation, failure in mitigation

The EU has introduced successful adaptation measures, i.e. effective measures to cope with climate change in the short run. However, effective long-term mitigation strategies are not in place, raising concerns about the long-term developments. Sectors and regions most affected by climate change, e.g. agriculture, tourism, are coping well in the near future and industries focused on short-term solutions, such as disaster management, experience growth and job opportunities.

In the long-run, emerging inequalities among regions (including an urban-rural divide), sectors, occupations and societal groups are expected as the lack of effective mitigation will result in an uneven distribution of the impact of climate change.

H3: Climate policies and green transition

Climate mitigation and adaptation measures in Europe bring about the expected results. The EU labour market becomes a dynamic landscape where innovation, resilience, and sustainability coalesce. This harmonised approach not only mitigates the impacts of climate change but also shapes a future where economic prosperity is intertwined with environmental stewardship.

References

Asikainen, T. et al. (2021). The future of jobs is green. EUR 30867 EN, Publications Office of the European Union, Luxembourg. ISBN 978-92-76-42571-7. doi:10.2760/218792. JRC126047.

Bowen, A. et al. (2018). Characterising green employment: The impacts of 'greening' on workforce composition. **Energy Economics**, 72: 263–275.

Cedefop (2023). Green transition a real job engine. https://www.cedefop.europa.eu/en/news/green-transition-real-job-engine

Dasgupta S., et al. (2021). Effects of climate change on combined labour productivity and supply: an empirical, multi-model study. Lancet Planetary Health, 5(7), pp. E455-E465. https://doi.org/10.1016/S2542-5196(21)00170-4.

Iotzov V., Gauk M. (2020). Structural change in coal-phase out regions. European Territorial Observation Network. Luxembourg. Policy brief. ISBN: 978-2-919795-68-0.

Gensheimer, M. (2023). Territorial perspective on green industrialisation. European Territorial Observation Network. Luxembourg. Working paper. ISBN: 978-2-919816-69-9.

Eurofound. (2023a). Impact of climate change and climate policies on living conditions, working conditions, employment and social dialogue: A conceptual framework, Eurofound research paper, Publications Office of the European Union, Luxembourg. ISBN 978-92-897-2318-3.

Eurofound. (2023b). Fit for 55 climate package: Impact on EU employment by 2030, Publications Office of the European Union, Luxembourg.

European Central Bank (ECB). (2023). How climate change affects potential output. https://www.ecb.europa.eu/pub/economic-bulletin/articles/2023/html/ecb.ebart202306_02~0535282388.en.html

European Climate and Health Observatory. (2022). Climate change impacts mental health in Europe. https://climate-adapt.eea.europa.eu/en/observatory/evidence/health-effects/mental-health-effects/european_climate_health_observatory_mental-health_evidence_review_2022.pdf

European Environment Agency (EEA) (2021). Heat and cold – extreme heat. https://www.eea.europa.eu/publications/europes-changing-climate-hazards-1/heat-and-cold/heat-and-cold-extreme-heat

European Environment Agency (EEA) (2022). Climate change as a threat to health and well-being in Europe: focus on heat and infectious diseases. EEA Report No 07/2022. Luxembourg: Publications Office of the European Union, 2022.

European Environment Agency (EEA) (2023) Economic losses from weather- and climate-related extremes in Europe. https://www.eea.europa.eu/en/analysis/indicators/economic-losses-from-climate-related#:~:text=Economic%20losses%20from%20weather%2D%20and%20climate%2Drelated%20extremes%20in%20Europe,-Published%2006%20Oct&text=Between%201980%20and%202022%2C%20weather,EUR%2052.3%20billion%20in%202022.

European Investment Bank (EIB) (2023). The EIB climate survey. Government action, personal choices and the green transition. ISBN: 978-92-861-5535-2. DOI: 10.2867/055829. https://www.eib.org/en/publications/20230098-eib-climate-survey-europe

European Parliament. (2020). Report on a strong social Europe for Just Transitions, 2020/2084(INI).

Giacometti, A. and Salonen, H. (2022). BSRWood – Accelerating wood construction across the Baltic Sea Region. Nordregio. https://nordregio.org/research/bsrwood/

Intergovernmental Panel on Climate Change (IPCC. (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844.

International Labour Organization (ILO) (2019). Working on a warmer planet. The impact of heat stress on labour productivity and decent work. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_711919.pdf

Ioannou, L.G., et al. (2021). Occupational heat stress: multi-country observations and interventions. International Journal of Environmental Research and Public Health 18(12), p. 6303. https://doi.org/10.3390/ijerph18126303.

Kapetaki, Z. et al. (2021). Recent trends in EU coal, peat and oil shale regions. EUR 30618 EN, Publications Office of the European Union, Luxembourg. ISBN 978-92-76-30987-1. doi:10.2760/510714, JRC123508.

Narocki, C. (2021). Heatwaves as an occupational hazard: the impact of heat and heatwaves on workers' health, safety and wellbeing and on social inequalities. European Trade Union Institute. https://www.etui.org/sites/default/files/2021-11/Heatwaves%20as%20an%20occupational%20hazard%20The%20impact%20of%20heat%20and%20heatwaves%20on%20workers%E2%80%99%20health%2C%20safety%20and%20wellbeing%20and%20on%20social%20inequalities-2021.pdf

NSPA (Northern Sparsely Populated Areas Network) (2022). **Northern Sparsely Populated Areas' (NSPA) Views on the European Commission's Initiative on Brain Drain – Mitigating challenges associated with population decline**. NSPA Steering Committee. https://www.nspa-network.eu/media/1ssnz2lv/20220609-nspa-position-paper-on-brain-drain.pdf

OSHA. (2023). Heat at work – Guidance for workplaces. https://osha.europa.eu/en/publications/heat-work-guidance-workplaces

OECD (2023). The effects of the EU Fit for 55 package on labour markets and the demand for skills. OECD social, employment and migration working papers No. 297.

Pogačar, T., et al. (2018). The effect of hot days on occupational heat stress in the manufacturing industry: implications for workers' well-being and productivity. International Journal of Biometeorology, 62(7), pp. 1251-1264. https://doi.org/10.1007/ s00484-018-1530-6.

Szewczyk, W., et al. (2021). Heat stress, labour productivity and adaptation in Europe — a regional and occupational analysis. Environmental Research Letters, 16(10), 105002. https://doi. org/10.1088/1748-9326/ac24cf.

United Nations Framework Convention on Climate Change. (2015). Paris Agreement, https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.

van Daalen K.R., et al. (2022). The 2022 Europe report of the Lancet Countdown on health and climate change: towards a climate resilient future. Lancet Public Health 2022. https://doi.org/10.1016/S2468-2667(22)00197-9.

Vandeplas A., et al. (2022). The possible implications of the green transition for the EU labour market. European Commission. Luxembourg: Publications office of the European Union. https://ec.europa.eu/info/publications/economic-and-financial-affairs-publications_en.

World Economic Forum (WEF. (2023). Future of Jobs Report 2023. https://www.weforum.org/publications/the-future-of-jobs-report-2023/

World Health Organisation (WHO). (2021). WHO health and climate change global survey report. https://www.who.int/ publications/i/item/9789240038509.

eures.europa.eu

Subscribe to our newsletter

youtube.com/user/EURESjob

twitter.com/EURESjob

linkedin.com/company/eures

facebook.com/EURESjobs

instagram.com/euresjobs/