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BUILDING FOR TODAY AND THE FUTURE

FUTURE GREEN CONSTRUCTION JOBS: SKILLS AND DECENT WORKING CONDITIONS

EXECUTIVE SUMMARY

In 2018, the International Labour Organization predicted 24 million new green jobs would be created by 2030. However, jobs growth to date has been moderate, with the percentage of green jobs in OECD countries only rising from 16% to 18% between 2011 and 2021.

Some European countries and New Zealand have led the way in green employment creation. In Europe's Baltic and Nordic countries, the UK, Switzerland, and France, 24% or more of all jobs across sectors are green, far more than in Southern and Eastern European countries. Regional imbalances have been found within countries, with capital regions usually presenting the highest proportions of green jobs and experiencing ongoing growth in green employment, exacerbating intra-country imbalances.

The built environment accounts for 37% of global emissions, with an urgent need to decarbonise buildings and construction. OECD data shows that 30% of current jobs in the construction sector are polluting, and 50% of construction jobs are green, but it is unclear whether green employment is being created where polluting or brown employment is being lost.

Construction is one of the sectors that is predicted to gain most from the green transition in terms of employment creation. The rollout of large investment programmes with earmarked funding per country, such as the EU's National Resilience and Recovery Plans and Renovation Wave, makes mapping green employment creation possible, with key hotspots identified in Italy, Spain, France, and Poland. However, these predictions have yet to materialise, with growth in the number of people working in construction in some European countries being slower than predicted, or numbers even falling. The issue is not purely one of worker supply, with evidence showing a smaller number of green vacancies in construction than in other sectors such as manufacturing, with some of the technological innovation analysed in this research indicated to be partly responsible.

New technologies, such as off-site construction and renewable energies, can absorb the expected employment growth in construction, as well as shift the geographical distribution of jobs from the construction site to the supply chain. There is little information about where this employment creation is taking place, but research shows localised employment growth in energy efficiency, and regions with a traditional production of modular homes (such as caravans) have a higher chance of becoming off-site construction hubs due to skills and workforce availability.

The number of workers moving from brown or polluting construction jobs to green employment has only been analysed in a few geographies, with wide evidence suggesting small but growing numbers. In the UK, movers to green jobs are more often female compared to the average green worker, and younger and with a higher degree of formal education than the average brown worker. Brown to green movers have increased their wages, but these remained lower than those of the average worker entering a green employment, indicating a potential brown penalty.

Owing to the formal education gap between brown and green employment, and the difference in tasks performed in polluting and green jobs, the green transition debate has mostly focused on the need to provide skills to and to re-skill existing workers. Projected in-demand skills for the construction and engineering workforce include waste management, energy efficiency, and digital skills, such as programming and robot management, or knowledge of AI-assisted tools, 3D modelling, GIS, CAD or BIM skills. This brief shows some overlap between the skills needed for construction and those forecast for off-site construction, including knowledge of digital design and of artificial intelligence and virtual reality-assisted design tools.

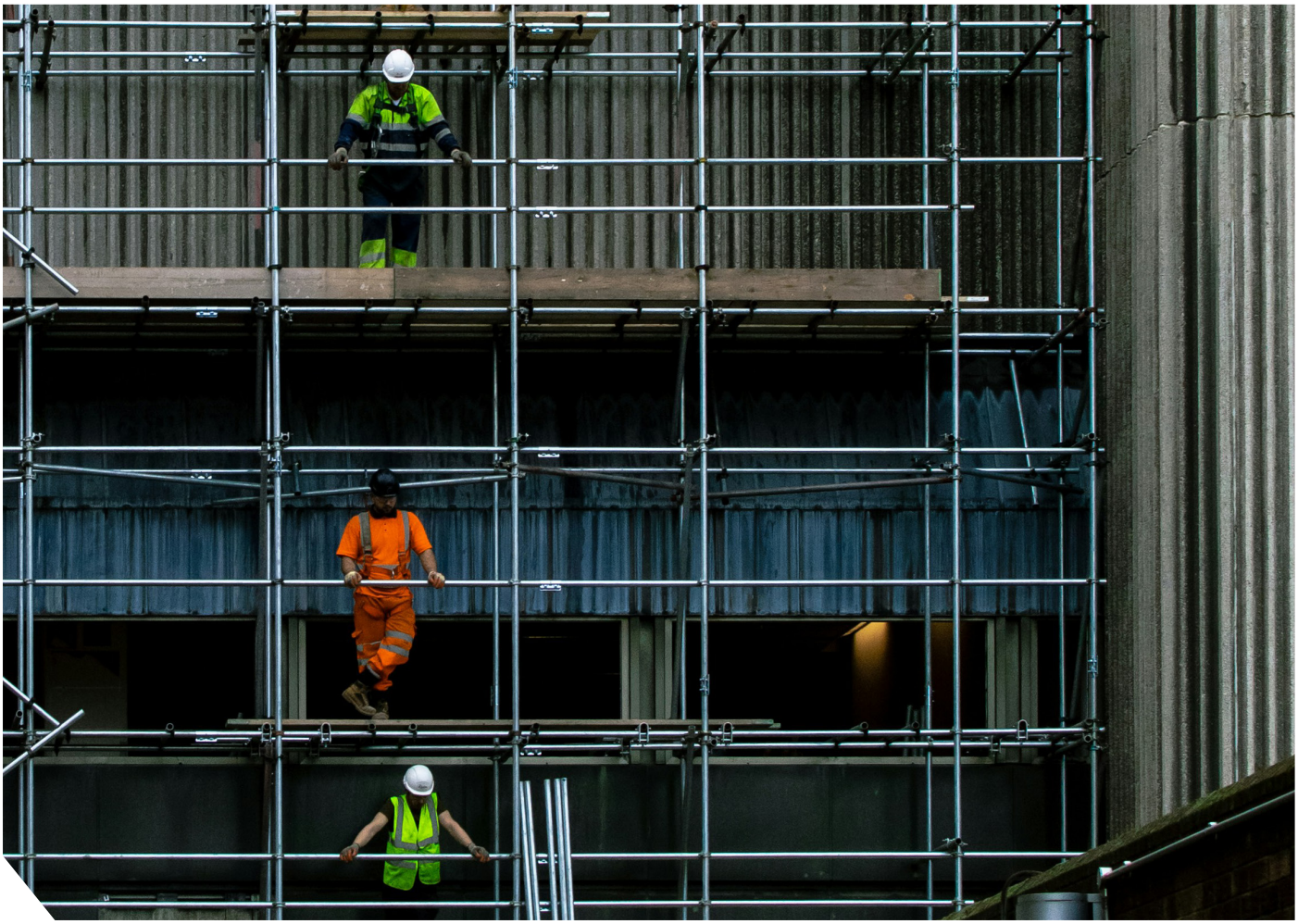
In the push to decarbonise the built environment, it will be crucial to ensure green jobs address the construction sector's longstanding issues of high injury rates, the gender gap, precariousness, and informal work. Closing the deficit in decent working conditions, addressing occupational safety and health (OSH) risks, as well as promoting workers' right to unionise will therefore be central to the future of green employment and the wider green transition.

Aside from the analysis of wage differentials, limited research has been undertaken on green employment working conditions, across sectors and in construction in particular. Country-specific studies draw conflicting conclusions about the quality of green employment conditions across sectors. In the UK, the proportion of temporary contracts is higher in brown employment, but green workers are more often self-employed. In Portugal, green jobs have a lower level of structured provision and coverage of OSH services, a higher incidence and severity of accidents, and lower levels of professional qualification. In the construction sector, different studies in the UK, US, Australia, and Sweden have found that OSH risks are lower in off-site construction.

To conclude, the growth in green jobs has so far been significantly slower than forecast. Regional disparities in green employment are clear, but wider geographical analyses are needed beyond OECD and EU countries. In the construction sector, where significant job growth is predicted, challenges persist, including a deficit in decent working conditions and the different skill requirements for green jobs. Without providing equitable access to green employment opportunities and improving working conditions, the jobs needed to deliver the green transition will not be created or filled.

Addressing these issues requires collaboration between the industry, social partners, employers, and trade unions at all levels of government to ensure not only that environmental objectives are met, but also social equity and that decent work is accessible for all. Only by creating quality green jobs and providing clear information on where they will be located, as well as what skills they will require, will it be possible to bring the green transition forward.

This policy brief provides a comprehensive overview of the risks associated with skill mismatches and the deficit in decent working conditions in the green transition, particularly focusing on workforce impact, geographical distribution, required skills for new green jobs, and changes in working conditions. Drawing on data from the ILO, OECD and EU reports, as well as academic literature, this brief aims to support workers in developing informed collective bargaining strategies to ensure equitable access to new green employment and improved working conditions.



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1. INTRODUCTION

1.1 WORKFORCE TRENDS AND EMPLOYMENT CLASSIFICATIONS: CONSTRUCTION SECTOR SKILLS IN THE GREEN TRANSITION

The International Labour Organization (ILO) predicts that the green transition required to respond to the climate crisis, and ensure a more sustainable planet and global economy will result in a net increase in construction jobs, both in Europe and globally.[1] This is despite the projected phasing out of high-carbon emitting employment in the sector,[2] also known as "polluting" or "brown" jobs.

There is no universally accepted definition of the new jobs created by the green transition, commonly referred to as "green jobs". According to UNEP, they are the ones that help to protect and restore ecosystems and biodiversity, reduce energy consumption, decarbonise the economy, and minimise or altogether avoid the generation of all forms of waste and pollution.[3] While these are predicted to outnumber the "brown" jobs that will be lost, it is unclear how they will be distributed geographically, and what skills they will require.

Technology will play a key role in the transition, with innovations in the materials' industry, construction with renewable energy sources, and an increase in off-site construction. These phenomena add further complexity to forecasting what future green jobs in construction will entail, where they will be based, and who they will go to.

1.2 ADDRESSING DECENT WORK CONDITIONS DEFICIT AND SKILLS MISMATCH IN THE CONSTRUCTION SECTOR

The right to work and to favourable working conditions are included in the UN Universal Declaration of Human Rights, and businesses are responsible for respecting them under the UN Guiding Principles on Businesses and Human Rights.

The ILO Declaration on Fundamental Principles and Rights at Work expresses the commitment by governments, employers, and worker's organisations to a safe and healthy working environment; the Charter of Fundamental Rights of the EU ensures workers' rights to fair and safe working conditions, and the term decent work, initially coined by ILO, is an integral part of Goal 8 of the 2030 Agenda.

Governments and businesses must ensure that construction workers enjoy decent working conditions and that they are not left behind because of climate action, ensuring a just transition.

However, the deficit of decent working conditions remains unaddressed in the construction sector. A number of worker rights are at high risk, including high degrees of informality, hazardous working conditions, and wage theft, often hidden behind multiple layers of subcontracting. Gender imbalances are also high in the construction workforce. Partly due to this reason, the construction sector has traditionally experienced significant labour shortages.[4]

According to the ILO, green jobs are by definition decent, as the term refers to a subset of employment in the environmental sector that meets the requirements of decent work – adequate wages, safe conditions, workers' rights, social dialogue and social protection.[5]

Therefore, the creation of new green jobs presents an opportunity to rectify longstanding issues, such as the decent working conditions deficit in the construction sector.

The decarbonisation of the built environment requires green construction workers but, at the moment, it is unclear how the green transition is addressing these long-standing issues, if future green employment opportunities are representing an improvement compared to the jobs they are replacing,[6] and whether new green jobs in construction are decent in practice.

Evidence from the ground suggests that worker-driven technology that factors climate change impacts and workers needs is likely to bring benefits for employees (see example below).

However, research has not assessed the impact that new technological developments will have on working conditions, like occupational safety and health (OSH). In sectors dominated by migrant, temporary or informal work with already large decent work deficits, they will likely require rethinking universal social protection schemes.

If new green jobs do not provide improved working conditions, this will compound existing inequalities, vulnerabilities, and skills mismatch issues[7] and result in green construction facing widespread labour shortages, notably in the EU,[8] which could scupper progress towards green targets in the built environment.

GBH on tech innovation used to protect OSH in Austria

GBH, the Austrian BWI affiliate for building and construction workers, launched an app strengthening OSH services due to increased heat waves. The climate crisis causes extreme natural events to occur more frequently, which poses extreme danger for people working outdoors, particularly workers on construction sites.

If temperatures are too high and reach 32.5 degrees Celsius, the employer can stop or modify work on the site, and construction workers must continue to be paid 60% of their hourly wages without working. To enable this, GBH has launched a heat app that alerts employees via their phones when heat limits are exceeded. The app launch aims to support and encourage workers to speak out against working when it's no longer reasonable.

2. POLICY BRIEF AIM STATEMENT AND METHODOLOGY

This brief aims to bring clarity on the risks of skill mismatch and decent working conditions deficit in the green transition by assessing its impact on workforce numbers, geographical location, skills demand for new green jobs, and change in working conditions.

The brief's main geographic focus is European, but it also includes global analyses, which are all based on data from ILO, OECD and EU institutional reports, as well as academic literature. However, the research acknowledges the unbalanced legacy of emissions that has historically transferred commodities and wealth from developing countries to industrialised economies.

The limited geographical scope of this study does not intend to be used to justify or perpetuate such inequalities, but to reinforce that wider geographical analyses are needed to fully understand the future of green employment.

A stronger evidence base is needed to inform social dialogue, policy advocacy and collective bargaining strategies in the green and just transition. Therefore, it is necessary to identify which jobs may be lost, by whom, and where, as well as what new jobs may be created, where, and what skills will be required. With this information in place, workers and their trade unions can identify potential risk factors, mitigate against them and ensure equitable access to new green employment opportunities.

Evidence on relevant skills is also needed from industry and governments to drive vocational training and apprenticeship programmes, grant brown job holders access to new green employment, enable workers to organise in new green jobs, and to undertake collective bargaining to ensure the new jobs result in improved working conditions, attracting the workers needed for the green transition.

Unionised workers are already tackling the above risks, and identifying mitigation measures. To inform future collective bargaining strategies, as well as seeking common ground beyond regional boundaries, demonstrating global solidarity on policies that would help all workers, this brief shares best practice approaches on how construction worker representatives are tackling skill mismatch and OSH in green employment.

3. WORKFORCE AND GEOGRAPHICAL IMPACT OF THE GREEN TRANSITION

3.1 GENERAL GREEN AND BROWN EMPLOYMENT TRENDS

The ILO's flagship report "World Employment and Social Outlook 2018" predicted the creation of 24 million jobs by 2030 in the green economy, which included 6.5 million jobs in the construction sector due to the transition.

Over the last decade, the share of green jobs over total employment has increased slightly, and brown jobs have either stayed the same, or reduced moderately. Analysis shows that the share of polluting or brown jobs over total employment in some OECD countries decreased slightly between 2011 and 2021, shifting from 12.4% to 11.7%, whilst green-task jobs increased from 16% to 18%.

However, the geographical distribution of green-task jobs varies considerably within countries, with green jobs accounting for 7% more jobs in the greenest regions, on average, than the least green ones.[9]

The proportion of green employment over total jobs is higher than 30% in capital regions like Île-de-France, Stockholm, Oslo, Greater London, and Luxembourg, and is also considerably high in the Baltic countries, District of Columbia, Copenhagen, Helsinki, New Zealand, and Switzerland (see Figure 2).

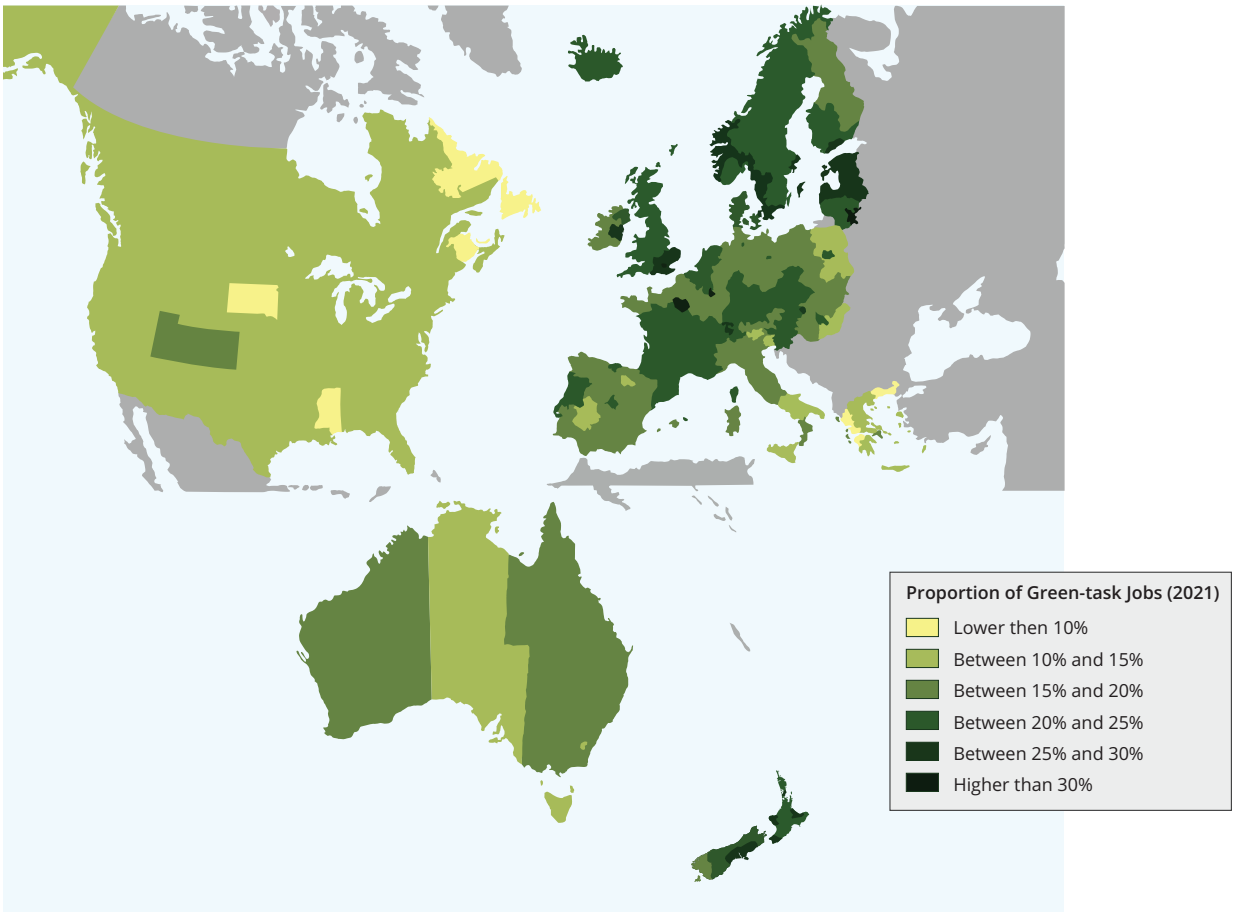

Figure 1. Share of green-task jobs across regions, OECD regions. Source: OECD (2023), Job Creation and Local Economic Development 2023: Bridging the Great Green Divide

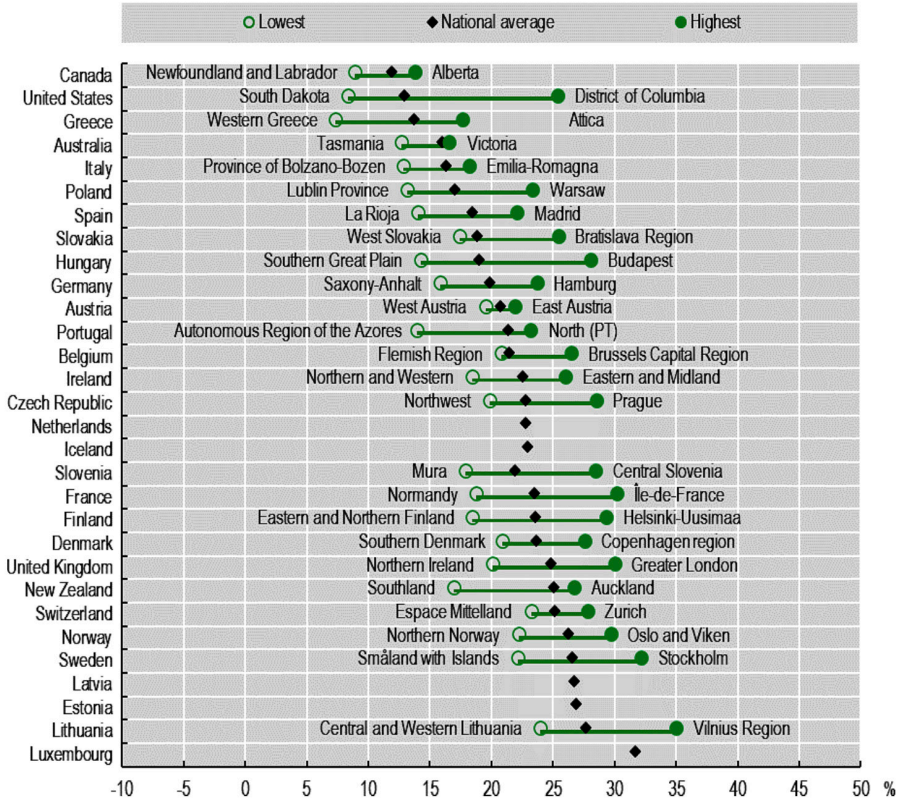

Figure 2. Source: Share of green-task jobs across and within countries, OECD regions. Source: OECD (2023), Job Creation and Local Economic Development 2023: Bridging the Great Green Divide

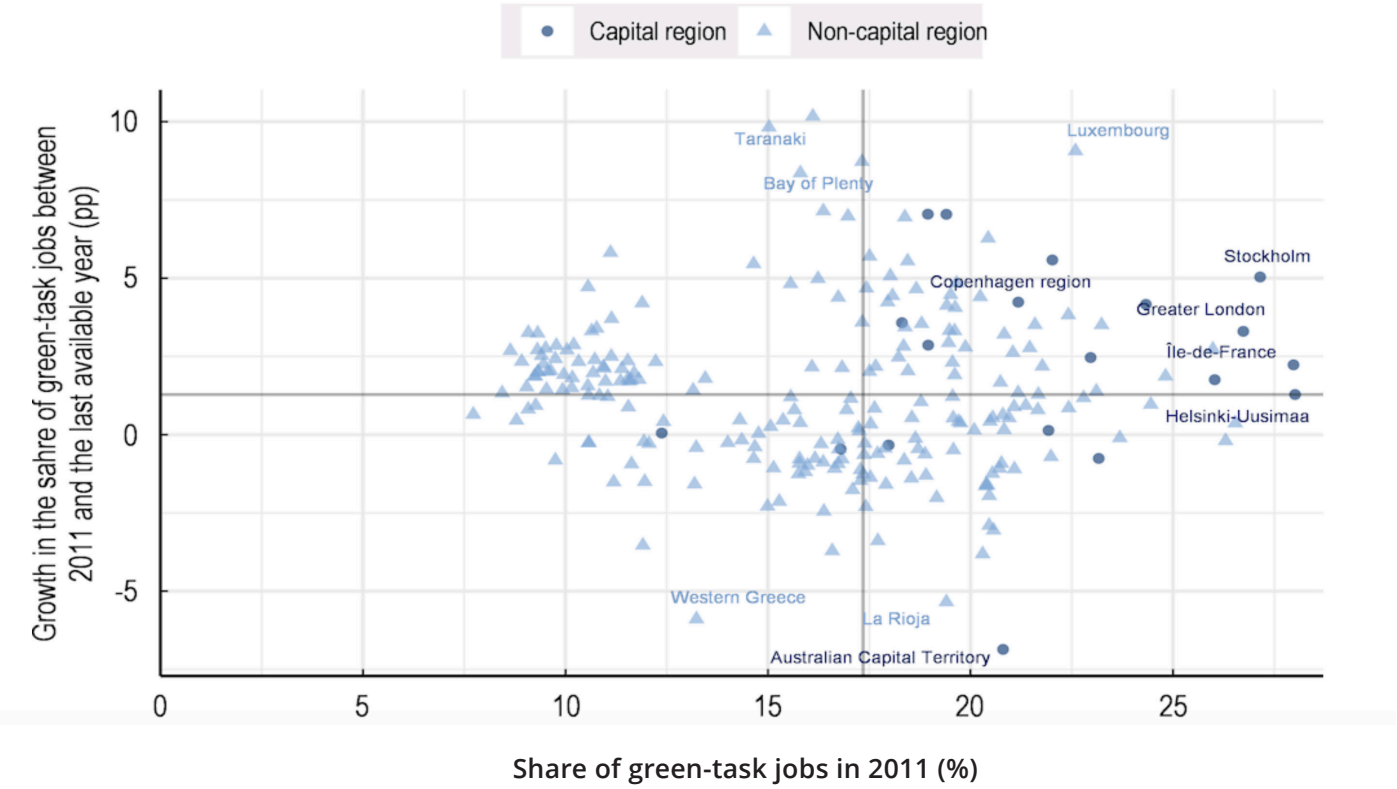

Figure 3. Share of green-task and polluting jobs in OECD regions. Source: OECD (2023), Job Creation and Local Economic Development 2023: Bridging the Great Green Divide

In the last decade, capital regions have generally experienced a larger growth in green employment creation, despite those areas already having a higher proportion of green jobs, and smaller polluting labour markets. In France, for example, 10% of jobs in Île-de-France are polluting jobs and 30% are green, whereas, in the rest of the country, these numbers are 16% and 22% respectively.

From a regional perspective, Europe and New Zealand present higher rates of green employment than Canada, the US and Australia. Within Europe, lower rates of green employment are found in the Southern and Eastern European countries, while the Baltic and Nordic countries, Switzerland and France all see higher rates of such employment.

Regarding the impact of climate policy on brown or polluting employment, modelling from the Trade Union Congress (TUC), a UK cross-sector trade union, estimated about 660,000 jobs in high carbon manufacturing industries to be at risk in the UK alone, which included jobs in the construction sector.[10]

In a wider geographical scope, another analysis estimated the share of vulnerable workers exposed to climate policies in selected countries between 1997 and 2009. These workers were defined as both working in a polluting industry, and having low or medium educational attainment.[11]

The figures show the proportion of affected workers declining over time almost everywhere, but with significant variations: between 2.9% and 3.1% in Denmark, France, Brazil, and the US, compared to between 8.2 and 8.6% in Czechia and China. The countries with the highest proportion of vulnerable workers by 2009 were new EU countries, Russia and China, with a share of vulnerable workers between 6% and 8%. Unfortunately, this data is now quite outdated, and a new dataset would be beneficial.

More generally, a geographical overlay of the green jobs being created and workers being affected by decarbonisation programmes could play a crucial role in informing workers and their representatives about shifts in the workforce. IRENA has published a report on growing employment in the renewable energy sector, indicating that a total of 12.7 million jobs exist globally in renewable energy in 2021. China alone accounts for 42% of employment, followed by the EU and Brazil with 10% each, and the US and India with 7% each.[12] However, further geographical analyses of green employment creation are lacking.

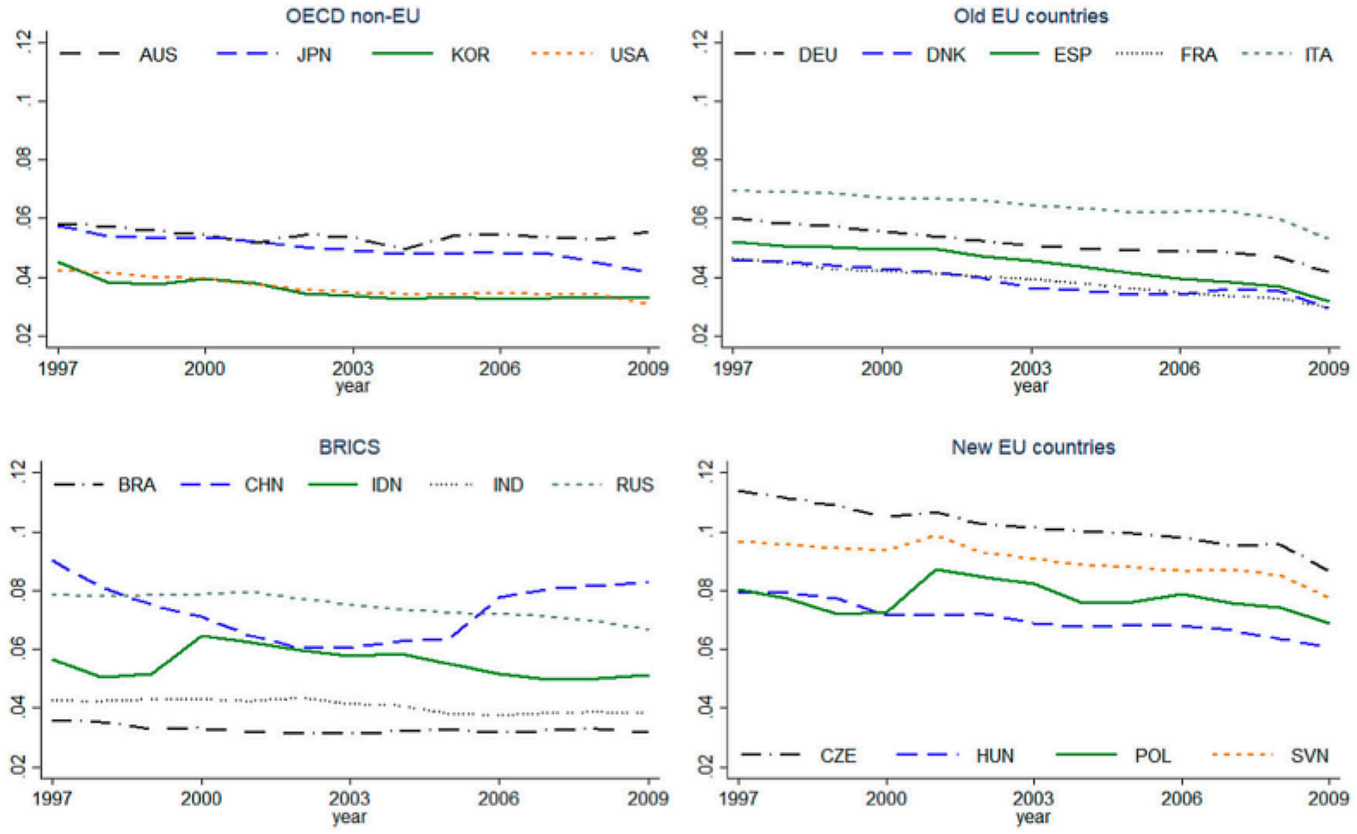

Figure 4. Evolution of vulnerable workers in highly polluting industries, share of hours worked on total hours. Source: Vona, F. (2019), Job losses and political acceptability of climate policies: why the 'job-killing' argument is so persistent and how to overturn it

3.2 CONSTRUCTION SECTOR TRENDS

The general employment trends discussed above are expected to apply to the construction sector, but some in a more intensified way, with construction projected to be the second sector by new green jobs created and therefore net workforce growth.

This is partly due to the high share of green-task jobs, with more than 50% of the total employment qualifying as green, compared to almost 30% classified as polluting jobs.[13]

However, the sector is seventh in terms of vacancies for green employment. OECD data shows that the construction sector made up less than 5% of total green vacancies, behind manufacturing (20%), professorial & scientific (17.5%), administrative and support service activities (17%), wholesale retail and trade (7%), information and communications (6.5%) and finance (5%).

The projected impact on the workforce remains positive. In Latin America, the sector expects a net increase in employment of 58% of the workforce by 2030 in a decarbonisation scenario, compared to 2014.[14] In Europe, JTC-ITUC and EFBWW's report "Skills and quality jobs in construction" projected green job creation in the construction sector due to the National Recovery and Resilience Plans (NRRPs) and the Renovation Wave.[15]

Energy efficient renovations of the European building stock linked to National Recovery and Resilience Plans (NRRPs) have been projected to generate 2.4 million direct jobs between 2021 and 2026. Geographically, employment growth is expected to be greater in countries with greater investment, such as Italy, Spain, France and Greece, as seen in Table 1 of the Annex. As a proportion of the workforce, Greece stands out, as projected job creation due to NRRPs would entail almost a 150% increase in people working in construction by 2026, compared to the 2020 workforce. Croatia would experience a 37% increase, and countries like Italy, Bulgaria, Spain and Romania would experience increases close to 30%.

Figure 5. Average jobs created in energy efficiency, proportional to total people employed in construction, sustained by NRRPs. Source: JTC-ITUC & EFBWW (2023) & Eurostat (2024),[16] author's production.

The projections of total recruitment needs for energy renovations in the EU between 2023 and 2030 vary from 1.7 to 2.8 million jobs depending on the methodology used, as shown in Table 1. According to the CEDEFOP Skills Intelligence database, 1,259,647 workers in energy efficiency construction are expected to retire during that period. Additionally, between 486,600 and 1,549,000 new green jobs will be created, depending on the methodology used.[17]

In one analysis, JTC-ITUC & EFBWW equated the expected investment in energy efficiency between 2023 and 2030 to that seen in the wider building sector in the years preceding the 2008 financial crisis. With this assumption, at least 1,549,000 more workers would be needed to meet the green EU targets for 2030. In another analysis, CEDEFOP[18] forecast through statistical modelling that the Green Deal would result in the creation of 486,600 additional jobs.

	Retiring workers	New employment creation	Total recruitment needs
Calculations based on pre-crisis job creation	1,259,647	1,549,000	2,808,647
CEDEFOP Forecasted job creation	1,259,647	486,600, of which: • 122,500 highly skilled non-manual • 28,600 skilled non-manual • 305,200 skilled manual occupations • 30,400 skilled manual	1,746,247

Table 1. Forecasts on employment creation in the EU as a consequence of the renovation wave. Source: JTC-ITUC & EFBWW, (2023), Skills and quality jobs in construction

It must be noted that concerns have been raised about green employment creation predictions, and that there is little evidence that the sector's workforce is increasing. As seen in Table 2, between 2018 (the starting year of the renovation wave) and 2020, **some EU countries** (Croatia, Cyprus, Hungary, Malta, or Romania, for instance) **have experienced a large increase in the number of people employed in the construction sector. In others** (like Bulgaria, Greece, Italy, Slovakia and Spain), **however, the growth has been minimal, and significantly smaller than predicted. In some cases** (Sweden or Finland), **the number of construction workers has actually decreased.**[19]

	Energy e iciency job increase sustained by NRRPS 2021-2026, compared to 2020 workforce	2018-2020% growth in construction sector employment
Austria	1.80%	4.12%
Belgium	15.31%	8.14%
Bulgaria	33.32%	1.70%
Croatia	36.92%	18.78%
Cyprus	13.18%	18.48%
Czechia	11.35%	2.00%
Denmark	4.49%	4.26%
Estonia	9.68%	2.66%
Finland	1.83%	-0.32%
France	16.83%	8.86%
Germany	6.14%	5.25%
Greece	145.51%	2.68%
Hungary	14.68%	17.17%
Ireland	5.32%	8.88%
Italy	34.41%	3.16%
Latvia	17.77%	-2.98%
Lithuania	10.17%	5.99%
Malta	23.11%	24.11%
Netherlands	9.03%	7.83%
Poland	18.78%	10.70%
Portugal	9.26%	11.39%
Romania	27.72%	21.37%
Slovakia	23.88%	1.71%
Slovenia	6.31%	8.95%
Spain	28.72%	-1.76%
Sweden	1.64%	-2.04%

Table 2. Predicted job creation on energy efficiency sustained by NRRPs in the construction sector as an increase of total workforce, and actual workforce increase between 2018 and 2020. Sources: JTC-ITUC & EFBWW, (2023), Skills and quality jobs in construction; Eurostat (2024), Statistical classification of economic activities in the European Community (NACE Rev.2): Construction. SBS data by NUTS 2 regions and NACE Rev. 2 (from 2008 onwards). Author's own production.

In any case, there is no available data on actual green employment creation in the construction sector beyond jobs created in energy efficiency or renewable energy. IRENA reported that the photovoltaic sector was the fastest growing in 2021 in terms of job creation, employing 4.1 million people globally and accounting for a third of the total renewable energy workforce.

Regarding renewable energy equipment installation, evidence suggests that gender-oriented training programmes contribute to reducing the gender gap in the construction workforce (see example below).

ILO and UOCRA training on solar panels water heating for female construction workers in Argentina

In Argentina, women make up 5% of the construction workforce. In order to address both the gender gap and training needs in the green transition, UOCRA Women and Page OIT have developed the project "Training for the transition to environmentally sustainable work processes with a gender perspective".

This jointly promotes reskilling, and strengthens the competences of women in the construction industry, and enhances capacities in solar thermal energy for domestic water heating. The project trained 150 women working in construction in the Argentinian cities of Buenos Aires and Mar del Plata.

In relation to employment creation and destruction across sectors as a consequence of climate policy, Marin & Vona (2018)[20] point out that the decline of employment in EU polluting industries occurred before the implementation of environmental regulations. It is therefore most likely to be a result of globalisation and automation, thus partly attributable to technological change.

Indeed, technology plays an important role in labour market developments in the built environment and in the workforce. Although there is limited analysis available, an indicative example is the expansion of modular construction.

Modular construction reduces whole build time by approximately 50%,[21] thus cutting half the costs and reducing the required workforce. In the US, a survey study determined that the demand for all 18 mapped off-site construction occupations will increase, and demand for 79% of the on-site workforce occupations will decrease.[22]

Larger growth in off-site construction is seen in computer-aided manufacturing and information modelling professionals; assembly, fabrication, and production personnel; planners, expeditors, facilitators, and sequence management and supply chain personnel; logistics and transportation management personnel; and technology and configuration specialists.

Regarding on-site construction, the survey study showed growth is expected for off-site modules/components installation and setup personnel; lifting, cranes, hoisting, rigging, and signal personnel; instrumentation and control personnel; equipment operators; and heavy civil personnel.

The demand for the other mapped occupations is expected to shrink, including drywall personnel, general labourers/helpers, glaziers, and electrical personnel. The survey results on shrinking demand for electricians on-site due to a rise in off-site construction conflict with global US electrician needs, as Rewiring America (2020) projected that a million more electricians would be needed to meet climate goals in the country.[23]

It is important to note that off-site construction shifts workforce demand from the construction to the manufacturing sector.[24] Accounting for 20% of total green vacancies according to OECD data,[25] the manufacturing industry will probably be capturing the increasing demand for green and technology-led phenomena like off-site construction.

There have been some efforts to map geographically the companies working on off-site construction, addressing the uncertainty on how the shift to off-site is impacting job distribution, but further research is needed.

In the UK, timber frame and modular building companies cluster in the Manchester area, steel companies in Birmingham, and modular construction in Hull, an area that has led the caravan industry and therefore already boasts a workforce with the kinds of skills and experience needed.[26] However, further mapping efforts are needed to comprehend the geographical impact of workforce relocation across the value chain.

4. ACCESSING FUTURE, DECENT, AND GREEN EMPLOYMENT

4.1 GENERAL TRENDS ON WORKING CONDITIONS IN GREEN JOBS

US and UK studies show that green occupations exhibit higher levels of standard dimensions of human capital such as formal education, work experience and on-the-job training.

Across all sectors, the transition from a brown to a green job is quite infrequent due to the significant difference in associated tasks. Therefore, high-skilled and highly-educated workers are often better positioned to benefit from the green transition. Additionally, green jobs use more intensively high-level cognitive and interpersonal skills compared to non-green jobs.[27]

In the UK, a Resolution Foundation report (2022) showed that, in 2019, 9% of the brown employment workforce left or lost their jobs, but only 2% went into green employment. However, out of those leaving brown for other jobs (i.e. not retiring or remaining unemployed), the percentage going to green jobs had increased from 8.5% in 2013 to 50% in 2019. Movers to green jobs were more likely to be female than the average green worker, and younger and more educated than the average brown employee.

While the Resolution Foundation report indicated that workers who moved from brown jobs to green jobs had access to better paying jobs, there is conflicting evidence on the wider quality of green employment. Portugal-based research concluded that, in green employment, there is a lower level of structured OSH provisions (e.g. health and safety training, personal protective equipment, and emergency response planning), and a lower level of working population covered by those provisions. In Portugal, the incidence and severity of accidents at work were also found to be higher in green jobs.

Thus, education and working conditions analyses differ in diverse contexts. Lower levels of professional qualification were seen in Portuguese green employment,[28] and UK-based analysis suggesting green jobs tend to require higher formal education and offer better conditions.

Also in the UK, in 2019 green jobs comprised 13% of overall employment, but just 6% of temporary contract work, and brown jobs comprised 4% of overall employment and 4% of workers on temporary contracts.[29] However, compared to the average worker, those in green jobs were more likely to be self-employed and those in brown jobs less likely to be so: 17% of self-employed workers are in a green job, but only 2% are in a brown job.

At OECD level, the wage premium of green-task jobs over non-green-task jobs is 20%, and 12% compared to polluting jobs.[30] In the UK, the small number of workers moving from brown to green jobs experienced the largest increase in relative wages, compared to other shifts (e.g. from non-brown employment) to green, with an 18% average hourly increase.

It is important to note that, given that workers shifting from brown to green jobs had a higher degree of formal education than the average brown, they already had a higher starting wage. However, brown-to-green movers still earned less than an average worker joining green employment, showing a brown penalty.

Regarding the risk of automation, studies examining the task content of green jobs have noted that the work tends to be less routinised than non-green, reducing the risk of automation.[31]

4.2 CONSTRUCTION SECTOR TRENDS

Research has identified how decent working conditions in the construction sector still remain unaddressed. Local research carried out in European cities found high degrees of informality, often caused by complex sub-procurement; precariousness, wage theft, unpaid overtime, and overdue salaries in the sector.[32] Globally, the sector is still heavily reliant on migrant workers, who have a higher vulnerability to abuse; construction workers were found to be living in substandard housing arrangements, many unaware of their employers' obligations; and gender disparity continues to be a very common trend.[33]

Despite a proven wage premium across all green occupations and lower automation risk, green jobs are not necessarily better, and those at risk of shifts in their job from the decarbonisation wave across sectors need to know that they will receive an equivalent quality job.[34] This matches concerns raised already in 2010 by ILO officers in South Africa, warning that green construction jobs do not automatically constitute decent work, and that existing labour problems in construction, like casual labour, poor working conditions, and weak social dialogue, could be transferred to the new green jobs in the sector.[35]

Few studies have compared the working conditions of green, brown, and average employment in the construction sector. **Green building construction presents many of the same occupational risks found in conventional construction.** In the EU, in 2021, the construction sector had the highest incidence of non-fatal accidents at work (3,511 accidents per 100,000 workers), and it was the sector with the most fatal accidents, 22% of the total.[36] **More research is needed on how the green transition is impacting occupational and safety hazards in the construction sector,** as well as informality levels, wage theft, precariousness, unionisation rates, gender gap, and access to adequate housing, when it is the employer's obligation to provide this.

Some have, however, analysed the benefits of off-site construction for employees.[37] In the UK, it has been found that safety risks are easier to identify and control;[38] in Australia, these methods reduced the number of dangerous tasks on site, and thus, reduced the number of people working in dangerous positions, also reducing exposure to weather;[39] in Sweden, exposure to harm was reduced by minimising the occurrence of awkward work postures;[40] and in the USA and Sweden, off-site construction reduced chances of occurrence of falls or impacts with other objects.[41]

An increase in worker wages has not been identified as one of the benefits of off-site construction. Given the differentials in green job demand between manufacturing and construction, and general cost reduction as the main highlighted advantage of off-site construction, there is potential for this to result in increased offshoring, with associated risks and opportunities for workers.

However, given the fast growth of the green economy and employment, the main concerns involve gaps in skills that affect inexperienced or unskilled workers, which impact occupational and safety risks as well as access to these new green jobs.

Evidence from the ground shows that skill mismatch risk is mitigated when social partners in the sector work together with employer representatives and education providers to regularly forecast demanded skills, and to adapt and provide skills training (see example below).

CEDEFOP has identified the key skills that can be required at the managerial and technical level as a consequence of the green transition in construction.[42]

Low Energy Construction skills integration in inclusive Vocational Education and Training in Belgium

Belgium's inclusive vocational education and training system, regulated both by social partners and the state, is based on occupational profiles that are used by colleges and training organisations to develop teaching curricula. The recent revision of occupational profiles relating to low energy construction (LEC) has been led by Constructiv, a joint body formed by trade union and employer representatives. Rather than creating new occupations based on specific new competences, LEC knowledge (e.g. installation of renewable energy systems, sealing, and insulation skills) has been integrated into existing occupational profiles, many of which overlap.

Skills required to manage the green transition and implement changes (managerial positions)	Needs detected regarding skills for technical positions
• Knowledge of **waste management and circular economy** principles; • Understanding of the concept of sustainability and its application in construction; • Skills related to **demolition waste management;** • **On-site recycling;** • Energy conservation and processes for bringing about **energy efficiency;** • Knowledge of green materials' use and properties, especially for architects and designers.	• For traditional craftworkers (plumbers, electricians, carpenters and joiners, plasterers, bricklayers, thermal insulators, and window installers) **up-skilling is needed in energy efficiency,** in following **waste management** guidelines, in the application of **circularity principles** when handling materials (avoiding waste as much as possible), and making more **efficient use of energy;** • Knowledge of safe and **correct use of bio-based materials and nano-materials,** like skills related to wood used in construction; • **Installation of renewable energy equipment,** like solar panels; • Knowledge of material structures and their interaction with the environment.

Table 3. Detected and required skills on the green transition for managerial and technical positions. Source: Construction Blueprint (2021), Construction Blueprint (2022) & CEDEFOP (2023).

Most of the emerging green skills in the construction sector relate to waste management and energy efficiency, and some to green materials.

Knowledge of waste management, circularity principles guidelines, demolition waste management and recycling are emerging skills, and re-skilling will be particularly important for traditional craftworkers.

Regarding energy efficiency, skills on demand relate to energy conservation processes, and re-skilling will be needed for the installation of renewable energy equipment.

Lastly, knowledge of the correct use of bio-based materials like wood will entail re-skilling, and knowledge of green materials' properties will be especially needed for architects and designers.

The adoption of digital technologies has also created demand for emerging skills, which further highlights the need to upskill workers in construction sites. Some of those digitalisation skills and reskilling needs have been listed by CEDEFOP.[43]

Emerging skills in digitalisation	Reskilling needs in construction sites due to the adoption of digital technologies
• Data analysis; • **Robot programming;** • **Robot managing:** operation of robotic systems used in a manufacturing environment, but also on site, such as **demolition, welding, and bricklaying robots;** • **Construction drone piloting;** • **Sensor installation and operation;** • Knowledge of AI-assisted tools in architecture; • Design automation expertise (using key tools such as **3D modelling**); • Cybersecurity expertise; • **GIS skills;** • Innovation and integration expertise.	• Increased familiarity with the use of digital devices on site, such as computers, tablets and other smart devices for monitoring processes and operations; • Usage of cloud technologies; • Basic **programming knowledge;** • Familiarity with common **data standards and KPIs;** • Knowledge of **construction-specific application programmes, like CAD or 3D modelling;** • **Knowledge of BIM and related digital tools;** • Knowledge of digital workflow and project management platforms and advanced scheduling optimisation programmes.

Table 4. Emerging skills and reskilling needs in construction due to digitalisation. Source: CEDEFOP (2023), The greening of the EU construction sector. Skills intelligence data insight

Lastly, the skills and reskilling needs derived from off-site construction have been analysed in the US-based survey study by Assdad et al (2021), shown in Table 3 of the Annex, where skills in demand were mapped for the engineering and construction workforce.[44] Some skills in demand for off-site only, or that are already being applied on-site, but that serve for off-site construction as well, include:

Engineering and design workforce		Construction and fabrication workforce	
On-site and off-site construction skills	**Off-site specific skills**	**On-site and off-site construction skills**	**Off-site specific skills**
• Digital design tools, such as BIM; • Knowledge of artificial intelligence and virtual reality-assisted design;	• Package management (fabrication, detailing and reading); • Knowledge of off-site construction typologies, stability and constructability; • Knowledge on design for manufacturing and assembly, supply chain, procurement, logistics and transportation	• Hoisting and rigging techniques; • Health, safety, and environment (HSE) planning and management; • Welding technologies; • Workforce management and development;	• Automation, robotics, and -automated computer technologies, as CAT • Good manufacturing practices • Skills relating to operation planning and integration of on-site and off-site activities.
See more in the Annex, Table 3			

Table 5. Skills in demand for off-site construction, for engineering and manufacturing workforce and for construction and fabrication workforce. Source: Assaad, R.H. et al (2022), The Impact of Offsite Construction on the Workforce: Required Skillset and Prioritization of Training Needs

5. CONCLUSIONS

The analysis presented in this policy brief sheds light on the complexities of the green transition within the construction sector. While projections anticipate significant growth in green employment, the reality has been far different, with a slower-than-forecast uptake or even a reduction in countries where green employment growth has been forecast.

This difference between forecast and reality might be partially explained by unaddressed challenges such as skills mismatches and decent working conditions deficit, which aggravate the labour shortage that many countries were already experiencing in the construction sector.

Geographical disparities in green employment distribution raise questions about the equitable allocation of opportunities across regions, and new technological phenomena add uncertainty to the distribution of new employment.

Wider geographical analyses of employment creation and destruction as a consequence of climate policy and technological developments, specific to the construction sector, are needed to better inform policymakers and worker representatives.

The need for upskilling and reskilling is evident, particularly in response to the technological advancements shaping the sector. Moreover, the quality of working conditions in green employment, especially within the construction sector, warrants attention. While off-site construction presents potential benefits in terms of safety and efficiency, it may result in job losses, and questions remain regarding broader issues in the sector, such as informality, precariousness, and occupational hazards.

In navigating these complexities, policymakers, in cooperation with industry social partners, must prioritise strategies that ensure equitable access to green jobs while addressing skills gaps and improving working conditions. While workers and their representatives are already addressing those challenges, it is necessary to foster collaboration between industry employers, government, and labour organisations, to create a transition that not only meets environmental objectives but also promotes human rights, social equity and decent work for all.

Annex I

Table 1 - Jobs in energy efficiency sustained by NRRPs as % of people employed in construction.

Country	Jobs in energy efficiency renovations sustained by NRRPS	Persons employed in construction (2020)	Jobs in energy efficiency as % of the persons employed in construction
Greece	221,238	152,043	145.51%
Croatia	43,135	116,832	36.92%
Italy	464,400	1,349,569	34.41%
Bulgaria	51,138	153,461	33.32%
Spain	354,402	1,233,890	28.72%
Romania	122,580	442,135	27.72%
Slovakia	41,904	175,505	23.88%
Malta	3,240	14,017	23.11%
Poland	208,278	1,109,214	18.78%
Latvia	12,474	70,181	17.77%
France	314,280	1,867,592	16.83%
Belgium	52,218	341,063	15.31%
Hungary	41,364	281,713	14.68%
Cyprus	4,806	36,454	13.18%
Czechia	43,524	383,338	11.35%
Lithuania	11,772	115,789	10.17%
Estonia	4,973	51,400	9.68%
Portugal	32,940	355,834	9.26%
Netherlands	45,862	507,931	9.03%
Slovenia	4,644	73,554	6.31%
Germany	139,158	2,268,009	6.14%
Ireland	8,370	157,349	5.32%
Denmark	8,640	192,358	4.49%
Finland	3,780	206,867	1.83%
Austria	5,746	319,887	1.80%
Sweden	7,115	432,717	1.64%

Sources: JTC-ITUC & EFBWW, (2023), Skills and quality jobs in construction; Eurostat (2024), Statistical classification of economic activities in the European Community (NACE Rev.2): Construction. SBS data by NUTS 2 regions and NACE Rev. 2 (from 2008 onwards). Author's own production.

Table 2 - Evolution of people working in the construction sector, EU countries, 2018-2020

People employed in the construction sector	2018	2020	2018-2020 difference	%
Belgium	315,381	341,063	25,682	8.14%
Bulgaria	150,900	153,461	2,561	1.70%
Czechia	375,833	383,338	7,505	2.00%
Denmark	184,502	192,358	7,856	4.26%
Germany	2,154,897	2,268,009	113,112	5.25%
Estonia	50,066	51,400	1,334	2.66%
Ireland	144,521	157,349	12,828	8.88%
Greece	148,078	152,043	3,965	2.68%
Spain	1,256,045	1,233,890	-22,155	-1.76%
France	1,715,599	1,867,592	151,993	8.86%
Croatia	98,364	116,832	18,468	18.78%
Italy	1,308,231	1,349,569	41,338	3.16%
Cyprus	30,769	36,454	5,685	18.48%
Latvia	72,336	70,181	-2,155	-2.98%
Lithuania	10,9242	115,789	6,547	5.99%
Luxembourg	46,842	50,136	3,294	7.03%
Hungary	240,428	281,713	41,285	17.17%
Malta	11,294	14,017	2,723	24.11%
Netherlands	471,054	507,931	36,877	7.83%
Austria	307,231	319,887	12,656	4.12%
Poland	1,001,956	1,109,214	107,258	10.70%
Portugal	319,451	355,834	36,383	11.39%
Romania	364,289	442,135	77,846	21.37%
Slovenia	67,514	73,554	6,040	8.95%
Slovakia	172,546	175,505	2,959	1.71%
Finland	207,526	206,867	-659	-0.32%
Sweden	441,715	432,717	-8,998	-2.04%

Source: Eurostat (2024), Statistical classification of economic activities in the European Community (NACE Rev.2): Construction. SBS data by NUTS 2 regions and NACE Rev. 2 (from 2008 onwards). Author's own production.

Table 3 - Construction-related skills in demand. Source:

Construction-related skills in demand, US-based survey study	
Engineering and design workforce	
On-site and off-site construction	• Quality assurance and control, testing, inspection, and permitting procedures; • Digital design (e.g., BIM); • Material selection; • Contract and tender documents; • Scheduling and work breakdown structure (WBS); • Value engineering, estimation, and cost management; • Interfaces, accuracy, and tolerances; • Artificial intelligence- and virtual reality-assisted design; • Customized repetitive design; • Design integration and interface; • Design adaptability and flexibility; • Practical construction/field experience.
Off-site construction only	• Fabrication package creation, detailing, and reading; • Stability and constructability of components and modules; • Supply chain and procurement; • Logistics and transportation; • Off-site construction philosophy; • Design for manufacturing and assembly (DfMA); • Design freeze; • Off-site construction typologies.
Construction and fabrication workforce	
On-site and off-site construction	• Logistics and transportation; • Workflow and schedule management; • Quality assurance and control, quality management systems and commissioning; • Estimation and cost management; • Supply chain and procurement functions; • Hoisting and rigging techniques; • Health, safety, and environment (HSE) planning and management; • Constructability and Collaboration; • Contracts; • Labour regulatory and jurisdictional considerations; • Lean six sigma; • Welding technologies; • Corrective and preventive actions (CAPA); • Digital technologies; • Workforce management and development; • Total quality management; • Practical experience.
Off-site construction only	• Automation, robotics, and computer-automated technologies (CAT); • Placement, assembly, and installation; • Manufacturing and fabrication processes; • Operation management and process planning; • Good manufacturing practices (GMP); • Integration of on-site and off-site activities; • Off-site construction philosophy.

Source: Assaad, R.H. et al (2022), The Impact of Offsite Construction on the Workforce: Required Skillset and Prioritization of Training Needs. Author's own production

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