

1 Overview

This chapter reflects on lessons from the COVID-19 pandemic that can guide reforms in skills policies to strengthen resilience and promote the twin green and digital transition. These reforms should be seen in the context of ongoing environmental degradation and the complexity of information landscapes driven by rapid technological developments. The chapter first defines resilience and then stresses that promoting system-level resilience through effective skills policies requires empowering individuals with a wide range of skills at varying levels of proficiency. The chapter also stresses that attitudes and dispositions are key enablers of skills development and effective skills use. Finally, the chapter highlights the importance of embedding skills policies in the context of comprehensive policy efforts and of monitoring the economic and social consequences of policy actions.

1.1. Introduction

The coronavirus (COVID-19) pandemic and policy actions aimed at containing its spread had a profound impact on societies and economies around the world. They are a reminder that societies can profoundly reorganise themselves if there is urgency, but also that sound policy interventions are critical to channelling the actions of economic and social actors. At the same time, the pandemic highlighted how major interventions necessary to reduce a threat – such as viral spread – can create new challenges for communities and societies. For example, however necessary they were, the closure of schools and all non-essential businesses during the pandemic came with high psychological, economic, and social costs. Building system-level resilience and reorganising societies to meet the defining challenges of our time – climate change, environmental degradation and technological developments in how information is used and exchanged (the twin green and digital transition) – requires comprehensive interventions to ensure that future economic growth is both sustainable and inclusive.

Skills policies play a key role in supporting the twin green and digital transition, contributing to system-level as well as individual resilience. In the absence of adequate investments in education and training, efforts to ensure that economic growth and development occur within the limits of planetary boundaries might not be successful and/or lead to short- and medium-term losses of labour market opportunities. Similarly, without adequate investments in education and training, digital transformations might be delayed or reduced, and existing innovations might lower social welfare.

Climate change and technological developments in information and communication exchange are the defining challenges of our time. Globally, July 2023 was the hottest month on record (NASA, 2023^[1]). In particular, in that month, the global average surface temperature was 0.72°C warmer, and the global average sea surface temperature was 0.51°C warmer than the 1991-2020 average (Copernicus Climate Change Service, 2023^[2]). Between 2017 and 2021, individuals in OECD countries, on average, had to endure 14 additional days of strong heat stress exposure compared to the period between 1981 and 2010 (IEA/OECD, 2022^[3]). Rising temperatures are fuelling weather extremes, wildfires, biodiversity loss and natural disasters, leading to food and water insecurity, economic disruption, poor health, conflict and migration.

At the same time, progress in artificial intelligence (AI) and, in particular, the onset of generative AI is such that, in some areas, its output has become indistinguishable from that of humans. This suggests that OECD economies may be on the brink of an AI revolution, which could fundamentally change the workplace (OECD, 2023^[4]) and society at large. Estimates suggest that ChatGPT, the chatbot released in November 2022 by OpenAI, was the fastest-growing consumer application in history after it reached 100 million monthly active users in January 2023, just two months after its launch (Reuters, 2023^[5]). The use of generative AI has far-reaching implications for knowledge production and exchange: it is being increasingly leveraged in research to expedite the innovation cycle, reduce publication timelines and promote inclusivity in science by aiding individuals in expressing their ideas fluently, thereby broadening the diversity of scientific perspectives. However, these models can worsen information problems in online spaces, in part because large language models produce very convincing text that may be inaccurate and, in part, because they reduce the time and effort needed to generate fake and harmful content (van Dis et al., 2023^[6]).

The speed of climate change and recent technological innovation is not matched by the speed of change in education and skills policies. Promoting environmental sustainability requires a profound rethinking of production and consumption, with important consequences for labour markets and the demand for skills. The current scale and pace of investments in skills policies are inadequate to significantly reduce the likelihood of going beyond tipping points, leading to irreversible and severe changes in the climate system (OECD, 2022^[7]), to successfully adapt to changing environmental conditions, and to leverage technological innovations such as AI and robotics to improve labour market opportunities and conditions. As AI and robotics are being increasingly deployed in a range of industries, many of the tasks

currently performed by individuals will become automatable, leading to the emergence of new jobs, the disappearance of some jobs and the transformation of many others (Lassébie and Quintini, 2022^[8]).

Yet, as new job profiles and skills requirements emerge, on average across OECD countries, only around four in ten adults participate in formal or non-formal learning for job-related reasons (OECD, 2021^[9]). This hampers the ability of workers to reallocate from sectors and occupations that will shrink into sectors that will grow in the near future. Moreover, across OECD countries, only three in ten young people possess at least baseline levels of the cognitive, attitudinal and behavioural dimensions of environmental sustainability competence and only seven in ten reach baseline levels in all foundational skills that are key in information-rich societies – reading, mathematics and science – by age 15. Training opportunities that respond to emerging labour market needs and efforts to facilitate their uptake can promote a just and inclusive green and digital transition. In turn, education systems that equip young people not only with skills but also with the attitudes needed to manage change can ensure that the green and digital transition is sustainable in the longer term.

Successfully building resilience through skills policies also depends on ensuring that skills development is promoted among the most vulnerable. The pandemic highlighted that social justice and equity considerations aside, the high level of interconnectedness in modern societies means that **the level of vulnerability of societies is often tied to the actions of the least informed**. It also made clear that in order for societies to reap the benefits of investments in skills development, a renewed emphasis should be put on **equipping individuals with a set of beliefs, attitudes and dispositions that are aligned with long-term individual and social welfare**.

The term “resilience” was originally used in physics and engineering to characterise the ability of materials to resume their original shape or condition after being subjected to a shock, i.e. a sudden change in circumstances (Treloar, 1975^[10]). The term was later adopted to refer to an individual’s or system’s ability to overcome adversity and display positive adjustment (Daniel, Wassell and Campbell, 2002^[11]; Howard, Dryden and Johnson, 1999^[12]). In this context, **resilience refers to the phenomenon where individuals who have faced adverse experiences exhibit lower levels of vulnerability than initially anticipated**. The goal is to understand the factors contributing to this resilience, including when, how and why it manifests (Luthar, 2003^[13]; Masten and Powell, 2003^[14]; Rutter, 2006^[15]).

External shocks cannot be altered in the realm of inorganic materials. However, in human societies, the probability of external shocks occurring can be influenced. Consequently, **building resilience involves mitigating the impact of adverse events but also reducing the likelihood of such events happening in the first place**. Furthermore, individuals can adapt to their surroundings, which means that if circumstances change over the long term, they can strive to achieve a new equilibrium through adaptation.

In the context of this report, resilience refers to the ability of societies to reorganise themselves in order to: 1) limit future environmental degradation and safeguard information exchange; 2) adapt to current and foreseen environmental conditions and level of technological development; and 3) adapt to structural changes in labour markets that will result from the adoption of new technologies and from efforts to reach climate neutrality. Critically, **resilience entails ensuring that such transformations do not create new forms of labour market and social vulnerability**.

1.2. Towards a sustainable and inclusive twin green and digital transition

Estimates suggest that, compared to those born in the 1960s, on average around the world, children born at the onset of the COVID-19 pandemic in 2020 may experience 6.8 times more heatwaves during their lifetimes (Luten, Ryan and Wakefield, 2021^[16]). However, limiting global warming to 1.5 C above pre-industrial levels could reduce this additional exposure to heatwaves by 45% (Global Commission on Adaptation, 2019^[17]). Given this outlook, it is critical to not only establish ambitious

strategies to mitigate global warming but also to empower future generations by providing them with the necessary skills to adapt to evolving environmental conditions and make decisions that foster sustainable growth.

Decoupling economic growth from emissions growth and addressing the extent to which energy extraction and human production generate pollutants and create a loss of biodiversity is within the grasp of our societies. However, decarbonising the economy will profoundly impact labour markets worldwide in the coming years and decades. The green transition could boost economic growth, but the speed and efficiency with which the transition will occur depends on individuals having the right set of skills to sustain and power green innovations. Moreover, and equally important, unless all individuals have the right set of skills, labour market transformations due to the transition to net-zero emissions could create social tensions and ultimately derail or at least slow down progress towards a new growth paradigm that does not depend on environmental degradation. **Education and training systems can support resilience by ensuring that most people possess the right skills needed to adapt to existing environmental changes, to create the technologies that will propel the green transition, to work in the new jobs that will be created as a result of the green transition and to adopt behaviours better aligned with the achievement of environmental objectives.**

Human action also drives the quality of the information landscape. Throughout history, technological innovations have profoundly impacted individuals' capacity to acquire, use and exchange information. From the invention of writing to the printing press, from the advent of the Internet to the onset of generative AI, technological developments have facilitated new possibilities for individuals to connect and interact with others. At the same time, alongside benefits arising from cheaper and faster information exchange, societies have had to develop ways to adapt to such technological advances. For instance, the advent of the printing press and the subsequent proliferation of printed materials facilitated the dissemination of misinformation and thus posed a challenge in terms of ensuring the accuracy and reliability of information. Developments in social media and AI are creating similar problems.

Information is critical to enable individuals to make informed decisions. Technology plays a fundamental role not only in giving people access to information but increasingly in directly extracting and generating the information that is exchanged. During the pandemic, information allowed individuals to safeguard their health and the well-being of others. However, the pandemic also demonstrated that unless people have **adequate levels of skills to access, filter, assess and process information**, exposure to misleading, inaccurate, and false information can lead communities to experience worse rather than improved outcomes.

Communication is key in today's interconnected world. Of the estimated 8 billion people who lived in the world at the end of 2022, about 5 billion were connected to the Internet (World Bank, 2021^[18]). The Internet dramatically increased the amount of information that is accessible and exchanged around the world. But quantitative increases in the amount of information that is available on line have not necessarily been accompanied by increases in the quality of such information, and the emergence of generative AI systems is changing yet again how information is extracted and generated. To reap the benefits of emerging information societies, countries need to have an adequate pool of individuals who possess the skills to develop, adapt and maintain AI applications since these underpin how information is collected, used and exchanged. In addition, countries need to ensure that, whether on or off line, populations have the full set of skills that allow them to integrate new technologies into their work and everyday lives to improve their productivity and well-being.

1.3. Skills for a resilient green and digital transition

Reorienting the economy so that economic growth occurs within planetary boundaries and ensuring that rapid technological developments do not create new social and economic vulnerability may change the set

of tasks individuals will have to perform. Such change is likely to require individuals to rely on a renewed set of skills in their work and everyday life. As a result, education and training systems will have to adapt to align skills development opportunities with emerging skills needs in labour markets and society more widely. Emerging skills needs that are critical to build system-level resilience to the green and digital transition at the population level require:

- **Focusing efforts to improve information-processing skills among low-proficiency adults.** Skills such as literacy, numeracy and digital literacy allow individuals to access, analyse, interpret, summarise, organise, store, retrieve and communicate information. The emergence of knowledge-rich societies in which value rests on the ability to gather, use and exchange information effectively means that individuals without at least baseline levels of proficiency in information-processing skills will increasingly be at risk of economic and social exclusion. Increases in the complexity of the information landscape result in more information becoming available from a variety of sources, heightening the need for all individuals to be able to analyse, interpret, and organise information. Similarly, the growth of job profiles resulting from the green transition in service industries and industries with a high technological content increases the demand for workers who possess skills to effectively manage quantitative and narrative information.
- **Prioritising the acquisition of socio-emotional and communication skills for all.** Skills such as the capacity to collaborate with others, manage emotions, persevere in difficult circumstances and effectively communicate with diverse groups enable individuals to effectively navigate their social environments and make responsible decisions. These skills are critical to building a resilient green and digital transition because these are uniquely human skills and, therefore, not easily automatable even with advances in AI in the near future. Moreover, the collective effort needed to promote the green transition rests on the capacity of communities to negotiate conflict and pool collective expertise to solve complex systemic problems.
- **Raising awareness about the role of metacognitive skills.** Metacognitive skills refer to the ability to think about and regulate one's own thinking processes, monitor and evaluate one's own learning and understanding, and plan, set goals, and adjust strategies to meet those goals. There is increasing evidence of the role played by heuristics, biases and cognitive profiles in shaping decision making. Metacognitive skills are critical if individuals are to regulate their behaviour. In the face of uncertainty induced by climate change and technological developments, metacognitive skills allow individuals to recognise the role of heuristics and biases in shaping decision making and make more informed use of knowledge and information. Metacognitive skills, in fact, empower individuals by helping them characterise knowledge and knowledge generation processes and can help individuals effectively work alongside others – whether humans or machines. They help individuals and communities solve complex problems and develop reasonable risk mitigation strategies both at individual and societal levels.

1.4. Adapting investments in skills development to a changing context

The speed and complexity of changes associated with green and digital transition require profound transformations in how education systems equip young people with the skills, as well as the knowledge and attitudes, to thrive in the future. At the same time, they require adults to continuously adapt to match new labour market and social demands through a renewed commitment to adult education and training in all its forms – including formal, non-formal and informal learning.

Recognising the range of skills individuals have and valuing the potential of individuals to become proficient in different domains widens the scope for greater participation in training programmes. Skills can be acquired through experience and lost through lack of use. Therefore, the level of skills of workers is not just about individual workers; it is also a reflection of how production processes are

structured and whether individuals have been given the opportunity to build their skills or not. Recognising the potentially wide range of skills and levels of proficiency workers possess can, in turn, motivate both employers and employees to invest in skills development: workers because they are empowered in their capacity to acquire skills, and employers because they can see the potential returns associated with investments in skills development.

One step for skills policies to promote resilience and a lifelong learning culture, as well as support the green and digital transitions, is to advocate for a change in how workers are classified. **Workers in blue-collar occupations are generally referred to as being “unskilled” or “low-skilled” and managers and professionals as “high-skilled”.** However, high and low are adjectives that classify skills depending on the level of proficiency, not the type of skills individuals possess. This means that, for example, a blue-collar worker may have high levels of fine motor and problem-solving skills and low levels of programming skills, whereas the opposite may be true of a professional. The fact that certain skills may be more relevant than others in specific contexts – and therefore yield a comparative advantage and are therefore in high demand – says as much about the context individuals operate in as about the skills individuals possess.

Standard characterisations of manual workers as being “unskilled” or “low-skilled” and professionals as being “high-skilled” reduce the incentives individuals with different occupations have to invest in lifelong learning. Manual workers may be led to believe that acquiring proficiency in a wider range of skills is beyond their capacity, and professionals may be led to believe that they do not need to invest further in skills development. As such, they limit the scope of skills policies and potentially create labour market inefficiencies. This characterisation arises from a traditional view of skill acquisition focused solely on educational qualifications acquired through formal schooling. To an extent, this is due to the fact that educational qualifications are the only information available in labour force or other social surveys used to map and study labour markets. At the same time, because of historical developments in education systems, focusing on educational qualifications in most contexts has the unintended consequence of leading to a hierarchical vision of education systems in which academically oriented programmes command a higher status than vocationally oriented programmes.

Effectively promoting system-level resilience first requires identifying emerging skills needs and prioritising investments to ensure that support reaches those vulnerable to changing conditions.

Second, it requires identifying what proficiency benchmarks in a given skill individuals need to reach to be able to behave at work and in everyday life in ways that align with the achievement of such objectives. Third, it requires policy makers to ensure that individuals are able to progressively reach such benchmarks as labour market and social arrangements evolve, prioritising skills investments to meet the demands of vulnerable populations.

Promoting a culture of lifelong learning goes hand in hand with fostering equal access to education and training opportunities (OECD, 2023^[19]). Lifelong learning opportunities should be created to fulfil the needs of a diverse set of individuals. Policy makers should create flexible education and training opportunities that take into account individuals’ unique barriers to participation (including lack of time or financial resources, caring responsibilities, lack of prerequisites, lack of knowledge about opportunities) and target groups in greatest need of support. Examples of efforts aimed at empowering individuals and reducing financial barriers to participation include individual learning accounts – such as the French *Compte Personnel de Formation* (OECD, 2019^[20]) – or vouchers, coupons provided to individuals or companies to cover direct training costs, as for example, the *Bildungsprämie* in Germany (OECD, 2021^[21]). Pre-apprenticeship programmes can facilitate the integration of migrants into regular vocational education and training (VET) programmes, such as the case of *Integrationsvorlehre* in Switzerland (OECD, 2023^[22]). Flexible measures have been used in Denmark to allow learners who already fulfil specific requirements to skip parts of their VET programme, thus shortening the length of training significantly and increasing motivation to learn during the programme (Ministry of Children and Education, n.d.^[23]).

This report maps the distribution of skills that are key for the twin green and digital transition across and within countries and for different population groups. Mapping these skill distributions can assist in the formulation of effective skills policies aimed at reducing vulnerability to emerging threats. Specifically, the report identifies populations with limited proficiency in key skills (such as information-processing skills), thereby enabling targeted investments in policies to address the limited proficiencies. By addressing the vulnerability of the identified populations, broader local and global communities can also benefit from reduced vulnerability.

1.5. The role of attitudes and dispositions

Decisions concerning the skills individuals and societies invest in, whether such skills are mobilised, and the goals pursued through their use depend on the attitudes and dispositions individuals hold and the values societies prioritise. Attitudes and dispositions play a pivotal role in driving individuals' motivation to utilise their skills and enhance how effectively skills are used. For instance, recognising the importance of promoting environmental sustainability is essential to motivating individuals to integrate sustainable practices into their daily lives as consumers. Attitudes are also critical if individuals are to consider strategies to enhance environmental sustainability in their workplaces and apply scientific knowledge to develop solutions in this domain. It is noteworthy that many skills that can contribute to environmental sustainability can equally be utilised for environmental degradation, with the divergence solely determined by the type of activity workers are engaged in and, to some extent, even their own attitudes and dispositions. For example, proficiency in physics and chemistry can be used to develop ways to reduce system-level dependency on energy generated through fossil fuels or, by contrast, to devise new ways to extract fossil fuels from natural reserves. Similarly, the technical skills required to develop AI systems that may propagate false information endangering public health can also be employed to facilitate health promotion and the adoption of preventive measures. Individuals' choices in utilising their skills depend on their attitudes and dispositions.

Equipping all individuals with skills is a necessary – but not a sufficient – condition to facilitate the green and digital transition. Attitudes and values are also essential. Societies must nurture in generations, new and old, not only a sound understanding of the challenges arising from climate change, environmental degradation and technological advancements in information exchange but also a deep appreciation for the fragility and intricacy of physical and digital ecosystems. Similarly, new attitudes and dispositions are needed if societies are to adapt to new digital environments. This is especially the case given very recent advances in generative AI systems and their potential to profoundly reshape information ecosystems.

Education and skills policies are crucial in tackling challenges associated with the green and digital transition and building resilience at the individual, community and system levels. Education and training systems should accompany skills development with the development of attitudes and dispositions that can sustain the effective use of skills. Attitudes and dispositions are key enablers of skills investments. Skills do not translate into meaningful action without the will to act.

1.6. The green transition and how skills policies can promote resilience

Reorienting the economy to create an environmentally sustainable future requires the adoption of environmentally sustainable production and consumption practices. Skills policies can promote system-level resilience by:

1. **strengthening the environmental sustainability competence of individuals**
2. **ensuring that achieving ambitious climate objectives does not lead to labour market vulnerability**
3. **developing the range of skills and attitudes needed to adapt to new environmental conditions.**

1.6.1. Strengthen the environmental sustainability competence of individuals

Environmental sustainability competence comprises the knowledge, skills, attitudes and values that are critical to promoting environmental sustainability. It enables individuals to tackle environmental challenges, adopt practices in their work and everyday life that promote environmental sustainability, be ready to work in future green jobs and be environmentally thoughtful consumers. Yet, this report finds that on average, across OECD countries, only 31% of 15-year-old students have foundational levels across all key dimensions of environmental sustainability competence, meaning that they achieve at least a foundational level of science proficiency; have an awareness of climate change and global warming; care for the environment; have environmental self-efficacy; and are engaged in behaviour to promote environmental sustainability. Furthermore, large disparities exist in the extent to which education systems and societies equip children with environmental sustainability competence. In particular, 21% of socio-economically disadvantaged youths, but 46% of their more advantaged peers, had mastered the foundation skills and mindsets they will need to find employment in the new green economy and to act for environmental sustainability as consumers. Although science proficiency is the key information-processing skill underpinning the capacity of individuals to contribute to and thrive in a low-carbon economy, attitudinal and dispositional components of environmental sustainability are powerful drivers of engagement in environmentally sustainable behaviours together with knowledge and skills. Worryingly, inequalities in attitudes and dispositions mirror inequalities in science proficiency – such as in the case of socio-economic inequalities – or are wider than inequalities in science proficiency – such as in the case of inequalities between genders. Given the key role played by emotional, attitudinal and behavioural dimensions of environmental sustainability competence and the fact that these dimensions can be acquired through repeated exposure to role models and long-term socialisation, environmental protection should be made a shared cultural and social norm. Investing in building environmental sustainability competence among young people and adults should thus be comprehensive and entail:

- **Ensuring that the appreciation and protection of the environment is taught and nurtured from an early age and continued over the life course.** Education systems should promote more equitable learning of environmental competence to make sure that today's marked socio-economic divide in environmental sustainability competence between students with a high and low socio-economic status is mitigated. Although this requires whole-of-society efforts between parents, the education system and other social institutions, the education system can promote early childhood education and care programmes that aim at teaching children environmental sustainability competence from the early years. Such efforts should be the foundation upon which education systems then continue to support the acquisition of environmental sustainability competence. Furthermore, since many adults remain ill-informed about the threats arising from climate change and environmental degradation, environmental awareness among adults should be expanded through sensitisation campaigns about the threats of climate change and the importance of adopting behaviours that reduce environmental degradation.
- **Empowering teachers and trainers to support the acquisition of environmental sustainability competence.** Initial teacher training programmes and professional development modules should be reviewed and updated to ensure that teachers are aware of the importance of integrating aspects related to the development of environmental sustainability competence in the curriculum and have the pedagogical and content knowledge needed to do so. Such programmes should be regularly updated to integrate new knowledge and information on environmental

challenges and on the effectiveness of different approaches to promote the development of environmental sustainability competence in the classroom.

- **Promoting the development of environmental sustainability throughout the lifecycle.** The understanding of the impact of human actions on the environment, key environmental phenomena and possibilities to promote environmental protection have evolved dramatically in the recent past. Efforts in the early years should be complemented by the opportunity to update their environmental sustainability competence later in life, as well as programmes tailoring individuals already in the labour market who did not benefit from any training in environmental sustainability early on. Whenever possible, adult training systems and sensitisation campaigns should build on early interventions by providing individuals with up-to-date information on environmental degradation. At the same time, efforts should be made to identify individuals who did not benefit from early interventions while in school and provide tailored programmes aimed at supporting their acquisition of the knowledge, skills, attitudes, and values that are critical to promoting environmental sustainability via training programmes. Furthermore, as environmental degradation has worsened, many individuals who were sceptic about the urgency of climate action have realised the need to develop and sustain initiatives to protect the environment. New generations who are working towards protecting the environment can be powerful agents of change, mobilising prior generations and helping them establish a new environmental consciousness and awareness.

1.6.2. Ensure that achieving ambitious climate objectives does not lead to labour market vulnerability

Ambitious climate mitigation policies will be needed to limit climate change and halt environmental degradation. Although these policies are essential to avert environmental collapse, they will affect labour markets and the demand for skills in the next decade. Building system-level resilience requires minimising the economic and social cost of the green transition, so anticipating possible unintended effects of efforts aimed at decarbonising economies on labour markets is critical to putting in place adequate policy responses. This report considers the effects of policies in countries in the European Union (EU) as a case study to consider how policies will have to adapt to ensure that the skills workers possess are aligned with the skills that will be demanded in the economy. The case of the EU is instructive because of the ambition of the policy package being implemented, the number of jurisdictions being affected and the availability of timely data. Projections indicate that reducing greenhouse gas emissions in the EU by 55% by 2030 through the EU's Fit for 55 policy package can be achieved without a decrease in overall labour market opportunities and, in fact, with a small gain in employment. However, according to OECD projections the policy is projected to result in overall lower employment for blue-collar workers. Minimising labour market mismatches arising from the policies is, therefore, critical to reducing delays and transition costs for individuals and businesses. Moreover, because evidence suggests that whenever in a country unemployment increases, public support for environmental action decreases, reducing the social and economic costs associated with the implementation of climate change mitigation policies is critical to guarantee sustained public support for such policies. Supporting workers in localities particularly affected by downsizing activities that generate high levels of CO₂ emissions through labour market and social policies is critical. In this regard, ensuring the effective and inclusive implementation of policies aimed at reducing greenhouse gas emissions entails:

- **Coupling climate change mitigation policies with technological adoption to facilitate a green transition that promotes employment growth.** Thanks to technological adoption and diffusion, projections indicate that climate change mitigation policies can be achieved while still promoting sectoral and employment growth. Successfully achieving decarbonisation, as well as economic and job growth, depends on ensuring the adoption of digital technologies and on improvements in labour productivity related to technology use. Many of the skills projected to increase in demand between 2019 and 2030 relate to the development and use of digital tools and applications or to

interpersonal communication, management and leadership. By contrast, many of the skills projected to decline in demand relate to using tools and machinery. This is because the implementation of Fit for 55 is expected to accelerate the existing trend, leading to a structural reallocation of employment opportunities from blue-collar and manual jobs to jobs in the service economy.

- **Considering the distributional implications of policies aimed at reducing greenhouse gas emissions.** The modelling results indicate that although overall employment is projected to grow between 2019 and 2030, even under the implementation of ambitious initiatives to reduce greenhouse gas emissions, employment is projected to shrink considerably in some sectors and for some workers. In particular, the employment of blue-collar workers is projected to shrink, and in some sectors, such as mining coal and lignite, it is projected to shrink by as much as 90%. Because the distribution of workers in different sectors and occupations differs across countries as well as across regions, within most countries, some countries/localities will be especially hard hit by job losses. The geographical distribution of workers by sector and occupation should be evaluated in the development of adequate policy responses aimed at facilitating their redeployment in sectors and occupations for which labour demand will increase. In fact, in the case of the EU the Recommendation on ensuring a fair transition towards climate neutrality was adopted in 2022 to take into account the distributional implications of the transition. The Recommendation invites EU member states to adopt measures to address the employment and social aspects of climate, energy and environmental policies, encouraging the adoption of actions to support people most affected by the green transition for instance by stimulating the creation of quality jobs and facilitating access to safe working conditions protecting health and safety in the context of this green transition (Council of the European Union, 2022^[24]). The Recommendation also puts a focus on education and training measures, inviting EU member states to integrate the employment and social aspects of the green transition in the development and implementation of relevant national strategies (Council of the European Union, 2022^[24]). Other proposals concentrate on fairness of tax-benefit and social protection systems and on ensuring access to affordable essential services and housing for people and households most affected by the green transition. The effects of policies aimed at decarbonising economies should be adequately and continually monitored to ensure that policies aimed at supporting displaced workers are timely and tailored to these workers' needs. Minimising transition costs (including economic costs and reduced overall well-being) requires organising social protection to support groups of individuals for which viable labour market transitions are not feasible or are too costly to be implemented and organising training for those for whom such transitions are available. In particular, anticipation efforts should consider the profile of displaced workers in order to facilitate their redeployment in sectors for which labour demand is projected to grow, with the aim of anticipating the intensity of training needs and organise both upskilling and reskilling efforts to reduce mismatches and facilitate inter-sectoral and inter-occupational mobility. Alongside the development of learning opportunities that are responsive to emerging needs, efforts should be made to improve the accessibility of such opportunities for diverse groups of learners. Even in the absence of the additional demands arising because of labour market changes induced by the green transition, participation in adult learning opportunities is low, particularly among many of those who would most benefit from taking part in lifelong learning. Efforts should reduce the effects of external barriers (for example, time, cost, lack of information, architecture) and internal barriers (for example, lack of motivation, lack of prerequisite skills) to participation.
- **Investing in career guidance and working with employers to develop new hiring practices.** Career guidance and educational orientation programmes can assist individuals of all ages in making well-informed educational, training and occupational choices and in managing their careers. At the same time, formal educational qualifications remain a key criterion guiding employers in hiring decisions. Although this may be changing due to the large and persistent skills

shortages employers face in some sectors, skills-based hiring will have to become more widespread and accepted if the deployment of workers across sectors and occupations following engagement in training courses is to be successful. Although qualifications and degrees from initial education and training will continue to play a key role, alternative credentials (including digital badges, micro-credentials, nano credentials, minor awards, etc.) will be critical to ensure that more adults engage in adult learning opportunities and to provide more adequate information on workers' skills and proficiencies to prospective employers.

- **Investing in adequate labour market and skills data.** Existing data collection instruments in many OECD countries are not well suited to mapping economic activities and employment distribution. Most of the literature overcomes these limitations by using data from the United States and assuming that the skills required of different occupations in different countries match the skills content estimated in the United States using the O*NET database. However, since an important effect of the green transition will be the reorganisation of production to reach green objectives and the fact that countries might follow different trajectories, it will be important to ensure that adequate data will be collected to support evidence-based policy making. In particular, highly detailed sectoral and occupational data are needed to identify how aligned with green objectives different labour market opportunities are.

1.6.3. Develop the range of skills and attitudes needed to adapt to new environmental conditions

Despite the most ambitious mitigation efforts, a certain degree of climate change is already inevitable due to past emissions. Therefore, it will be necessary to implement a variety of adaptation policies to reduce the vulnerability of individuals and societies to the impacts of climate change and environmental degradation. Events such as wildfires, extreme temperatures and flooding can disrupt skills acquisition directly by forcing the closure of schools and increasing absenteeism but also indirectly by reducing the potential of individuals to learn when they are in class and to achieve their full potential during high-stakes exams. Socio-economically disadvantaged children and adults are more likely to suffer the negative consequences of adverse environmental conditions. This is because they are often more exposed to poor environmental conditions and lack the resources to invest in adaptation technologies or protective behaviours. Promoting the successful adaptation of learning systems to climate change entails:

- **Preparing learning environments for extreme temperatures and destructive weather events.** Education and training systems should develop emergency protocols to protect students and staff during extreme weather events and ensure the continuity of instruction during such events. This can include measures such as installing emergency generators, establishing evacuation plans and providing training on safety and how to respond to emergencies. Schools and training institutions should also reduce their carbon footprint and increase their resilience to extreme weather events, saving on operating costs and repair work. Designing workplaces to ensure adequate environmental conditions is also key to promoting workers' safety, productivity and effective use of skills.
- **Considering the differential effects of environmental conditions on the acquisition of skills and on inequalities in skills development.** Reorganising when and where learning takes place may help reduce overall exposure and thus mitigate the largest effects on cognition. Ensuring that classrooms have cooling devices or good ventilation can also attenuate the overall effects of extreme temperatures on cognition. Furthermore, because socio-economically disadvantaged groups are often more exposed to worse environmental conditions and have less access to mitigation technologies, investments should focus on reducing inequalities.

- **Accompanying investments in adaptation infrastructures with a focus on the full set of skills needed for successful adaptation.** Infrastructural investments in adaptation should be accompanied by investments in building the full set of skills individuals need to be resilient to extreme weather events. Skills policies could include a focus on the skills necessary to keep safe under extreme weather events as well as physical skills such as the ability to swim without assistance and the ability to ride bicycles. Even though education systems in many OECD countries have prioritised the acquisition of cognitive skills and the transmission of knowledge, the green and digital transition requires a greater balance between investments in academic domains and physical education (OECD, 2019^[25]). Partnerships with not-for-profit organisations could be promoted to ensure more individuals possess skills that will be needed to be safe during extreme weather events and achieve personal autonomy, safety and well-being.
- **Ensuring that public support for sustainable investments following extreme weather events translates into long-term change.** Whereas education programmes can easily reach young people with the aim of equipping them with environmental sustainability competence and the skill set needed to adapt to climate change, adults are harder to reach. Public information campaigns and initiatives aimed at empowering individuals with the knowledge and skills needed to adapt to new environmental challenges should build on public interest and support for actions prioritising the environment in the aftermath of natural disasters. Governments should provide clear and consistent messaging to the public about the need for sustainable investments in the wake of extreme weather events, explaining the link between climate change and extreme weather events and highlighting the importance of long-term sustainable investments. Sustainability plans should outline specific measures to address climate change and promote sustainable investments. They should be developed in collaboration with a wide range of stakeholders, including the public, and regularly updated to reflect changing circumstances.

1.7. The digital transition and how skills policies can promote resilience

Recent technological innovations have profoundly changed how information is collected, stored, used, generated and exchanged. Supporting further technological innovations while ensuring that technological developments enhance the economic well-being of broad populations rather than only a few, and addressing the possible negative effects of new technologies on health, well-being and social cohesion requires:

1. **identifying emerging skills needs to more effectively operate in information-rich societies and work alongside emerging generative AI systems**
2. **promoting health literacy to protect communities from infodemics**
3. **supporting language learning to facilitate interlinguistic communication**
4. **strengthening a wider set of skills and attitudes AI professionals need to be able to develop ethical and trustworthy AI systems.**

1.7.1. *Identify emerging skills needs to more effectively operate in information-rich societies and work alongside emerging generative AI systems*

With the rise of social media, the decline of traditional news outlets and advances in the capabilities of AI technologies, particularly generative AI, there has been a proliferation of information available to individuals around the world. However, quantitative increases in the amount of information available have yet to be accompanied by increases in the trustworthiness of such information and in an understanding of how best individuals can use the power of new technologies in making use of information and data to improve their productivity and personal well-being. On the one hand, new technologies are leading to an increase in the

amount of false or misleading information individuals are routinely exposed to and a decrease in how much individuals trust institutions. The ease with which information can be produced and shared is also leading to information overload on the part of potential users because many lack the ability to effectively manage information flows. As a result, some individuals feel overwhelmed, and others unwillingly and unknowingly spread false or misleading information. The ability to evaluate the quality of information and the ability to seek, retrieve and propagate relevant information rests on a range of cognitive and metacognitive skills, knowledge, as well as attitudes and dispositions. On the other hand, AI has the potential to profoundly impact all industries and occupations that rely on data and information, automating a wide range of tasks currently performed by humans. Many of today's political and social tensions arising in response to the automation of tasks made possible by advances in AI revolve around the questions of whether technologies will substitute or complement workers, give rise to better or worse labour market conditions, and ultimately whether they will be associated with an increase or a decrease in labour market opportunities. Ensuring that all individuals possess the full range of skills and attitudes to effectively deal with technological advances in how information is shared and used entails:

- **Integrating media literacy in education and training programmes.** Media literacy education should become part of national curricula starting in primary school years and continuing in secondary and tertiary academic and vocationally oriented programmes. Students could also be trained in lateral reading, the process of comparing untrusted information to other, more trusted sources. Studies have found that lateral reading interventions can be useful in improving information handling. Giving people the opportunity to deliberate has been found to positively impact truth discernment. If people can follow a quick evaluation of a headline with the opportunity to re-evaluate, they show less belief in false news.
- **Reorganising learning so that young people develop an understanding of the different ways in which knowledge is acquired.** Teachers can introduce students to different ways of developing knowledge, such as inductive and deductive reasoning, discuss how epistemic beliefs can influence scientific thinking, and encourage young people to explore scientific concepts through inquiry so that they can gain a deeper understanding of how scientific knowledge is constructed. Collaborative learning can also help young people develop more sophisticated epistemic beliefs by exposing them to different perspectives and ways of thinking. Finally, group work can also help students develop communication skills and improve their ability to articulate their own beliefs. Such efforts could be strengthened by programmes aimed at prompting individuals with media literacy information before they engage in social media or other online sources that might expose them to misleading or false information.
- **Including the development of metacognitive skills as part of learning objectives.** More focus should be placed on developing metacognitive and critical thinking skills: individuals' actions and behaviours are shaped by cognitive biases, which can be transitory (for example, due to fatigue) or permanent (for example, because of framing effects). Individuals should be educated about the role cognitive biases play in decision making, and their metacognitive skills should be promoted to limit the harmful effects of such biases. Teachers play an important role in developing students' awareness of their own skills and abilities, as well as their critical thinking skills. It is crucial to encourage teachers to teach critical thinking in different subjects and help young people develop an awareness of their own skills and limitations. Embedding critical thinking in all subjects is considered more beneficial than generic critical thinking interventions. For example, teachers could choose questions and tasks that put more emphasis on particular forms of reasoning and connect this reasoning to real-world use in and outside their fields. Individuals should also develop the ability to recognise the information context they are exposed to, for example, what the type of moderation specific platforms use, their policies if users break the terms of service and their policies on content removal.

- **Fostering public understanding and awareness of AI technologies and the skills to operate alongside emerging technologies.** Open dialogue between policy makers, scientists, industry representatives, trade unions and the general public can help to address concerns, gather feedback and incorporate diverse perspectives into AI governance processes. Promoting public education initiatives to enhance digital literacy can empower individuals to make informed decisions about AI-related matters. Improvements in AI technologies require prioritising investments in the development of skills, attitudes and dispositions that enhance people's readiness to meaningfully engage in tasks alongside AI systems. Critical attitudes and dispositions include risk preferences, attitudes towards failure and self-confidence. Critical skills include goal setting, the capacity to interpret information and evaluate the quality of evidence. As the capabilities of AI systems evolve, it is critical to continuously evaluate what skills and attitudes will allow individuals to make the most of AI developments in their work and everyday life. Adequate investments should be made in skills assessments, and anticipation initiatives to identify the set of skills and attitudes workers in different sectors and occupations will need to effectively integrate advances in AI capabilities. Engagement in lifelong learning will play a critical role in ensuring the alignment of people's skill sets and attitudes to a new technological reality and that new managerial practices emerge so that workers' contribution to production processes is strengthened and adequately valued.
- **Reflecting on the opportunities and threats for skills development of generative AI.** Although it is too early to evaluate the full impact generative AI will have, it is likely to profoundly impact education and training systems. Skills policies will have to integrate emerging evidence and make the most of opportunities generative AI will bring to individualised and customised learning experiences in order to match learning provision with learners' needs and cognitive profiles. This could help educators increase the accessibility of learning, for example, for neurodiverse students and students struggling with linguistic barriers. Generative AI could also allow instructors to scale constructive critiques for iterative learning and provide timely feedback. At the same time, the integration of generative AI in education and training poses safety and ethical risks that should be adequately considered and addressed, for example, through policies governing the use of generative AI by staff and learners.

1.7.2. Promote health literacy to protect communities from infodemics

Healthcare is a key area in which the outcomes of widespread use of information technologies depend on the skills of individuals. Information technologies, such as health apps, wearable devices and online health platforms, provide individuals with unprecedented access to health information and tools that allow them to monitor and manage their health and well-being. However, the effectiveness of these resources hinges on users' ability to comprehend, evaluate and apply the information they encounter. If individuals misinterpret health data or rely on inaccurate information, they can incur wrong self-diagnoses, inadequate treatment adherence or make misguided health decisions. While technological developments in generative AI might improve early disease detection and treatment options, they also run the risk of amplifying online misinformation, thereby increasing the importance for individuals to have the ability to critically evaluate and discern health information. In an era of rampant digital misinformation, individuals lacking strong health literacy skills are more susceptible to becoming the victims of false and misleading claims, potentially compromising their health and undermining the effectiveness of evidence-based medical practices. During the worst health crisis in a century, over four in ten adults reported that they would find it difficult or very difficult to judge the advantages and disadvantages of different treatment options; decide how to protect themselves from illness using information from the mass media; or find information on how to handle mental health problems. At the same time, unless healthcare providers have the ability to effectively communicate information to a range of individuals with varying levels of health literacy, they may be unable to improve patients' outcomes or engage in effective public health measures through prevention. The cost

of investments aimed at supporting health literacy development at the population level and improved communication skills among healthcare professionals should, therefore, be considered a key part of healthcare prevention strategies. As such, it should be evaluated against the cost of inaction, in particular, the fact that lower investments in preventive services often lead to greater reliance on costly emergency services as well as worse overall outcomes. Ensuring that technological innovations lead to improved health entails:

- **Promoting the development of health literacy throughout the lifecycle.** Promoting health literacy should start in childhood and continue in adolescence, adulthood and the elderly years. Adopting a lifecycle approach to the development of health literacy would entail identifying how best to equip individuals with health literacy that they can use to promote their health in the present and future. Health literacy instruction should be part of physical education in the early years. General practitioners and other healthcare professionals could work to build health literacy among adults. In particular, individuals should be supported in understanding the implications of a rapidly evolving technological landscape with the aim of empowering them to use information to enhance their own health and the well-being of their communities.
- **Improving the accessibility of health-related information by enhancing the communication skills of healthcare providers.** Healthcare professionals should receive training to ensure that health-related information is made available and communicated in ways that are comprehensible by individuals with varying levels of health literacy. Health literacy action plans should involve patient groups to ensure that health-related information is communicated in ways that are understandable for a diverse set of users. In particular, given the increase of international migration, health-related information should be made available in the languages of large migrant communities, and translators should be available for those whose low health literacy is due to an inability or limited ability to speak the language.
- **Addressing healthcare providers' biases through de-bias training.** Some healthcare providers display biases in how they communicate with and treat different population groups. In particular, in many countries, ethnic minorities and women often experience worse outcomes as a result. On top of strengthening the health literacy of these groups to empower them to more effectively advocate for their health, healthcare practitioners should be trained to identify and address the biases they and their colleagues hold.
- **Promoting the administration of health literacy surveys.** Little information exists on the levels of health literacy in populations. This may mean that the current standards applied in communicating healthcare information by providers remain ill-suited to the skill levels of end users, potentially limiting these users' ability to engage in health decisions. Administering regular population-level health literacy surveys can help to identify target groups for interventions aimed at enhancing health literacy. Such surveys can also reduce the risk that low levels of health literacy reduce people's health by giving healthcare providers an understanding of the sets of skills their patients have and how best they can tailor health-related communication given such skills.

1.7.3. Support language learning to facilitate interlinguistic communication in the digital age

Being able to accurately exchange information with others is key to being able to make the most of digital information ecosystems, and developments in AI are facilitating interlinguistic exchange although they pose significant challenges for language professionals. But whether on or off line, people's ability to access information and communicate with others depends on their proficiency to leverage technological innovations for interlinguistic exchange. This includes their own linguistic abilities, as well as the ability to understand when AI systems are hindering rather than facilitating communication because of biases and limitations. English is the most demanded language in the labour market and is widely used on line.

Moreover, English is the language that is most widely used by the technology sector, and recent advances in large language models are generally biased towards English or other languages with a large online presence upon which such models can be trained. Making the most of the opportunities afforded by information exchange at a time of rapid advances in AI entails:

- **Encouraging early language learning and increasing the amount of time devoted to language instruction, particularly in vocational education and training programmes.** Despite the importance of languages in labour markets and societies, with English conferring unique advantages, many vocational programmes do not include learning a modern language course as part of their core programme. Because the earlier a child is exposed to a non-native language, the easier it is for them to become proficient and becoming proficient in a language can take several years of consistent exposure, language instruction should start as early as possible, and students should be exposed to language learning for an adequate amount of time over an extended number of years. Although language learning is easier at a young age, adults can also acquire language skills. Adults should be informed about the labour market and employability benefits associated with having language skills, and language courses should be part of adult education programmes.
- **Educating young people and adults about machine translation (MT) technology outputs, their potential, and the threats arising from poor translations.** Given changes in how technologies afford interlinguistic communication, language learning programmes should be designed to facilitate an understanding of the challenges and opportunities for interlinguistic communication inherent in the use of AI tools and applications. Language learning courses in schools and training institutions should include modules aimed at educating learners about the limitations of MT technology, the information to seek when considering their use, the biases inherently programmed into the technology and the contexts in which the use of these tools could be especially controversial. In order to educate adults, freely accessible online MT systems could be required to provide information about their limitations and direct users to information programmes aimed at communicating the benefits and limitations of MT tools in easily accessible formats. Platforms could also be required to clearly indicate whether content is in the original language, was translated, and, if so, using which tool or translation company.
- **Recognising the importance of language professionals for effective information exchange.** Encourage the formal recognition of the work conducted by language professionals and ensure that language professionals remain involved in high-stakes settings requiring interlinguistic communication, such as the healthcare and the criminal justice system. Language professionals should receive training in how they can best engage in coproduction with machine-learning technologies and invest in continuous professional development. For example, the curricula of courses designed to train language professionals should include modules in post-editing and MT.

1.7.4. Strengthen a wider set of skills and attitudes AI professionals need to be able to develop ethical and trustworthy AI systems

The continuous evolution of AI systems brings with it different skills needed by AI workers to develop, adapt, and maintain AI applications, as well as different attitudes populations should have to live and work in the age of AI. Although the number of individuals with the skills needed to develop, maintain and adapt AI systems remains small, there has been a very marked increase in the demand for workers with such skills and countries' economic competitiveness rests on their ability to have a suitable pipeline of individuals with such skills. Although the deployment of AI systems poses critical ethical dilemmas, ethical considerations remain largely ignored in job postings for individuals involved in the development, maintenance and adaptation of AI tools and applications. Ensuring an adequate talent pool of individuals who are able to develop, adapt and maintain AI systems and who prioritise ethical considerations in their work, as well as populations that have the attitudes needed to work and live with AI, entails:

- **Promoting the development of skills to develop, adapt and maintain AI tools and applications.** Encourage the development of AI skills through educational programmes and training, ensuring that an adequate pipeline of learners acquire solid technical skills that would allow them to use new tools and applications as they emerge and become widely demanded in AI-related jobs while acknowledging the importance of a broad skills mix in the AI field. In particular, educational and training programmes aimed at forming AI professionals should adopt an interdisciplinary approach to skills development, combining technical expertise with leadership, management, innovation and problem-solving abilities. Given the rapidly evolving nature of the field, ensuring that education and training programmes respond to labour market needs requires fostering collaborations between education institutions and industry and creating ample opportunities for workers to engage in professional development through timely and flexible professional development opportunities.
- **Including ethical aspects of AI development and use in education and training programmes leading to AI jobs.** Despite strong commitments regarding the importance of promoting responsible AI development and use, only a small minority of employers seek AI talent with skills related to ethics in AI. Education and training programmes on data science, data analytics and similar modules that usually lead into AI professions should be required to include courses in ethics and responsible AI. Efforts should also be made to foster international collaboration and knowledge exchange to learn from best practices and experiences in different countries. Developing common frameworks, sharing insights and aligning policies can support the responsible and inclusive development and adoption of AI.

1.8. Report roadmap

This report details key results that can help OECD countries build system-level resilience by supporting a new vision for skills policies to promote an inclusive twin green and digital transition.

Although the report details the interconnected nature of policies aimed at promoting environmental sustainability and using technological innovations to facilitate effective information exchange, the material is organised into two main sections:

- **The first considers the role of skills, attitudes and dispositions in promoting adaptation to environmental changes and shaping a greener future.**
- **The second considers the role of skills, attitudes and dispositions in promoting adaptation to complex information landscapes and in shaping the quality of information exchange through technological development.**

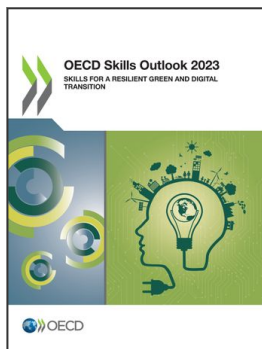
The report reviews the experiences of countries and jurisdictions that have successfully developed skills policies to empower people for the green and digital transition over the life course. As such, the report considers interventions tailored both at young people and adults and that take place in schools, workplaces and wider society. The report presents seven analytical chapters featuring detailed results and examples of policy initiatives implemented in different countries or national sub-regions. For analytical purposes, different chapters focus on different sets of countries for which data were available, with the aim of enriching the knowledge base upon which OECD countries can develop reform initiatives. A wide range of data sources and analytical techniques were also used to reflect the role of skills, attitudes and dispositions in supporting system-level resilience. These range from international, large-scale assessment initiatives of young and adult populations, such as data from the Programme for International Student Assessment (PISA) and the Survey of Adult Skills (a product of the Programme for the International Assessment of Adult Competencies [PIAAC]); data from social surveys such as the Lloyd's Risk Poll, the Wellcome Global Monitor, the World Values Survey, the European Social Survey, the OECD's Environmental Policy and Individual Behaviour Change (EPIC) Survey, the European Health Literacy

Population Survey, Ipsos Cycling Across the World Survey, the Adult Education Survey; key data on teaching languages at school in Europe; the European Labour Force Survey; the International Disasters Database; as well as data from vacancies posted on line by prospective employers. Data analysis was complemented with systematic reviews of the literature and modelling.

References

- Copernicus Climate Change Service (2023), *July 2023: Global air and ocean temperatures reach new record highs*, <https://climate.copernicus.eu/july-2023-global-air-and-ocean-temperatures-reach-new-record-highs> (accessed on 8 September 2023). [2]
- Council of the European Union (2022), *Council takes action to ensure green transition is fair and inclusive*, <https://www.consilium.europa.eu/en/press/press-releases/2022/06/16/council-takes-action-to-ensure-green-transition-is-fair-and-inclusive/> (accessed on 11 October 2023). [24]
- Daniel, B., S. Wassell and I. Campbell (2002), *Adolescence: Assessing and Promoting Resilience in Vulnerable Children: The School Years*, Jessica Kingsley Publishers, Philadelphia, PA. [11]
- Global Commission on Adaptation (2019), *Adapt Now: A Global Call or Leadership on Climate Resilience*, <https://openknowledge.worldbank.org/handle/10986/32362> (accessed on 7 June 2022). [17]
- Howard, S., J. Dryden and B. Johnson (1999), "Childhood resilience: Review and critique of literature", *Oxford Review of Education*, Vol. 25/3, pp. 307-23, <https://www.jstor.org/stable/1050923>. [12]
- IEA/OECD (2022), "Climate-related hazards: Extreme temperature", *Environment Statistics (database)*, Environment Statistics (database), <https://oe.cd/dx/4TF>. [3]
- Lassébie, J. and G. Quintini (2022), "What skills and abilities can automation technologies replicate and what does it mean for workers?: New evidence", *OECD Social, Employment and Migration Working Papers*, No. 282, OECD Publishing, Paris, <https://doi.org/10.1787/646aad77-en>. [8]
- Luten, S., E. Ryan and J. Wakefield (2021), *Born into the Climate Crisis*, Save the Children International, <https://resourcecentre.savethechildren.net/pdf/born-into-the-climate-crisis.pdf> (accessed on 22 July 2022). [16]
- Luthar, S. (2003), *Resilience and Vulnerability: Adaptation in the Context of Childhood Adversities*, Cambridge University Press, <https://doi.org/10.1017/CBO9780511615788>. [13]
- Masten, A. and J. Powell (2003), "A resilience framework for research, policy, and practice", in *Resilience and Vulnerability: Adaptation in the Context of Childhood Adversities*, Cambridge University Press, <https://doi.org/10.1017/CBO9780511615788.003>. [14]
- Ministry of Children and Education (n.d.), *Vocational education and training in Denmark*, <https://eng.uvm.dk/upper-secondary-education/vocational-education-and-training-in-denmark> (accessed on 5 September 2023). [23]

- NASA (2023), *NASA Clocks July 2023 as Hottest Month on Record Ever Since 1880*, [1]
<https://www.nasa.gov/press-release/nasa-clocks-july-2023-as-hottest-month-on-record-ever-since-1880> (accessed on 11 September 2023).
- OECD (2023), *Building Future-Ready Vocational Education and Training Systems*, OECD [22]
 Reviews of Vocational Education and Training, OECD Publishing, Paris,
<https://doi.org/10.1787/28551a79-en>.
- OECD (2023), *Flexible adult learning provision: What it is, why it matters, and how to make it work*, OECD Publishing, Paris, <https://www.oecd.org/els/emp/skills-and-work/adult-learning/booklet-flexibility-2023.pdf>. [19]
- OECD (2023), *OECD Employment Outlook 2023: Artificial Intelligence and the Labour Market*, [4]
 OECD Publishing, Paris, <https://doi.org/10.1787/08785bba-en>.
- OECD (2022), *Climate Tipping Points: Insights for Effective Policy Action*, OECD Publishing, [7]
 Paris, <https://doi.org/10.1787/abc5a69e-en>.
- OECD (2021), *Continuing Education and Training in Germany, Getting Skills Right*, OECD [21]
 Publishing, Paris, <https://doi.org/10.1787/1f552468-en>.
- OECD (2021), *OECD Skills Outlook 2021: Learning for Life*, OECD Publishing, Paris, [9]
<https://doi.org/10.1787/0ae365b4-en>.
- OECD (2019), *Individual Learning Accounts: Panacea or Pandora's Box?*, OECD Publishing, [20]
 Paris, <https://doi.org/10.1787/203b21a8-en>.
- OECD (2019), *OECD Future of Education 2030: Making Physical Education Dynamic and [25]
 Inclusive for 2030*, OECD Publishing, Paris, <https://www.oecd.org/education/2030-project/contact/oecd-future-of-education-2030-making-physical-dynamic-and-inclusive-for-2030.pdf>.
- Reuters (2023), *ChatGPT sets record for fastest-growing user base - analyst note*, [5]
<https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023-02-01/> (accessed on 12 July 2023).
- Rutter, M. (2006), "Implications of Resilience Concepts for Scientific Understanding", *Annals of [15]
 the New York Academy of Sciences*, Vol. 1094/1, pp. 1-12,
<https://doi.org/10.1196/annals.1376.002>.
- Treloar, L. (1975), *The Physics of Rubber Elasticity*, Oxford University Press, Oxford. [10]
- van Dis, E. et al. (2023), "ChatGPT: Five priorities for research", *Nature*, Vol. 614/7947, pp. 224- [6]
 226, <https://doi.org/10.1038/d41586-023-00288-7>.
- World Bank (2021), "Individuals using the Internet (% of population)", *International [18]
 Telecommunication Union (ITU) World Telecommunication/ICT Indicators Database*,
<https://data.worldbank.org/indicator/it.net.user.zs?end=2017&start=1986&view=chart>.



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