The impact of the 3Ds on G7 labour markets: Key issues

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Introduction

The world of work is undergoing substantial change. The 3Ds of Digitalisation, Decarbonisation and Demographic change are global trends driving shifts in how we work, where we work and what we work on. These shifts have been amplified and accelerated by the COVID-19 pandemic. This note seeks to identify the key challenges and opportunities for employment and social policies of the 3Ds. It starts by highlighting the key issues arising from each of the 3Ds separately and then discusses the issues arising from the interactions of these closely intertwined trends. The note is a contribution to the discussions the German G7 Presidency has planned on the important topic of facilitating a sustainable business and a socially just transformation.

1. Digitalisation

Over the past two to three decades, the pace of technological progress and the speed of its diffusion across countries have been startling. The growing use of robots perhaps best epitomises the digital and AI revolution and fears of job automation in the workplace. The worldwide stock of industrial robots increased fourfold between 2000 and 2020. The growth of the internet and the now ubiquitous use of smart mobile telephones has also led to new business models and new ways of working such as platform work and remote working. Going forward, **further leaps in the development of artificial intelligence (AI) are likely to have applications in a broad range of domains, encroaching upon many more tasks that previously could only be performed by humans**. However, the impact of these developments on the world of work is not determined in advance and will continue to depend on public policy choices and institutional arrangements.

The digital revolution has been fuelled by firms seeking to remain competitive in the context of **a world economy that has become increasingly integrated through international trade**. The growth of global value chains (GVCs) has encouraged greater specialisation in what gets produced, and how it is produced in different countries. Depending on where each country is positioned in these value chains, this has had different consequences in terms of the demand for skills and the types of jobs that are created. It has also created **greater economic vulnerabilities to shortages of materials** in the face of disruptions to global supply chains as occurred during the Covid-19 crisis.

Digitalisation has contributed to the creation of many new jobs. In the OECD countries, 40% of new jobs are in technology-intensive sectors. At the same time, many other jobs have been either fully automated or significantly overhauled. The OECD has estimated that prior to the pandemic around 14% of jobs on average across the OECD could be automated (Figure 1). Young people and low-skilled workers are more likely to be in occupations at greatest risk of automation, or within the same occupation more likely to undertake a greater proportion of automatable tasks, and hence face the highest risk of automation.[1] However, a much higher share (32%) of all jobs could undergo considerable change in how they were carried out, **requiring a substantially increased effort in skilling, reskilling and upskilling of workers**. Also, outside OECD countries a much larger share of jobs tend to be affected by robotisation and AI.[2] At the same time, **digitalisation has also led to the creation and expansion of new goods**
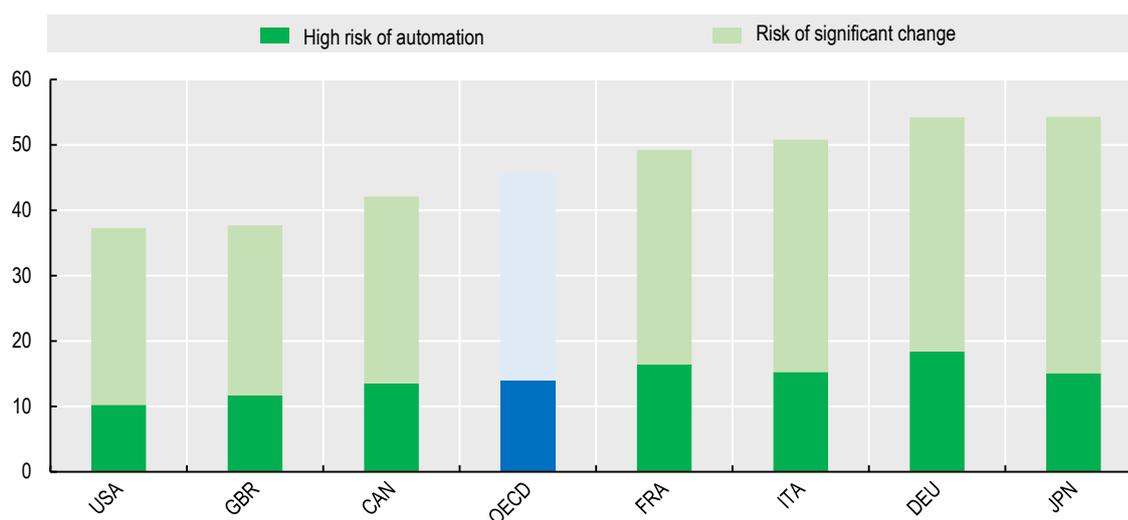
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[1] Nedelkoska, L. and G. Quintini (2018), "Automation, skills use and training", *OECD Social, Employment and Migration Working Papers*, No. 202, OECD Publishing, Paris, https://doi.org/10.1787/2e2f4eea-en; ILO. 2020. Global Employment Trends for Youth 2020: Technology and the future of jobs. Geneva.

[2] Carbonero, F.; Ernst, E.; Weber, E. (2018), "Robots worldwide: The impact of automation on employment and trade', *ILO Research Department Working Paper*, no. 36; Carbonero, F.; Davies, J.; Ernst, E.; Fossen, F. M.; Samaan, D.; Sorgner, A. (2021), "The Impact of Artificial Intelligence on Labor Markets in Developing Countries: A New Method with an Illustration for Lao PDR and Viet Nam", *IZA Discussion Paper*, no. 14944.

and services and increased productivity, which has created many new jobs, often requiring higher skills and better remunerated. Thus, far from the digital revolution leading to mass technological unemployment, employment rates rose in most G7 countries to record rates prior to the COVID-19 pandemic.

Figure 1. Jobs at risk of automation

Share of jobs which are at a high risk of automation or a risk of significant change (%)

Note: Jobs are at high risk of automation if the likelihood of their job being automated is at least 70%. Jobs at risk of significant change are those with the likelihood of their job being automated estimated at between 50 and 70%. Data for Belgium correspond to Flanders and data for the United Kingdom to England and Northern Ireland.

Source: OECD calculations based on the Survey of Adult Skills (PIAAC) (2012); and Nedelkoska, L. and G. Quintini (2018), "Automation, skills use and training", OECD Social, Employment and Migration Working Papers, No. 202, , https://doi.org/10.1787/2e2f4eea-en.

Digitalisation has brought many new opportunities – not just in terms of creating new jobs, but also in terms of job quality. Many dangerous and tedious tasks have been taken over by algorithms and robots, while more jobs have been created with a focus on human-centred tasks requiring social, caring, creativity and team-working skills. However, digitalisation and AI have also contributed to another key trend in the labour market, namely the **increased use of new forms of work arrangements**, including platform work. This trend has been accelerated by regulatory change, the emergence of new business models and, in some cases, incentives embedded in the tax system. **The rise of new forms of work arrangements brings some benefits, including new employment opportunities and more flexibility for both employers and workers, but there are also concerns about job quality, a higher concentration of more vulnerable groups in some of these jobs and in some cases a lack of adequate labour and social protection, including through collective representation.**[3]

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[3] ILO, ISSA, and OECD (2021), "Beyond COVID-19: Towards More Inclusive and Resilient Social Protection Systems", Paper prepared for the 1st G20 Employment Working Group Meeting under the 2021 Italian Presidency of the G20; ILO and OECD (2020), "Ensuring Better Social Protection for Self-Employed Workers", Paper prepared for the G20 Virtual EWG Meeting, Riyadh, 8 April 2020; ILO (2021); "Digital platforms and the world of work in G20 countries: status and policy action", Paper prepared for G20 EWG Meeting, Italy, July 2021; ILO and OECD (2018), "Promoting

Even prior to the Covid-19 crisis, there had been calls for adequate regulation, social protection, workers' voice and training opportunities for workers in non-standard forms of employment (i.e. those not involving full-time wage and salary work). During the initial stages of the crisis, many of these workers faced a high risk of income loss as well as exposure to the virus, without coverage from the labour and social protections afforded to full-time wage and salaried workers. While many governments (and some employers/platforms) put in place emergency measures to help workers, there is a clear **need for more sustainable solutions to improve job quality in new forms of work arrangements**, while mindful not to squash innovation. This is particularly pressing, given that new forms of work arrangements, including platform work and teleworking, were boosted by the Covid-19 pandemic.

More generally, **the costs and benefits of digitalisation have not always been equally shared: the low skilled have often been more exposed to the risk of automation, while the high-skilled have more often benefited from new technologies** (e.g. through the ability to telework during the Covid-19 crisis). Similarly, **AI risks increasing labour market disparities** as the early evidence suggests that it complements high-skilled workers, increasing their employment (Figure 2) and making them more productive.

Figure 2. AI exposure is associated with higher employment growth in occupations where computer use is high

Employment growth for each occupation/country combination, by level of computer use
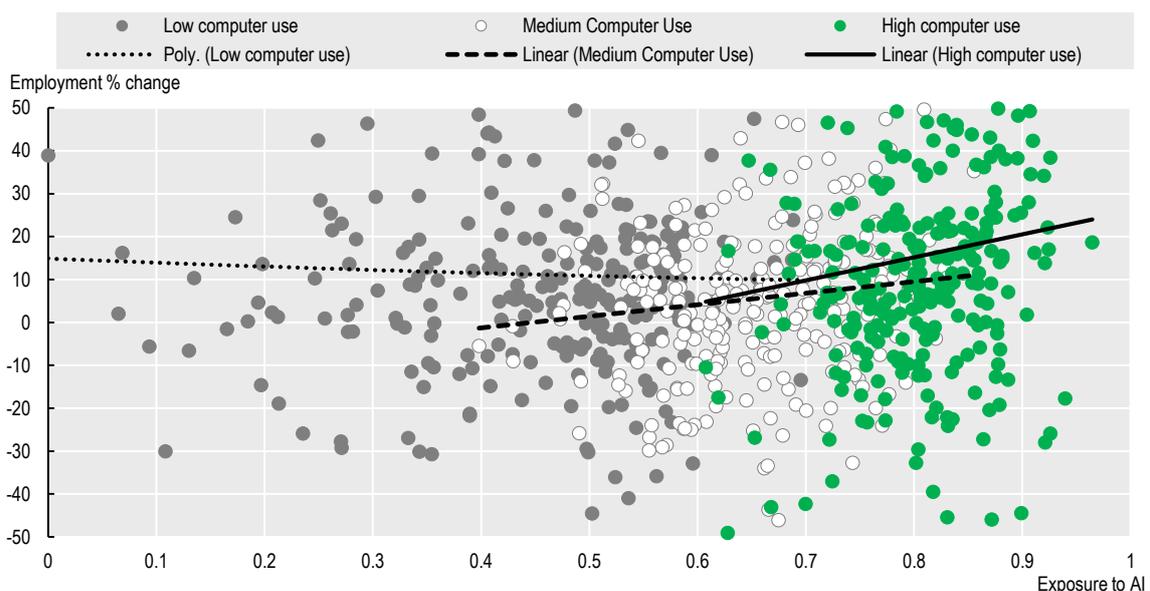
Note: Each dot represents an occupation/country pair. The colours represent different levels of computer use (low, medium, high). Linear lines of best fit have been drawn through each computer use group. The graph has been rescaled so that outliers are not visible.
Source: Based on Georgieff, A. and R. Hyee (2021), "Artificial intelligence and employment : New cross-country evidence", *OECD Social, Employment and Migration Working Papers*, No. 265, OECD Publishing, Paris, https://dx.doi.org/10.1787/c2c1d276-en.

The COVID-19 crisis may have worsened long-term prospects for low-skilled workers by accelerating automation but also given their lack of digital skills or even access to required digital tools to perform their job remotely. Going forward, **policymakers should strengthen their efforts to help**

Adequate Social Protection and Social Security Coverage for All Workers, Including Those in Non-Standard Forms of Employment-, Paper prepared for the G20 EWG Meeting, Buenos Aires, 20-21 February 2018.

affected workers manage transitions to new jobs, especially the low-skilled who may need training to reskill and effective employment support through Public (and private) Employment Services to find new jobs. With declining opportunities for young people to enter the labour market through low-skilled jobs, it is even more important for policymakers to **ensure that skills investments for younger workers match the needs of the labour market,** including by forecasting skills needs in light of automation trends. Adequate income support and access to health care for these groups while transitioning to new jobs is also needed.

AI also raises other issues that will require close scrutiny, including the explainability of decisions based on algorithms, and questions around transparency, privacy, data quality and bias. The OECD AI principles seek to promote AI that is innovative and trustworthy and that respects human rights and democratic values. They served as the basis for the G20 AI Principles adopted in 2019. Similarly, to promote the development of AI and address the potential high risks it poses to safety and fundamental rights, the European Commission has presented a proposal for a regulatory framework on AI and a revised coordinated plan on AI. While principle-based regulation is important, the fast pace at which new applications are being developed calls for a multi-stakeholder approach that includes the development of a responsive regulatory system, including regular reviews of continuing relevance, supported by independent auditors and effective due-diligence procedures.

2. The impact of decarbonisation on labour markets depends on the decarbonisation path and potentially accompanying just transition policies chosen by G7 governments

The **green transition has become a central policy priority** as countries seek to rebuild their economies, enhance resilience against future shocks and most importantly address the pressing challenges of climate change. Decarbonisation of the economies involves changing methods of production across several sectors. Such a change concerns particularly economic sectors that account for a high share of greenhouse gas (GHG) emissions and use a high level of resources such as energy, agriculture and waste management. Achieving decarbonisation implies changes to these industries as well as the industries that supply their inputs and depend on their outputs.

By integrating environmental considerations into recovery and fiscal stimulus measures, governments can make decisive inroads towards meeting environmental goals while boosting economic activity and job creation in the shorter and longer term. When well designed and implemented, **green stimulus measures can generate income and create jobs**[4]. However, the OECD Green Recovery Database shows that only around 20% of recovery spending has so far been allocated to environmentally positive measures.[5]

The IPCC Assessment Report 2021 points to the multiple possible pathways to reach *net zero emissions*. Depending on the decarbonisation policies chosen by G7 countries, they will therefore have complex and country specific economy- and society-wide impacts on labour markets and social outcomes, which, in turn, will have second-round feedback and induced effects on the economy and the labour market.

Just focusing narrowly on jobs and sectors that account for the highest share of Green-House-Gas (GHG) emissions, such as coal and oil, misses the complexity of the labour market impact of decarbonisation and its social implications, thereby putting at risk the implementation and success of climate mitigation policies.[6]

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[4] https://www.un-page.org/files/public/covid-19_ige_global_technical_report_final.pdf.

[5] https://www.oecd.org/coronavirus/en/themes/green-recovery.

[6] Decarbonisation of the economies involves changing methods of production and consumption across the economy. Such a change concerns particularly economic sectors that account for a high share of greenhouse gas (GHG)

Not fully anticipating, understanding and addressing the secondary and induced feedback effects playing out at the social, geographic, institutional and economic level may lead to social backlash making the transition to net zero ever harder. This may lead to withdrawing decarbonisation policies altogether.

For example, depending on the choice of different low-carbon energy sources -- nuclear, gas, green hydrogen, wind and solar -- will imply very different labour market outcomes, as will the growth of new energy value chains such as for example "green" hydrogen. First, the total number of direct and indirect jobs that are either created or lost will differ. Second, multiple labour market dimensions will be affected, such as labour market composition, skills needs, wage and labour income, gender, age, and geographic location. Thereby, feed-back impacts will occur through induced job creation, change in inequality, social cohesion, tax revenues and social spending, unionisation and labour market institutions to name a few. Success in meeting climate goals also depends on what is happening in countries outside of G7 and notably major current and future emitters China, Brazil, Indonesia, India and Russia In this context, it will be important that G7 countries support low-income countries in their transitions as well.

A positive impact on employment but large sectoral, occupational and regional shifts

Research shows that the overall impact of decarbonisation on labour markets, including in the G7 countries, is expected to be largely positive. However, Just Transition policies[7] will be instrumental in buffering the impact of the large sectoral, occupational and regional shifts that will occur.

An implementation of the Paris climate change agreement through measures for renewable energy development, energy efficiency and sustainable transportation, is projected by the ILO to result in the creation of 24 million new jobs by 2030.[8] At the same time, the ILO's projections also suggest that action taken to decarbonise the energy, transport and construction sectors and limit global warming to 2°C over the course of the century could result in the 6 million jobs losses worldwide due to the contraction of certain industries. However, there is is considerable uncertainty about the magnitude of these net job gains depending on the extent to which decarbonisation policies affect the macro economy and on induced labour-saving technological progress (Chateau et al., 2018).[9] Even if modest in aggregate terms, environmental policies can have important distributional implications for jobs at the sectoral, occupational and regional levels.[10]

However, this global pattern will have different effects at the country level depending on Government's fiscal, economic, industrial, social and labour market policies. Given the current global and country-specific structure of economies and industries, regions with a strong low-carbon energy industry base may gain, while fossil fuel dependent regions may lose. However, strong and early action may change each country's economic structure and hence the impact on job creation and social outcomes.

A joint study by the ILO and the UN Economic Commission for Europe (UNECE) indicates that the greening of the transport sector could create up to 15 million jobs worldwide by 2030, of which 5.4 million in UNECE

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emissions and use a high level of resources such as energy, agriculture and waste management. Achieving decarbonisation implies changes to these industries as well as the industries that supply their inputs and depend on their outputs.

[7] The ILO Guidelines for a Just Transition towards net zero include macro-economic, financial, industrial, enterprise, skills, social protection and other measures.

[8] ILO, 2018, World Employment and Social Outlook 2018: Greening with Jobs

[9] Chateau, J., R. Bibas and E. Lanzi (2018), "Impacts of Green Growth Policies on Labour Markets and Wage Income Distribution: A General Equilibrium Application to Climate and Energy Policies", *OECD Environment Working Papers*, No. 137, OECD Publishing, Paris, https://doi.org/10.1787/ea3696f4-en.

[10] OECD (2021), "The Inequality-Environment Nexus: Towards a people-centred green transition", *OECD Green Growth Papers*, 2021-01, OECD Publishing, Paris. https://doi.org/10.1787/ca9d8479-en.

countries and some 9.6 million mainly in Asia (ILO-UNECE, 202011). This is due to Asia's strong electrical equipment and machinery production capacity. Economic, industrial, trade, social and labour market policy in UNECE countries could, however, change labour market outcomes in the future.

The same is true for changing occupations and skills depending on the national economic and labour market structure and its prevailing or new policies. A significant proportion of the jobs destroyed may be reallocated in some countries but not in others. For example, some of the workers in the fossil fuel sector possess skills, which are relevant and transferable to the renewable energy sector. Skills synergies between the offshore wind and oil and gas industries include expertise in surveying and offshore installation; design and manufacture of support structures; large-scale installation; and operation and maintenance of offshore assets.

Countries which currently do not have a low-carbon energy industry may need to invest in existing and new technical and vocational training systems, retrain workers, offer on the job training and apprenticeship or chose a different economic development model in emerging sectors such as low carbon digital or care economy sector (see below in the section on linkages).

Job reallocation across sectors can also have gender and regional implications. Some of the most negatively affected industries (e.g. extractives and heavy industries) have a male-dominated workforce, calling for gender-sensitive transition policies in certain regions. At the same time, the still low female participation in STEM fields of education and specific barriers to female entrepreneurship may constrain women's participation in the renewable energy sector and other emerging industries. Furthermore, regional economies heavily reliant on carbon-intensive sectors or fossil fuel extraction may face severe challenges in their structural adjustment and diversification process.

Lastly, according to ILO estimates, it is important to highlight that 1.2 billion jobs, or 40% of the global workforce, depend on healthy ecosystems and stable weather conditions notably in agriculture, forestry, fisheries and natural resource-based sectors. If current global warming trends continue, just in terms of the impact of heat stress, 2.2% of total global working hours will be lost in 2030 ILO, 2019). This is a loss of productivity equivalent to 80 million full-time jobs.

No gains without the right policies for a just transition

To enable and reap the full benefits of decarbonisation on labour markets and support negatively affected workers, industries and entire economies, action will be required on a broad front to promote a resilient and inclusive green transition, as set out in the ILO Guidelines for a Just Transition and the OECD's policy approach for a human-centred green transition based on social dialogue and guided by International Labour Standards (Box 1).

Firstly, successful reallocation of workers to green jobs will depend on specific skills policies and actions. It will require identifying transferable skills, standardising skills certifications, establishing well-funded retraining programmes aligned with transition plans, and ensuring adequate income support for workers during retraining. Sectoral and place-based policies will also be needed that facilitate social dialogue, social capital investments, social protection, skills and education investments to ease the costs of structural adjustment for local economies.

Secondly, a priority must be connecting people to jobs. This involves supporting job creation but also expanding active labour market policies to quickly connect jobseekers to available jobs. Employment and training services need to be integrated, comprehensive and reach out to firms that create jobs and to people most at risk of long-term unemployment. Acting early, before plant closure and reconversion will be critical to achieving better outcomes for displaced workers. In addition, better labour market information and its dissemination is needed on skill needs arising from the green transition.

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[11] ILO-UNECE, 2020, Jobs in green and healthy transport: Making the green shift.

Box 1. An integrated policy approach to promoting the green transition

ILO Guidelines for a Just Transition[1]

The "ILO Guidelines for a just transition towards environmentally sustainable economies and societies for all" provide a globally endorsed framework to guide policies for a just transition to net zero. The Guidelines have been endorsed by a Tripartite Meeting of Experts in 2015 and reflect the views and perspectives of governments, employers, and workers' organisations. The Guidelines present a clear roadmap and lay out concrete policy areas to act on growth, industrial and sectoral policies, enterprise, skills, occupational safety and health, social protection, labour market policies, rights, and social dialogue and tripartism.

The operationalisation of the Guidelines involves four key areas of intervention:

- **Research and knowledge:** Country-specific assessments of the impacts of policy and investment scenarios to inform just transition policies and improve development outcomes.
- **Social dialogue:** A strong social consensus is crucial for transformative change. Effective social dialogue among governments, employers' and workers' organisations, and other key stakeholders can avoid disruptions of the social fabric.
- **Employment-centered policies for climate action:** Integrated national employment policies will support employment creation, enterprise development and investment measures in the green economy.
- **Inclusive social protection policies:** Social protection is crucial for climate change mitigation and adaptation and to make sure no one is left behind.

OECD policy approach for a human-centred green transition[2]

The OECD's policy approach for a human-centred green transition is structured around four pillars:

- **Mitigate the possible regressive impact of pricing environmental externalities for vulnerable households.** Well-designed revenue recycling schemes to accompany such price-based measures and transfer payment could be instrumental to this end.
- **Achieve inclusive green growth with investment in human capital, through active labour market policies, well-targeted income support measures, and upgrading skills to facilitate labour reallocation.** Measures to support the geographic mobility of workers at risk of losing their jobs in shrinking industries would be important, as well as reforms to improve access to affordable housing.
- **Address systemic inequalities with sectoral and place-based policies that facilitate social dialogue, social capital investments, social protection, skills and education investments to ease structural adjustment of local economies.** Geographically blind climate change and air-pollution control measures can result in rising discontent among local communities if the benefits and costs of environmental policies are dispersed geographically. Importantly, policy packages for an inclusive green transition should be place specific, as no "one-size-fits-all" green pathway is possible.
- E**nsure efficient and responsive governance to manage the inclusive green transition.** As policies in different domains (e.g. housing, transport) interact with each other across the economy (see the section on these interactions below), long-term strategies can help to strengthen coherency in favour of their alignment across different ministerial portfolios. Institutional mechanisms can support the mainstreaming of environmental and equity considerations in policy-making and budgeting across ministries and levels of government. Clear and regular entry points in the policy-making process for the civil society would also help to enhance public acceptance of ambitious green policies.

1. ILO (2016), "Guidelines for a just transition towards environmentally sustainable economies and societies for all." Geneva. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_432859.pdf.
2. OECD (2021), "The Inequality-Environment Nexus: Towards a people-centred green transition", *OECD Green Growth Papers*, 2021-01, OECD Publishing, Paris. https://doi.org/10.1787/ca9d8479-en.

Thirdly, it is important to maintain strong public support for policies to mitigate the impact of climate policies on people as both workers and household members. This requires more individualised employment and training support that reaches all groups in need. It also requires policies to offset any adverse effects of these policies on income inequality because of the cumulative impacts on worker displacement and incomes in response to, for example, price hikes in energy or the introduction of a carbon tax.[12] Reinforcing social protection along with other income-compensating measures will be a crucial building block of governments' strategies to prevent or cushion any damaging disruptions of people's livelihoods. Strengthening social protection systems in conjunction with decarbonisation policies and measures will be crucial to ensure that no one is left behind. More generally, these measures will require efficient and responsive governance to manage and enhance public acceptance of climate-change mitigation policies. G7 countries have started already to put in place such measures. Examples include:

- The tripartite agreement put in place for the closure of the Ruhr region coalmines in Germany aimed at achieving a just transition to decarbonisation through a slow and gradual phase-out of subsidised coal in conjunction with a socially acceptable reduction of the workforce and a package of measures for the affected miners.

- The process and consultations launched in Canada with a view to develop a just transition legislation to a low-carbon future.

Fourthly, there needs to be a strengthening of measurement frameworks and evaluation to monitor the outcomes of climate-change mitigation policies on economic, social and environmental outcomes.[13]

Lastly, better results can be achieved by consulting with and ensuring social dialogue with employers' and workers' representatives in policy-making on this issue. Social dialogue mechanisms will need to be reinforced to build a strong social consensus at all relevant levels.

In addition to these examples and measures mentioned above, other potential policy entry-points to promote and manage a just transition can be found in the ILO Guidelines for a just transition towards environmentally sustainable economies and societies for all.

3. Demographic change

The transformation of the labour market because of digitalisation and decarbonisation is occurring against the backdrop of rapid population ageing in G7 countries, reflecting longer and healthier lives and low fertility rates. Between 2020 and 2050, the number of persons aged 65 and over is projected to rise from 35 for every 100 people aged 20 to 64 on average across the G7 economies to 49 (Figure 3). The challenge of rapid population ageing is particularly acute in Italy and Japan, as well as in some emerging economies such as China. In contrast, other emerging economies such as Indonesia, South Africa, and India will continue to face the demographic challenge of integrating large numbers of young people into the workforce.

As with other trends, population ageing comes with challenges and opportunities, Longer and healthier lives can be powerful drivers of greater lifetime well-being. However, rapid population ageing will put pressure on the sustainability of public expenditures on pensions, health-care and

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[12] The cumulative impact of climate policies through their impact on josb and houshold incomes more generally are discussed in OECD (2021), "The inequalities-environment nexus: Towards a people-centred green transition", *OECD Green Growth Papers*, No. 2021/01, OECD Publishing, Paris, https://www.oecd.org/greengrowth/the-inequalities-environment-nexus-ca9d8479-en.htm

[13] For example, see the OECD's Post-COVID-19 Recovery Dashboard that draws upon the OECD's International Programme for Action on Climate (IPAC) and enshrines the methodology of the UN System of Environmental Economic Accounting (SEEA). Available at: https://www.oecd.org/mcm/The-OECD-Dashboard-to-Monitor-a-Strong,-Resilient,-Green-and-Inclusive-Post-Covid-19-Recovery.pdf.

long-term care. Ageing will also have a direct impact on consumption patterns: demand is likely to shift from durable goods (such as cars) towards services (such as health care). As preferences adjust, so too will trade and the relative importance of different industries. All of **these factors will have an impact on skill demands and the types of jobs that will be created**. **Shortages of qualified labour may also arise as the number of older workers retiring rises relative to the number of young people entering the labour market.** Consequently, a largely ageing population could put further pressure on existing social protection systems. Unless there is adequate and affordable provision of health and long-term care for the frail and elderly, along with more balanced gender roles in unpaid care and work responsibilities, rapid population ageing could also hinder the closing of gender gaps in the labour market. **Promoting higher employment rates (especially among women) and longer working lives will help share the benefits of longer life expectancy more fairly and ensure that adequate incomes in retirement are sustainable**. Fostering more age-inclusive workforces can also result in productivity gains for employers (OECD, 2020).[14]

Figure 3. Many countries are ageing rapidly

Projected change in the old-age dependency ratio, 1980-2050
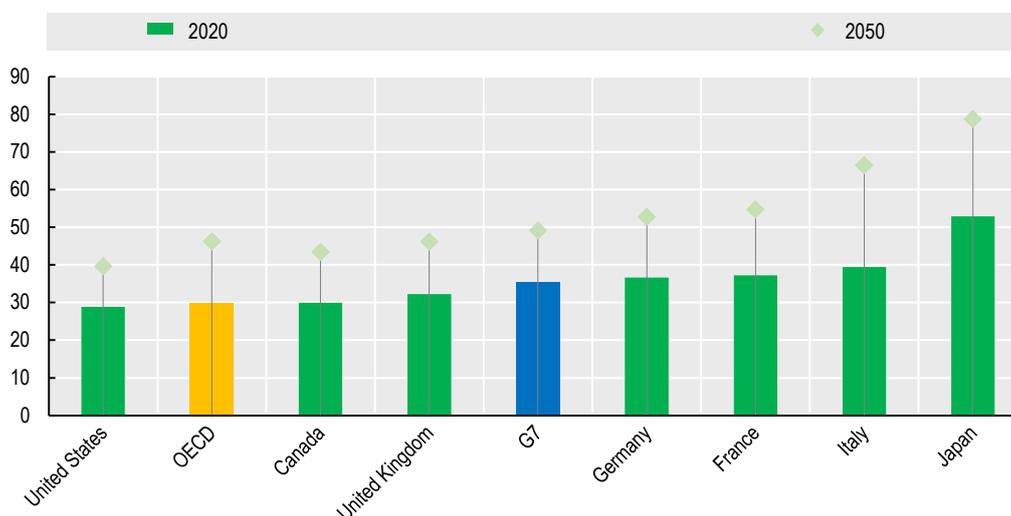
Note: The old-age dependency ratio is defined as the number of people aged 65 and over per 100 people of working-age (20-64).
Source: OECD Population and Labour Force Projections Database.

Achieving this objective will require **taking a lifecycle perspective to policy making** which takes into account all of the factors affecting the length and quality of working lives. The objective should be to ensure that older people have access to good employment choices and opportunities. As outlined in the OECD Council Recommendation on Ageing and Employment Policies, this requires **a comprehensive policy approach (**Figure 4**) which rewards working at an older age and later retirement, promotes employability throughout working lives, and encourages employers to retain and hire older workers**. This requires concerted action by governments, employers, trade unions and civil society to

[14] OECD (2020), *Promoting an Age-Inclusive Workforce: Living, Learning and Earning Longer*, OECD Publishing, Paris, https://dx.doi.org/10.1787/59752153-en.

ensure that the employment for older workers is beneficial for workers and employers alike, and takes into account the situation and needs of those with reduced work capacities and life expectancies.[15]

Beyond promoting longer working lives, the **drag on overall employment and growth as a result of population ageing can be countered by ensuring the widest participation of all adults in productive and good quality employment** irrespective of age, gender and gender identity, sexual orientation, ethnic background, religious belief, and disability and physical and mental health status. This can be illustrated in a simple way by calculating how much employment rates would increase if all groups in the working-age population had the same employment rate as prime-age men (aged 25-54) -- typically the group with the highest rate. Across the G7 economies, the increase would range from 12 percentage-points in Germany to 22 percentage-points in Italy (Figure 5).

Figure 4. A policy framework for promoting longer working lives
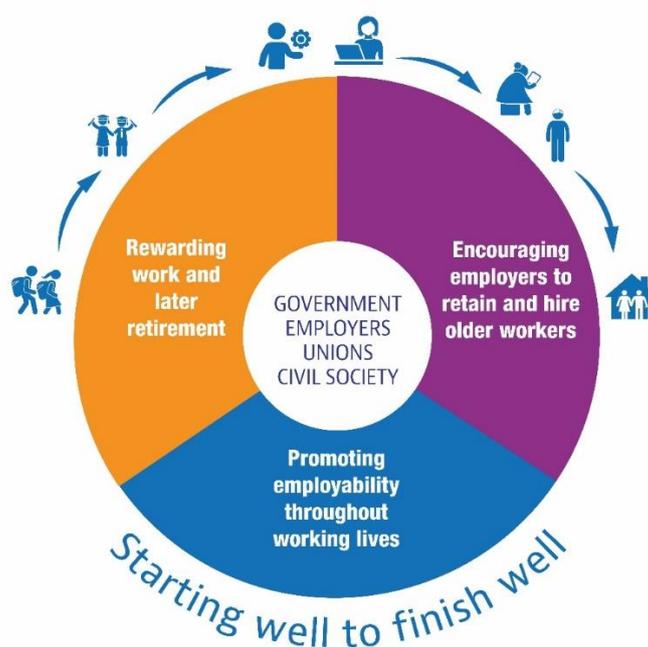
Source: OECD (2019), *Working Better with Age*, Ageing and Employment Policies, OECD Publishing, Paris, https://doi.org/10.1787/c4d4f66a-en..

However, **achieving a more inclusive labour market requires tackling discriminatory attitudes and practices**, and other employment barriers faced by different groups in the labour market. **It also requires policies and practices covering entire working careers**. Offering flexible working options can support workers across the life course to prevent burnout, manage family responsibilities and engage in learning. Likewise, preventing poor health before it begins, providing sound working conditions and supporting workers to manage chronic conditions regardless of age or life stage are key to productive and engaged

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[15] Resolution and conclusions on employment and social protection in the new demographic context, adopted during the 102nd session of the International Labour Conference, 2013.

workers. Training should be based on an all-age training policy that takes into account the skills needs of workers of all ages.

Flexibility in work arrangements is especially important, as women, on average, continue to take on more unpaid caring responsibilities than men do. Paid parental and paternity leave, childcare and long-term care policies are key to ensure a more equitable distribution of work and family obligations while contributing to closing the gender employment gap (OECD, 2017).[16] Tackling still large gender gaps in pay and gender segregation by occupation would also help to encourage women to enter and remain in the workforce.

Many young people continue to face a difficult transition from school to work. **Young people were particularly hit by the COVID-19 crisis** in terms of lost opportunities for employment experience, education and training, and social development as well as in poorer well-being more generally. **Early action is the best way to prevent long-term damage to their career prospects** and the fiscal costs of the required interventions are small in comparison to the benefits that accumulate over the rest of young people's lives.

Cutting across both age and gender, **people with disabilities or experiencing mental health conditions deserve particular attention in creating an inclusive labour market as well as other groups such as migrants, indigenous people and those living in rural or remote areas.**

Figure 5. Greater labour market inclusion would boost the workforce

Difference between the employment rates of men aged 25-54 and all persons aged 15-64, 2020 (% points)
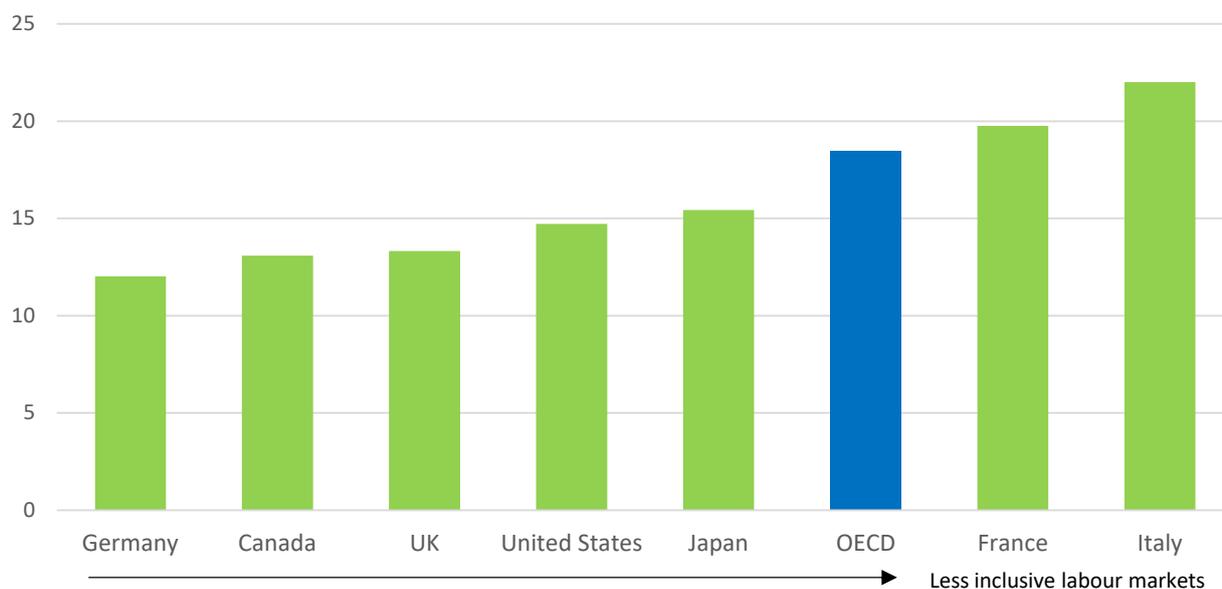
Note: The data indicate the percentage point increase in the share of the working-age population (15-64) employed if all groups in the population had the same employment rate as for prime-age men (25-54).
Source: OECD calculations based on data from: Eurostat, European Labour Survey for EU countries and the UK; and national labour force surveys for Japan and the United States.

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[16] OECD (2017), *The Pursuit of Gender Equality: An Uphill Battle*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264281318-en.

4. Interlinkages

Digital transformation, decarbonisation and demographic change: key drivers of the future of work

The global trends of digitalisation, decarbonisation and demographic change are not independent of each other and their impact on the world of work reflects interlinkages that are complex and depend on regional, national and sector specificities. As recognised by the ILO and the OECD, designing effective policy responses to the challenges and opportunities they raise will depend on taking into account these linkages.[17]

From a macroeconomic perspective, decarbonisation and digitalisation can be leveraged to address demographic change. In the interplay of all three Ds, decarbonisation and digitalisation have the potential to mitigate the potential impacts of demographic change on the overall economic growth of countries. The decrease in working-age population that comes with an ageing population brings a risk for declines in innovation and productivity. Decarbonisation and digitalisation present opportunities for promoting innovation and higher productivity *if* the existing gaps on the labour market in green and digital skills can be closed and people are connected to jobs in an inclusive and sustainable manner.

Decarbonisation – Digitalisation: areas for a common agenda

To ensure that the digital economy maximises the benefits while minimising the negative impacts on labour markets, specific policy measures would be required. Some of these policies are directly related to decarbonisation and just transition.

Employment and skills policies will need to be adopted to support the creation of good and decent employment opportunities in the digital and green economies. This will be particularly necessary in industrial areas previously dominated by emission intensive sectors, fossil fuel extraction and industries with high potential for automation, such as manufacturing. Employers tend to be more reluctant to train older workers as they are expected to leave the organisation sooner than younger employees.[18] As the average age of workers increases due to demographic change, employers must increase their efforts to train older workers as well. In this respect, successful digitalisation can provide important infrastructure services to identify possible occupational mobility and recommend necessary areas for upskilling, thereby supporting public employment services in their role to promote successful transitions.[19] Targeted education and skills policies should support the participation of women and girls in STEM fields, where they remain underrepresented, to improve their potential to reap the labour-market benefits of the green transition.

Social protection must be adapted to the structural changes in order to support a just transition. Social protection measures are indispensable to support transitions from jobs that have become redundant due to structural changes. Social protection in the form of adequate unemployment benefits and income support for re-skilling is essential to help workers who have been made redundant to cushion the financial impact of a job loss and give them the opportunity to transition to a different job. While decarbonisation and digitalisation will bring a net gain in jobs, there will be workers, most likely older and low skilled, who find themselves unemployed and unable to transition into a new job. They will turn from contributors to

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[17] ILO (2019), *ILO Centenary Declaration for the Future of Work* (2019); ILO (2021), *Global Call to Action for a Human-Centred Recovery from the COVID-19 Crisis that is Inclusive, Sustainable and Resilien*; and OECD (2019), *OECD Employment Outlook 2019: The Future of Work*, OECD Publishing, Paris, https://doi.org/10.1787/9ee00155-en.

[18] ILO (2018), *World Economic and Social Outlook*, p. 48.

[19] Ernst, E.; Merola, R; Samaan, D. (2019), "The economics of Artificial Intelligence: Implications for the Future of Work", *IZA Journal of Labor Policy*, Vol, 9, Nr. 4.

social insurance to beneficiaries, and potentially also increase social assistance. In addition, the increase of workers who transition from relatively well-paid jobs in emission-intensive sectors to the service sector with potentially lower wages will also affect contributions to social insurance, which may further increase the strain on social protection systems, especially in combination with an increase in pensioners due to demographic change. The pressure is compounded as social protection systems also play an important role in financing health and long-term care, which will be needed as a response to ageing populations.[20] In addition, research shows that most workers on digital labour platforms do not have social security coverage, as there are large gaps concerning health insurance and work-related injury provision, unemployment and disability insurance, and old-age pensions.[21] For these reasons, it is all the more important to ensure that workers in all forms of work, including on digital platforms, should be covered by adequate social protection.[22]

Successful decarbonisation and digitalisation require updating and carefully implementing Occupational Safety and Health regulations. With digitalisation and especially automation, some dangerous tasks no longer have to be executed by workers. However, the new types of tasks that are developing need to be evaluated regarding their effect on workers' health. Workers face risks for sickness, disease, and injury at work in some green jobs, specifically in the renewable energy sector, waste management and recycling.[23] Digitalisation also brings OSH risks, such as injury from traffic accidents for platform-based delivery drivers, deterioration of eyesight and ergonomic risks due to extensive use of screens and mobile devices. In combination with teleworking, digitalisation also brings psychosocial risks and the risk of increasingly blurred lines between personal life and work. With increasing automation, the risk of grave accidents resulting from interaction with robots also rises.[24] Failure to address these issues can lead to further strain on social protection, notably health insurance, and might ultimately decrease the size of the labour force if work-related injuries incapacitate workers to a large extent. As digitalisation has advanced rapidly, so has e-waste, with negative impacts on the occupational safety and health and highlighting the need to transition to a more circular economy.

Lastly, digitalisation can drive decarbonisation by introducing technologies and innovations to help decarbonise certain sectors and design new sustainable production systems and work practices. The benefits of digital technologies can be harnessed in multiple sectors to address the impacts of climate change, and reduce emission levels, while protecting workers and creating decent work opportunities. In the European context, sectors such as construction, manufacturing, transportation, energy and agriculture have started to draw on digital technologies to address climate change related concerns.[25] For example, the adoption of blockchain technology can sustain trust, ensure traceability, and advance enterprises and

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[20] ILO (202), *Building the Future of Social Protection for a Human-Centred World of Work*; ILO (2021), *World Social Protection Report 2020–22: Social Protection at the Crossroads – in Pursuit of a Better Future*.

[21] ILO (2021), *World Social Protection Report 2020–22: Social Protection at the Crossroads – in Pursuit of a Better Future*; ILO (2021), *World Employment and Social Outlook 2021: The Role of Digital Labour Platforms in Transforming the World of Work.*.

[22] 'Resolution and Conclusions Concerning the Second Recurrent Discussion on Social Protection (Social Security), 109th Session of the International Labour Conference', 2021; ILO, ISSA, OECD 2021. Beyond Covid-19: Towards more inclusive and resilient social protection systems, p. 6 ff; ILO 2021. World Social Protection Report 2020–22: Social Protection at the Crossroads – in Pursuit of a Better Future.;

[23] ILO (2012), *Promoting safety and health in a green economy*, p. 3 ff.

[24] ILO (2019), *Safety and health at the heart of the future of work*, p. 30 ff.

[25] See, for more information: https://www.digitaleurope.org/resources/digital-action-climate-action-8-ideas-to-accelerate-the-twin-transition/#digital.

production towards sustainability in sectors like mining, forestry, fishing and forestry. By providing digital and technical support, governments can also further promote decarbonisation by creating and expanding jobs in green industries. Digital technologies have enabled the development of climate-smart agriculture, involving the use of sensors, precision irrigation, climate management, control and forecasting systems, leading to an optimization of labour and environmental benefits. Climate-smart agriculture has been found in a range of countries to contribute to: sustainably increase agricultural productivity and incomes; adapt and build resilience of people and agri-food systems to climate change; and reduce or, where possible, avoid GHG emissions (FAO, 2021[26]). Such innovative methods of farming have proven to be more attractive to younger generations and encouraged many young women and men to venture into agricultural enterprises. Given the context of labour force shortage with an ageing population in many G7 countries, new methods of farming can contribute to the supply of labour in agriculture. In the energy sector, the deployment of smart grids helped to increase energy efficiency while generating opportunities for employment creation in the energy service sector. However, trade-offs also need to be addressed, such as potentially high-energy use from some digital technologies (including Blockchain) and waste management issues related to electronic waste.

Decarbonisation – demographic change: multifaceted connections

Decarbonisation is likely to impact countries and regions differently based on differences in population size and structure due to variations in birth rates, death rates, and by migration. Inversely, decarbonisation measures have the potential to trigger demographic changes.

Demographic changes have the potential to add specific challenges to decarbonisation processes. For instance, countries or regions facing aging populations and low population density risk skills shortages at a time when rapid transitions in skills might be needed for decarbonisation. With a large population receiving pensions, countries and companies could also face constraints with certain policy options, such as early retirement of workers in industries phasing out such as coal mining. Moreover, low fertility rates could lead to a reduction of students in education at times when increasing the number of students in education programmes and curriculum of relevance to the green economy will be essential to achieve a just transition.

On the other hand, decarbonisation of certain sectors will require restructuring of sectors and local labour markets, which in turn may alter demographic trends. For instance, without proper planning and policy measures, a phasing out of coalmines could reduce employment opportunities in specific geographical locations. In regions heavily dependent on coal, this could further incentivize workers to leave these regions for cities and urban areas. On the contrary, new and better forms of employment created by decarbonisation, such as the development of clean energy, could make certain regions more attractive, attract highly skilled workers and young populations, and thereby increase the population size. As an example, in Brandenburg, Saxony and North Rhine-Westphalia, heavily coal dependent regions of Germany, the renewable energy sector has provided jobs in different stages of the projects: from planning, manufacturing to operating. In 2016, the emerging renewable energy sector employed around 80,000 people in these three states alone, exceeding employment in coal mining and coal power plants in the same regions many times over (AEE et all, 2018).[27]

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[26] FAO (2021), *Climate-smart agriculture case studies 2021 – Projects from around the world*. Rome. https://doi.org/10.4060/cb5359en

[27] Agency for Renewable Energies (AEE), Karasek, A., (BEE), Uppenkamp, A. (BEE) (2018), *From coal to pioneers in renewable energy - Five practical examples of successful structural change in Germany* (unofficial translation from German language) BEE_Strukturwandel_Best-Practice (bee-ev.de).

Lastly, while decarbonisation efforts are deployed, it is important to note that the effect of climate change itself might affect differently regions depending on the structure of their populations. Further, within countries, more vulnerable and disadvantaged groups are likely to suffer more from climate impacts, increasing inequalities. For instance, projections based on a global temperature rise of 1.5°C by the end of this century suggest that already by 2030 2.2 per cent of total working hours worldwide could be lost because of higher temperatures, a loss equivalent to 80 million full-time jobs. This is equivalent to global economic losses of US$2,400 billion (ILO, 2019).[28] Heat stress is likely to impact people from different age groups in different ways, and to be the hardest on older and vulnerable people. Such factors should be taken into account when developing just transition and climate action adaptation and mitigation measures.

Digitalisation – demographic change

Demographic change will continue to increase demand for care services, which remains very labour-intensive, while simultaneously leading to an ageing workforce and labour shortages. Working conditions in the care sector are relatively poor, with high levels of physical and psychological stress, which become increasingly challenging for ageing workers.[29] Here, the use of robots can improve working conditions, especially to relieve workers of the physical strain for example when lifting patients out of beds.[30] Other digital solutions include cameras and sensors in patients' rooms that notify carers of issues instead of forcing the carer to do regular rounds of all rooms to see if they are needed. Remote care (telecare) reduces strain on carers and increases their autonomy, as it improves communication with patients and hospitals.[31] This allows workers to focus on aspects of care work that robots cannot provide. This also addresses labour shortages, as fewer workers are needed to provide care.

While digitalisation and automation can provide support to ageing workers in the growing care industry, ageing white-collar workers might suffer under an increasingly digitised working environment. In addition to the strain placed on eyes from looking at screens for prolonged periods of time, there is a high risk of long-term musculoskeletal disorders from working in an unsuitable environment.[32] This risk has increased with the growth of digital platform work and teleworking, where the working environment can become more difficult to control and adequate labour and social protection is often lacking. In general, a work force with a higher average age is more susceptible to work-related injuries, especially regarding physical and cognitive abilities, so this issue will become more pressing as demographic change advances. However, many older workers compensate a decline in work-related functional capacities through strategies based on experience. This means that workers' capacity should not be judged only based on their age, but rather the working conditions should be adapted to workers' needs, as the example of the use of robots in the care sector shows.[33]

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[28] ILO, 2019, Working on a warmer planet: The effect of heat stress on productivity and decent work. https://www.ilo.org/global/publications/books/WCMS_711919/lang--en/index.htm

[29] ILO and OECD (2019), "New job opportunities in an ageing society", Paper prepared for the 1st meeting of the G20 Employment Working Group.

[30] Guardian 2015. Robear: The bear-shaped nursing robot who'll look after you when you get old. Robear: the bear-shaped nursing robot who'll look after you when you get old | Robots | The Guardian, accessed 04.02.2022.

[31] ILO and OECD (2019). New job opportunities in an ageing society. Paper prepared for the 1st meeting of the G20 Employment Working Group, p. 23 ff.

[32] ILO (2019), Safety and health at the heart of the future of work, p. 30 ff.

[33] ILO (2019), *Safety and health at the heart of the future of work*, p. 30 ff.

Taking a more integrated policy approach to the 3Ds

The challenges for governments, firms and workers arising from the 3Ds are manifold and cut across all areas of labour market and social policy as well as other policy areas. Governments are aware of the issues at stake: in a recent survey of OECD countries, most list at least one of the 3Ds among the top three labour market and social policy challenges for 2022. Demographic change and digitalisation were both mentioned particularly often. Early insights from responses to the questionnaire that was circulated on behalf of the German G7 Presidency confirm that the 3Ds are high up on G7 countries' policy agenda. Canada, France, Germany, Italy and the United Kingdom have all major initiatives under way with the aim to help the labour market, firms and workers adjust to the demographic, digital and green transitions.

A key question that remains is whether it suffices to look at the policy challenges from the 3Ds individually or whether they should be tackled together given the strong interlinkages between them as highlighted in the previous section. The answers to the G7 questionnaire suggest that countries often treat these challenges in isolation and have undertaken only few significant assessments of the joint impact of the 3Ds. However, the right skills policy, for example, ought to take into account the skills that will be needed in a world with rapidly rising numbers of digital and green jobs and more older workers and consumers all at the same time. One example mentioned is the skills monitoring by Germany's Federal Ministry of Labour and Social Affairs that gives due account to digitalisation trends, climate change as well as the outcomes of the COVID-19 pandemic. The Ministry complements these evidence-based tools with strategic foresight and futures scenarios to improve further its understanding of the joint impact and interplay of the 3Ds. Now may be the moment for governments to embrace a more integrated policy approach to the 3Ds along such lines and ensure that the labour market of the future works for all.