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Migration and skills for the low-carbon transition

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Key messages

- The shift to low-carbon and climate-resilient economies must urgently accelerate. It necessitates the emergence of new sectors and technologies, which in turn requires the adaptation of existing sectors and industries, as well as new occupations, skills and expertise.
- Migration of workers both within and between countries can offer a way to adaptively manage the labour market needs of the transition – alongside appropriate skills development for those in situ, including workers in displaced, high-emissions industries.
- To allow this, there is a need for those working on the low-carbon transition, migration and skills development and labour markets to collaboratively address three practical and political challenges: anticipating needs, (re)skilling and facilitating mobility.



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About this paper

This paper has been produced as part of the Migration for Development project of ODI's Human Mobility Initiative. It aims to set out some of the key challenges around the labour and skills needs of the low-carbon transition, and explores opportunities where migrant workers can help meet gaps and support societies in their low-carbon transition. It aims to stimulate further debate by raising key issues, laying the groundwork for a series of conversations between key stakeholders in this area.

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Acronyms

EU ETS	European Union Emission Trading Scheme
GDP	Gross Domestic Product
GHG	greenhouse gas
ILO	International Labour Organization
IOM	International Organization for Migration
LMI	Labour Market Information
MENTOR	Mediterranean Network for Training Orientation to Regular Migration
NDC	Nationally Determined Contribution
NGO	non-governmental organisation
ODA	official development assistance
OECD	Organisation for Economic Cooperation and Development
PLS	Pacific Labour Scheme
STEM	science, technology, engineering and mathematics
SWP	Seasonal Worker Programme
VET	vocational education and training

Executive summary

Countries must speed up their decarbonisation efforts to avoid dangerous levels of climate change. This entails a rapid and deep transformation across all sectors of the economy, with an emphasis on those with the highest levels of greenhouse gas emissions. Covid-19 has made this more urgent still, and created a fork between two possible recovery pathways: one which is low-carbon, and one which locks in catastrophic climate change.

The low-carbon transition will require adapting and changing existing sectors and industries, creating new occupations requiring new skills, even as others become obsolete. Estimates of the effect on aggregate employment vary, but while earlier projections suggested negligible or negative impacts, more recent global analyses suggest a net employment gain of between 18 and 37 million people globally by 2030. It is important to recognise that this is only about 1% of the global labour force in 2019; that the task content of jobs may change more than entire jobs or occupations; and that the low-carbon transition will play out alongside other major disruptions to labour markets associated with automation and other technological developments. Nonetheless, the low-carbon transition does imply significant changes in the type of skills needed and the jobs available in specific locations.

Some of this will be met by skilling young people entering the workforce, and reskilling existing workers, especially those exiting declining sectors and industries. Some of these changes will require workers to stay in their habitual working locations, while others will need to move to adapt to the changing circumstances and requirements of emerging occupations. In some sectors there will be skills gaps that the existing workforce cannot fill, because of demographic trends or competing demands within the economy. In some countries, education and training systems may not be in place or sufficiently accessible to meet the rapidly changing needs of the low-carbon

transition. For all these reasons, labour mobility within and between countries will have a part to play in enabling and facilitating the low-carbon transition. Our contention is that policies for the low-carbon transition must, as part of the labour market solution, consider migration in all its forms – i.e. migration both domestically and internationally, short- and long-term, of people with different skill levels, and in all directions between and within countries at all levels of development.

Above all, the paper aims to provide an alternative narrative against two prevailing tendencies. First, the inclination to perceive the relationship between climate change and migration as largely negative: how climate change drives migration and displacement, creating a burden for migrant-receiving countries and areas. In contrast, this paper makes the case that migration can contribute to efforts to mitigate climate change. Second, the historical tendency for migration to provide an ad hoc solution to labour and skills needs in previous economic transitions. Against this, the paper aims to show how the policy and practice communities can proactively put in place the planning and flexibility to enable migration to support the transition to economies that avoid climate breakdown.

To ensure this, three policy and practice communities will need to work much more collaboratively: those working on the low-carbon transition across different sectors; those working on migration reform; and those working on skills development and labour markets.

A combination of anticipatory actions and adaptive systems is needed, above all recognising, and managing, the political economy and distributional implications of the low-carbon transition and its relationship with migration, labour and skills. Each policy domain faces acute political challenges: realising a ‘just’ low-carbon transition; creating migration systems

that are ‘fair’ for both origin and destination communities; and allocating the costs of skills development and education equitably, between individual beneficiaries and society at large, to name a few. Where the three domains intersect, the political economy challenges may increase, especially where inequalities are worsening due to technological innovation and environmental, health and economic crises. For example, there has been some progress in using carbon pricing revenues to fund retraining and other support for workers in declining industries such as coal. Ensuring that such active labour market policies and services can also benefit migrant workers – before or after they relocate – would be more complicated politically. However, opportunities for positive change may also open up. For example, countries at the frontier of developing skills for the low-carbon transition will create new global employment opportunities for their own citizens, even as they attract workers from elsewhere and build trade links in the long term. The Covid-19 crisis has also reminded us how attitudes to migrant workers in key sectors can shift positively and dramatically.

The paper identifies three distinct but interrelated challenges and opportunities to harness labour migration in support of the low-carbon transition. In each case, it points to the types of policy responses that might be needed, learning from other economic transitions and disruptions wherever possible.

- **Anticipating the labour and skills needs of the low-carbon transition.** The pace of the low-carbon transition, its unpredictability due to innovation and gaps in available data all mean that proactive planning must be balanced with an adaptive approach overall. The information systems and policy instruments available to guide skills development, education and labour markets are imperfect, and migration remains one – relatively crude – way to fill demand-supply mismatches in skills and labour. Nonetheless, there are areas that could be usefully improved through collaboration between the policy and practice communities working on climate, migration and labour/skills. Examples include upgrading information systems and mixed-methods analysis and projections for labour markets, to better reflect the opportunities and needs of the low-carbon transition, at different scales from local to global; clear but flexible transformation objectives and strategies in key sectors (e.g. energy, transport and construction) based on climate science, that set out skills needs and how these can be met; and institutional arrangements to facilitate dialogue between workers, unions, employers, governments and migrant organisations on skills needs and solutions.
- **(Re)skilling workers for the low-carbon transition.** Both education and skills development systems have an inertia that is, again, ill-suited to the rapidity and unpredictability of the low-carbon transition. Gaps between education and training systems and industry persist. Skills development and education for the low-carbon transition must disaggregate for and target different skill levels and age groups – from young people learning advanced technology skills in frontier industries to experienced manual workers in declining industries – as well as for those currently in informal employment. When considering these problems through the lens of migration, it is tempting to focus only on issues such as access to training for migrant workers. However, ‘just’ treatment of those in situ (i.e. ‘nationals’ or ‘local communities’) is also critical, for the political viability, both of the low-carbon transition, and of using migration to support that transition. Similarly, student mobility programmes and exchanges can help address the limitations of national education systems. In this light, policies for managing the decline of existing industries (e.g. early retirement for older workers and the development of long-term alternatives for youth and mid-career workers) are as important as efforts to enhance the skills-base for new industries (e.g. through collaborations between businesses, governments and educational institutions). To enable migration to contribute here, it is important to strengthen regional collaborations between countries, as well as bilateral partnerships on education and skills development. Other instruments, such as ‘green economic zones’, could potentially

be used by individual countries to encourage people to move, at least within national borders, to meet labour demands.

- **Facilitating labour mobility for the low-carbon transition.** For migration to support the low-carbon transition, people need to be able to successfully and legally move location. If the first two challenges are about enhancing information and skills, the third is firmly about facilitating people's movement directly – between different geographies and over a range of time periods. There is still an information component here – for example portable certification and appropriate advertising of vacancies (with clear guidance on migration routes) to tackle information asymmetries between employers and jobseekers. Next, facilitation: chambers of commerce and industry groups in low-carbon sectors can connect candidates with employers and provide guidance, including to people able to move to fill vacancies, while for international migrants, diaspora organisations may also contribute if they are connected with businesses in low-carbon sectors. Specific consideration must be given to the costs of moving – both by employers (e.g. relocation grants) and by governments (e.g. low-cost housing). More difficult, but crucial, is migration reform to facilitate the movement of workers – but there are examples of specific schemes that have been developed in response

to other economic disruptions and transitions, involving other emergent industries. Beyond the barriers to initial movement, arrangements must be in place to ensure mutual benefits for migrants, host communities and locations of origin, in the longer term. These include protection for migrant workers, for example regulation of working conditions and support for integration, as well as – for international migrants – making benefits such as pensions portable and reducing the costs and risks of remittance systems. But they also include 'soft' measures that make clear the economic and social contribution of migrant workers to both destination countries and countries of origin, so as to improve political acceptability.

This paper is a first attempt to map these three challenges and to connect three hitherto separate policy and practice communities in tackling them. It makes no claim to comprehensiveness. In most areas, there is a need for further research. Each community has different types and levels of responsibility for the tasks listed above. Some may be best tackled at a higher level and are not necessarily specific to the low-carbon transition. Yet even here there is a case for building awareness so that the three communities recognise the role of migration in upholding or undermining the emerging and urgent political bargain between climate and labour – namely, the 'just transition' or 'green new deal'.

1 Introduction

Climate change and migration are high on the global political agenda, and there is much debate about how climate change and related socio-economic factors may increase or otherwise change migration (Wilkinson et al., 2016). However, less attention has been paid to the new opportunities that migration can bring to countries that are transitioning towards a low-carbon, digitalised and more connected future. In response to this gap, this paper aims to start a conversation between three, often siloed, policy communities:

- **The climate policy and practice community**, especially stakeholders supporting the systems change required for deep decarbonisation in all sectors of the economy, including governments, companies and individuals.
- **The migration policy and practice community**, made up of stakeholders including governments, non-governmental organisations (NGOs), diaspora organisations and individuals interested in developing policies, programmes and narratives for enabling and encouraging open, flexible and productive migration.
- **The skills and labour policy and practice community**, consisting of players relevant to ‘active labour market policy’, which aims to match human capital and skills with appropriate work. These stakeholders can include governments, educational institutions, industrial organisations and individual businesses.

The conversation to have is about how migration can benefit countries and societies by helping to fill the skills shortages that are arising in the low-carbon transition.¹ To support that conversation, this working paper identifies specific challenges and tasks that need to be tackled, and the opportunities afforded by more coherent and flexible approaches across the three communities’ policy domains.

Coherence is important because, in most previous major economic transitions and transformations, labour migration has been an afterthought, requiring solutions to be cobbled together as challenges have arisen, with the migrant often seen as the problem or the victim, and rarely the agent. This reactive approach leads to inflexible rules to regulate migration, and to the formulation of migration policy in isolation from other major economic and social disruptions. Flexibility matters, meanwhile, because of the rapid development of new technologies and low-carbon solutions – from renewable energy to food and farming – as well as the fast-evolving policy landscape and social norms around climate change. This means that we must remain open to the emergence of new types of skills and occupations, and the disappearance of old ones.

As the paper makes clear, the low-carbon transition is only one major disruptor to labour markets, economies and societies. It stands alongside and interacts with others, including

1 Sources campaigning for reduced immigration from low- to high-income countries have also argued that this kind of migration implies a significant increase in individuals’ carbon footprints, due to an increase in material consumption and other factors (e.g. Migration Watch, 2010). However, this is problematic, especially when considering the role of migrants in the low-carbon transition. From an environmental and social justice perspective, rich countries are generally responsible for a greater share of historic and current emissions, while poorer countries are generally more vulnerable to climate change impacts. For citizens of poor countries, working on decarbonisation in rich countries is therefore likely to have quicker and greater impact on mitigating climate change and avoiding the worst impact on their country of origin. From an empirical perspective, it is also impossible to meaningfully compare the individual carbon footprints of migrants working on decarbonisation, with their contribution to overall emissions reduction.

automation, artificial intelligence and, most recently, the Covid-19 pandemic (see Box 1). The impact of the low-carbon transition in terms of aggregate job creation may not be vast – potentially adding about 1% to formal global employment, pre-Covid-19 (Botta, 2019). It is also important to recognise that it, as well as other disruptors, may often change the specific tasks involved in jobs and occupations, rather than destroying or creating jobs and occupations in their entirety (Autor, 2015; Gelb and Khan, 2016). However, the impact of the low-carbon transition on labour markets in specific locations and communities is, and will continue to be, profound (Botta, 2019). Migration can play a role in supporting the transition – alongside appropriate skills development and transition management for in situ communities, as demonstrated in Figure 1. Indeed, good practice and lessons learnt show that, when included at the early stages of wider policy and planning objectives, and when managed well, migration has a key role in improving labour market functioning and transforming societies and economies for the better (Popova and Panzica, 2017).

To realise that potential will require all three policy and practice communities to ‘speak each other’s language’ (Box 2). But more than that, it will require all three to navigate the contentious politics involved in their own and each other’s domains. Even before introducing migration to the low-carbon transition conversation, there is a fragile political bargain on the table

between labour and climate: the ‘just transition’. This – and country-specific articulations often referred to as the ‘Green New Deal’ – have the potential to bring workers, and by extension voters, on side with the required rapid and deep decarbonisation of our economies. Making this work in practice requires careful transition management, especially for communities in declining, high-emission sectors and industries (NCE, 2018). Introduced in the wrong way, migration could undermine the just transition agenda, making displaced workers resentful of opportunities being offered to ‘outsiders’.

The political economy questions become even more pressing and difficult in a three-way conversation between migration, climate and skills/labour. How should costs for skills development for the low-carbon transition be distributed between individuals, communities and countries, if we consider not only the winners and losers in one geographic location, but also migrants moving between those locations? How are migrant workers involved in the low-carbon transition going to be perceived by governments seeking to gain international competitive advantage through clean technologies and green industrial policy? Does migration from poorer countries to support decarbonisation in richer ones result in ‘brain-drain’?

This paper does not aim to fully resolve all these questions. This is partly because they can often only be tackled at the level of specific jurisdictions, facing specific challenges in terms of low-carbon transition, migration and labour/skills policy.

Figure 1 Addressing skills shortages in the low-carbon transition



Box 1 Covid-19: implications for labour markets, climate change and migration politics

While this paper focuses on long-term sectoral shifts and labour market trends, it is impossible to ignore the immediate impact of the Covid-19 pandemic, and the potential of the global reaction to it to dramatically reshape climate, labour and migration politics.

Covid-19's economic impact has presented policymakers with a fork in the road: using economic recovery packages to accelerate the transition away from fossil fuels, or locking their economies into high-carbon pathways and climate breakdown. Global lockdowns have resulted in an abrupt fall in demand and severe financial challenges for the fossil fuel sector, exacerbating existing difficulties facing the sector in recent years. At its lowest point during the pandemic, the price of crude oil was 75% below 2019's annual low, and some experts have predicted that the coal industry, which has seen plant closures and divestments due to reduced electricity demand, will never recover.

The pandemic has prompted shifts in policies and attitudes towards work. Programmes such as universal basic income, four-day working weeks and increased remote working have pushed governments to make choices around the nature of work, the distribution of the workforce and migrant labour. There are calls for major investments in infrastructure and public works as a means of creating jobs, with varying attention to environmental issues and the role of migrant workers.

The pandemic has also contributed to a rapid and profound shift in public attitudes towards migrant workers. Many migrants have provided services in the health, social care and food manufacturing sectors. In the UK, 33% of doctors, 18% of adult social carers and 40% of the food manufacturing workforce are foreign-born. Similarly, in the US, 30% of doctors, 27% of agricultural workers and 22% of the food manufacturing workforce were born outside the country.

Covid-19 has also led to a redefinition of the role and perceptions of the state, with direct implications for immigration policy. The pandemic has halted the movement of people and, in many cases, endangered the livelihoods of citizens, including migrants. It has also highlighted and exacerbated the inequalities faced by migrants due to gaps in migration governance, and emphasised the importance of creating pathways for accessing basic rights, especially healthcare, for labour migrants. It has also emphasised the crucial role played by many migrant essential workers in the Covid-19 response, and now in economic recovery from the pandemic. In April 2020, Portugal temporarily regularised all migrants and asylum-seekers, in part because ignoring the healthcare needs of irregular migrants undermined public health. Italy has also taken steps to temporarily regularise agricultural and care workers. Bahrain has mandated higher standards of accommodation for migrant workers, and Canada has ensured immediate access to the federal healthcare system for new migrants.

While the pandemic has created space for a policy 'reset', there is concern that opportunities for and attitudes towards migration will be affected in the long term. For example, cities from the Global South have predicted a concerning scenario in which more 'developed' countries close borders to less developed ones, impacting emigration and tourism. Another potential impact is forced migration arising from the second-order consequences of Covid-19, such as food price spikes. If financial stimulus packages are insufficient to prevent widespread unemployment and deteriorating living standards, attitudes to migration may harden. Already, there are examples of countries using Covid-19 to justify regressive steps, including South Africa excluding undocumented migrants and refugees from financial and food aid and deportations of migrant workers by Gulf states.

While climate and migration are high on the global political agenda, they are often valued below economic stability, conventional security and emergent crises such as Covid-19. If the climate movement wants to take advantage of the opportunity provided by the pandemic to accelerate carbon transition, they will have to condense a decade's worth of action into the next 18 months: the time in which policies will likely set the direction for Covid-19 recovery and beyond. The migration movement will meanwhile need to act fast to demonstrate the crucial positive role that migration can play in a green and resilient recovery. And the labour and skills policy community needs to urgently put the nuts and bolts in place to integrate migration into the low-carbon transition.

Sources: Franklin and Brancati (2015); Lafortune et al. (2016); Morris (2016); Vogt Isaksen (2019); Foresti (2020); Macrotrends (2020); ODI (2020); Ramiro (2020); Reidy (2020)

Box 2 Finding the right language to talk about migration, skills and the low-carbon transition

When attempting to bring three policy and practice communities together in conversation, it is essential to ensure that potential differences of language and definition are resolved up-front.

For example, this paper intentionally uses the more conventional term ‘migration’ rather than the increasingly popular ‘human mobility’ to represent all forms of migratory movement, including urbanisation and internal and international migration. Despite the nuance added by the term ‘human mobility’, which suggests migration outside of the stereotypical South-to-North international movement, ‘migration’ is preferred primarily to reduce misunderstanding among climate specialists, who may equate ‘mobility’ with low-carbon transport (e.g. electric vehicles and public transport).

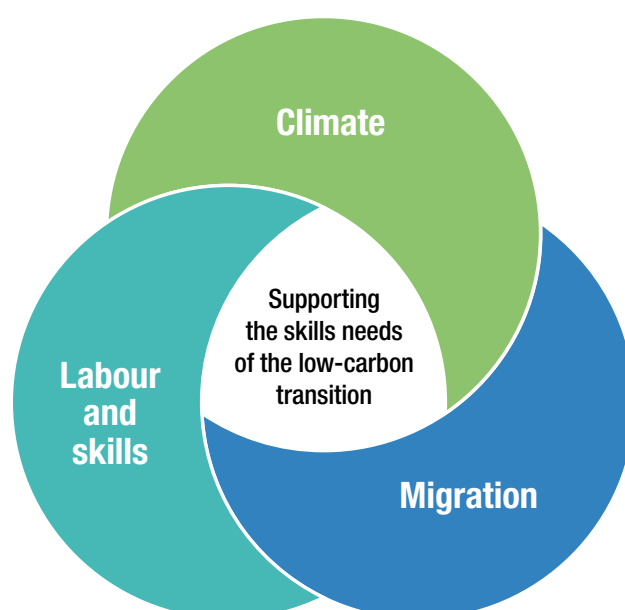
The paper is, in contrast, deliberately high-level. We aim to promote an open and flexible view of migration which recognises its role across different geographies – within national boundaries, across borders within a region, and further afield. We also take note of the fact that people may move with different skill levels, and for different periods of time, be it seasonal migration (for months at a time), over a period of a few years (e.g. to work on specific projects or to help build new sectors and gain experience while doing so), or for longer (with the aim of settling and fully integrating into their host society). It is only through accepting the multitude of pathways, timelines and circumstances that we can leverage the potential of migration to achieve societal goals. Nonetheless, we highlight political economy considerations here and throughout as key issues for further research and dialogue as the conversation evolves.

To help structure the conversation, the rest of this paper considers three interlinked but distinct challenges, illustrated in Figure 2.

- **Anticipating the skills needs of the low-carbon transition** – the implications of the decarbonisation agenda for key sectors and jobs, and how to incorporate migration into the effort to monitor and forecast resultant labour market changes.

- **(Re)skilling workers for the low-carbon transition** – how to address skills development for existing migrant workers and those who have yet to travel, but also (as a crucial part of the political bargain, already highlighted) how to balance this with skills development and compensation for in situ communities facing unemployment.
- **Facilitating labour mobility for the low-carbon transition** – both the immediate task of making it easier for people to move, and longer-term questions of integration and protection for migrant workers.

Figure 2 Policy and practice communities collaborating on the low-carbon transition



Each of these challenges is addressed in a separate chapter (chapters 2–4), making use of examples, including from countries where migration has played a role in supporting significant economic transition and disruption. These range from the role of Indian migrants in the Silicon Valley tech boom to Pacific Islander

circular migration to Australia, to Lebanese diaspora contributions to the economy of Côte d’Ivoire.² Chapter 5 concludes by drawing together overarching messages from the analysis and examples, together with initial priorities for each of the three communities to work on, and key areas for further research.

2 It is important to note that many of the case studies mentioned in this paper relate to South-North (S–N) international migration. Further research is needed into the effects of internal, regional and N–S/S–S/N–N migration on economic transition and disruption.

2 Anticipating skills needs

The creation of new employment opportunities from green technologies, products and services, and the resolution of resource bottlenecks, including human capital development (e.g. skills and training), are essential elements of achieving the low-carbon transition (OECD, 2015). It is doubtful whether market mechanisms on their own will be able to meet the pace of change needed and deliver the necessary skilled workers in a timely manner (Jagger et al., 2013). The shift from jobs in high-carbon industries to jobs in low-carbon ones must accelerate to keep the world to 2 °C of warming. Even if the current climate commitments – countries' Nationally Determined Contributions (NDCs) – are implemented, greenhouse gas (GHG) emissions would result in over 3 °C of global warming (UNEP, 2019). Business as usual in the fossil fuel industry would produce about 50% more fossil fuels by 2030 than would be consistent with a globally agreed 2 °C pathway, and 120% more than would be consistent with the aspirational 1.5 °C pathway (SEI et al., 2019).

Active labour market policies – which aim to improve the chances of unemployed people finding jobs ‘by developing [their] skill-set and by facilitating the matching between skills and job vacancies’ – have had a part to play in previous successful industrial restructuring (Botta, 2019: 31). A first step towards such policies, however, is to ensure a sound basis of information and analysis on how the low-carbon transition will affect labour markets. We also make the case that such information and analysis, if undertaken or connected across the right spatial scales, can highlight how migration might fill identified gaps. However, there are numerous issues to navigate, which we consider with respect to both forecasting exercises and monitoring for ongoing, adaptive management.

2.1 Projecting impacts of the low-carbon transition on labour markets

The shift to low-carbon economies entails the creation of new sectors, technologies and occupations, requiring new skills and expertise. Much of this results from the move to more sustainable models of energy generation and distribution across sectors (Box 3). There is, however, potential for job losses as well as gains, particularly in oil and gas extraction and coal-powered electricity generation.

Efforts to quantify these impacts through modelling and projections are still limited in number. Two 2018 assessments find that there are on balance more jobs to be created in low-carbon sectors than will be lost in the transition. According to the International Labour Organization (ILO), while the transition to an energy system compatible with 2 °C of global warming will lead to job losses of around 6 million by 2030, it will also mean the creation of some 24 million jobs – a net increase of approximately 18 million jobs across the world (see Figure 3; ILO, 2018).

The New Climate Economy initiative, meanwhile, has projected that its proposed package of climate policies would create 65 million new low-carbon jobs by 2030, against losses of 28 million, a net gain of 37 million jobs (NCE, 2018). Set against the total global labour force of 3.46 billion people in 2019, this is a small percentage (0.5–1%).³ However, a crucial consideration is that job gains and losses will not occur in the same place. As a result, ‘the limited effect on aggregate employment should not hide that far-reaching mitigation policies can profoundly affect the lives of specific communities’ (Botta, 2019: 6). The spatial

3 World Bank data, derived using data from the ILO ILOSTAT database (<https://data.worldbank.org/indicator/SL.TLF.TOTL.IN>). Data retrieved 1 March 2020.

Box 3 Jobs and skills for the low-carbon transition

Energy consumption accounts for 73% of GHG emissions globally. This includes generation of heat and electricity (30% of the total), transportation (15%) and manufacturing and construction (12%). Other major sources of GHG emissions are agriculture (e.g. livestock and crop cultivation: 12%); land use, land use change and forestry (e.g. deforestation: 6.5%); industrial processes (e.g. for chemicals and cement: 5.6%); and waste (e.g. landfills and wastewater: 3.2%).

The low-carbon transition therefore requires a transformation in energy generation and distribution, and in how we produce and consume food and other commodities and products; how we make use of land, water and other natural resources; how we travel and conduct day-to-day business; and how we build and run our infrastructure, including transport systems and buildings. The priorities for decarbonisation across and within sectors vary by country, and under the Paris Agreement countries are encouraged to set these out, and progressively increase ambition, via their NDCs.

A crucial distinction is between many low- and some middle-income countries, which have an opportunity to leapfrog to low-carbon options thanks to significant infrastructure deficits, and other countries – mainly high-income ones – where there is greater need for replacement or upgrading of existing infrastructure. In addition to differences in the physical capital stock, there are significant differences in human capital, all of which mean that the pace, process and cost of the low-carbon transition will look very different in different countries – much as it does for wider questions of economic transformation.

This of course also means that the skill requirements will vary significantly between countries, and must be analysed at country level or below. The full list of professions involved in the decarbonisation of key sectors is extensive. It includes engineers and technicians working on inventing, designing, manufacturing, installing and maintaining clean energy sources (such as solar, onshore and offshore wind and tidal power). It also includes jobs in construction – or retrofitting – low-carbon buildings to reduce emissions, for example through better insulation and heating and electricity efficiency measures – as well as in manufacturing the required materials and machinery. In the transport sector, decarbonisation has entailed creating jobs in the design and manufacture of electric vehicles, batteries and charging infrastructure; in electrifying railways; and in ride-sharing and smart trip planning technologies, to give a few examples. In all of the areas outlined above, new occupations have been created throughout value chains and lifecycles, from financing, innovation and manufacturing to logistics and implementation, maintenance and monitoring, coordination, evaluation and improvement.

The additional skills required for these jobs are highly variable, depending on candidates' background and career destination. As such, there is no generic list of low-carbon or green skills and, as noted, the situation is likely to evolve. That said, various regional and country studies have attempted to map skill requirements both in general and in terms of upskilling displaced workers specifically (several studies point to a high degree of transferability of skills between jobs in polluting industries and those in the low-carbon sector). Examples might include an industrial electrician being able to integrate energy systems and enhance their project management skills, in order to become a renewable energy manager; or a commodity broker acquiring technical skills to understand carbon markets and trading tools, in order to become a carbon trader. In common with wider trends in employment and education, 'soft skills' (for example language, intercultural or personal) are recognised as important in the low-carbon transition literature, but appear to have been less well researched.

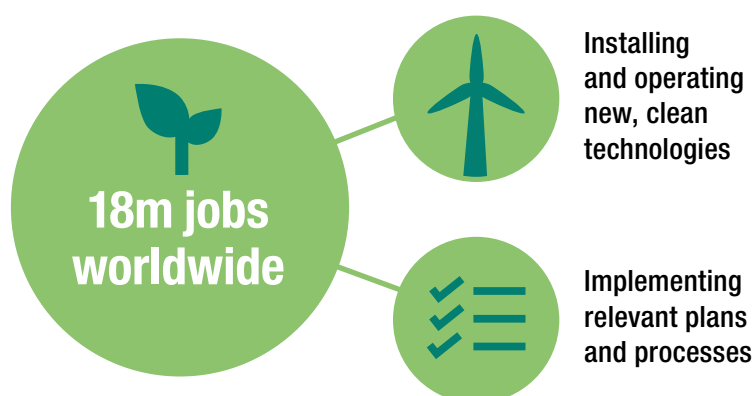
Sources: OECD (2014); NCE (2018); Botta (2019); Ge and Friedrich (2020)

Figure 3 The low-carbon transition creates job opportunities

For every job lost, around four jobs will be created



Resulting in a net gain of...



Note: Figures are estimates.

Sources: OECD, 2014; ILO, 2018

divergence also underscores that migration – including internal migration – may have a role in filling the new occupation vacancies.

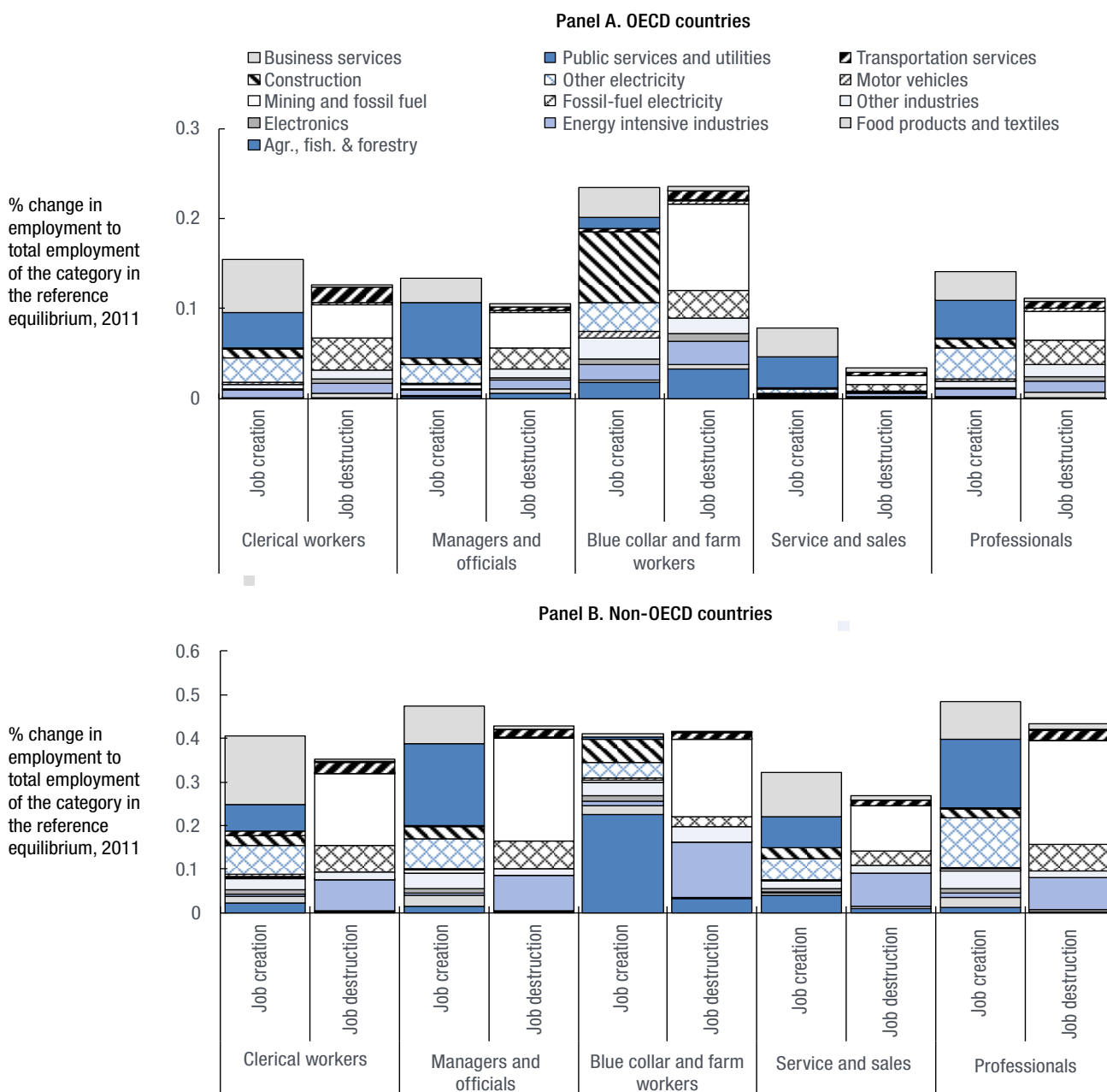
Figure 4 shows the results of one global modelling study on the impact of the low-carbon transition on labour markets, disaggregated for job family and sector. Both in countries belonging to the Organisation for Economic Cooperation and Development (OECD) and non-OECD countries, jobs created and destroyed among blue-collar workers by a carbon tax of \$50/tCO₂, implemented globally, would be roughly equal. However, the sectors in which new opportunities arise are quite different: a large share of jobs are created in construction (OECD) and agriculture (non-OECD), while many of those lost are in mining and fossil fuels. Workers may not be able to move easily between sectors without reskilling. Job categories and implied skill levels of jobs gained and lost are also an important consideration. This matters for the ‘just transition’, since low-skilled workers will generally be more affected by decarbonisation (Chateau et al., 2018). But it also matters for migration’s role within the just transition, given the political attention given to delineating between ‘high-skilled’ and other categories of migrant workers, at least in many rich countries’ migration policies and debates.

A region-by-region perspective on the same modelled projections suggests that, at the level of broad geographic units, the total reallocation of jobs is limited – less than 2% of total employment in most regions. However, the modelling also suggests that it could be higher in regions and countries where economic activity is dominated by fossil fuel-dependent sectors, for example in the Middle East and North Africa, or those classed as Transition Economies.⁴ It is, moreover, the interaction of geographic (at the country level and below), sectoral and job category shifts which is most relevant to determining where and which skills gaps will arise.

Projecting the impact of any major economic transition on labour markets, to this level of specificity, is difficult – especially when that transition is itself subject to significant policy uncertainty. Specifically, the projected impacts reported above are highly sensitive to various assumptions, for example mitigation scenarios and labour market characteristics (ibid.). The raw information on which projections and models are based is also often imperfect. New definitions and boundaries between ‘green’ sectors do not correspond well with conventional distinctions, and require new sector classifications (exacerbated by the fact that green

⁴ See Chateau et al. (2018: section 3.2) for a full explanation of these results.

Figure 4 Change in sectoral composition of job creation and job destruction by job category and by aggregate sectors for a carbon tax of \$50/tCO₂ globally



Source: Chateau (2018); OECD ENV-Linkages Model, central scenario, carbon tax of \$50/tCO₂

sector jobs are often ‘moving targets’, adapting constantly as technologies develop) (ILO, 2011). It is also difficult to predict when and where the task composition of jobs will change, as opposed to occupations changing in their entirety – a distinction which has helped temper some of the more extreme projections of the impact of automation on labour markets (Gelb and Khan, 2016). A final limitation is that estimates have to date tended to be quite high-level (Botta, 2019). There is less understanding of the implications

for job quality and the identity and self-worth dimensions of jobs (important considerations in ‘just transition’ debates), or of the differential impacts on specific groups, such as women, older workers and, indeed, migrants.

These challenges around labour market projections are difficult to resolve and often go beyond a single issue, such as the low-carbon transition. However, joint effort, thinking and resources from other policy and practice communities – including migration – may help.

For example, the ILO (2011) identifies questions to be explored through quantitative and qualitative skills analysis. How many direct/indirect jobs will be needed now and in the future (to which we might add: how will tasks, as opposed to jobs/occupations, change)? What occupations are required, and how should they be defined? How many people are needed in each occupation? What is the resulting demand for skills and competencies? What existing stock of people with the right skills and training is available to be recruited? What types of training and education are needed, and how can this be provided?

Such question frameworks provide a starting point for context-specific analyses which, crucially, can be conducted at an appropriate spatial scale to ask a further question: where and how can migration help bridge supply-demand gaps in labour markets for the low-carbon transition? The ILO, for example, conducted research and analysis of skills needs across the European Union (EU), Moldova and Ukraine, to help the latter two countries address issues affecting their labour markets, as well as labour migration. While undertaken in 2013, and not focused on the low-carbon transition, this nonetheless identified gaps in skills and expertise relating to the green economy (Popa et al., 2013).

2.2 Monitoring labour markets for adaptive management

Related to the difficulty of projecting shifts in labour markets is the problem of monitoring current changes. In order to manage the low-carbon transition adaptively, labour market policymakers will need continuous information, analysis and guidance, for example to inform decisions on budget allocations to (re)training measures and on the regulation of migration. Wider challenges to labour market statistical systems include a lack of surveys providing timely and disaggregated data, especially in developing and emerging economies (ILO, 2011). Migration can be incorporated within information systems and analyses, but there are challenges in coordinating across scales – for example, considering in-country migration, individual sub-national analyses can rarely be

aggregated to the national level due to regional inconsistencies (Řihová, 2016).

There is therefore a need to strengthen national statistical systems, drawing on frameworks that capture the structure of labour supply and demand as it interacts with the changing structure of the economy. However, while the structural deficits in monitoring labour markets in many countries will be brought into relief by the low-carbon transition, they are not new – and are a concern given other ‘disruptors’ such as automation. Again, there is a case for policy and practice communities including climate and migration to coordinate with others to lobby for and support efforts to improve labour market information systems, and encourage their use within an institutional framework that is inclusive, coordinated and collaborative (ILO, 2011), involving governments, employers’ and workers’ organisations, educational institutions and other relevant stakeholders. Local authorities and businesses can also play an important role in providing and using low-carbon transition labour market information, and in taking action on this basis to strengthen the supply side through education, training and, potentially, lobbying for clearer migration routes (Box 4).

Regarding institutional frameworks, many countries with advanced Labour Market Information (LMI) systems have invested in upgrading them to meet the demands of transitioning to a low-carbon economy. They are investing, not only in labour market monitoring and data collection and research into the evolution of occupations, but also in job matching and information provision for careers in the low-carbon economy (ILO, 2011). For example, France’s National Observatory for Jobs and Occupations of the Green Economy (Observatoire national des emplois et métiers de l’économie verte, or Onemev) has, since 2010, provided a neutral forum for analysis and dialogue, bringing together government ministries, research organisations and agencies responsible for environmental and labour issues. Onemev monitors employment in two ways: based on activities, to highlight ‘eco-activities’; and based on jobs and occupations, allowing it to estimate the number of jobs in ‘green’

and ‘greening’ professions (Cedefop, 2018). There may be scope to incorporate migration more explicitly in such institutional dialogues, as well as to involve workers’ and business representatives to ensure the ‘just transition’ perspective is addressed from all sides. However, even in countries with advanced LMI systems, quantitative analysis may be unable to gauge the

overall labour market impacts of the low-carbon transition, and especially the implications for specific issues such as migration. Qualitative analysis, for example case studies, is also needed to provide more detailed and nuanced guidance for the labour market, and to determine next steps, for example around vocational education and training (VET) (Cedefop, 2013).

Box 4 Jobs and skills needs in Liverpool’s low-carbon transition

In the UK, a Liverpool City Region employer skills survey shows the multitude of areas and sectors where new skills are required. Survey results show that shifts in energy generation, distribution and use have made an important contribution to the Liverpool City Region economy. Liverpool sits on the Irish Sea, which is home to the second-largest concentration of offshore wind turbines in the world. The increased use of electric and hybrid vehicles is creating a demand for scientists, engineers and skilled technicians. Improving energy efficiency in homes and businesses requires skilled workers and increased production of materials and technologies to manage energy consumption. There has been ground-breaking research and development into hydrogen technology, including for powering trains in response to the UK government’s policy to remove all diesel rolling-stock by 2040.

The skills need in new sectors is mounting annually. The survey shows that low-carbon sector employers had a higher level of recruitment activity than the average for the City Region (81% of businesses recruiting over the last year, compared to the survey average of 68%). This was attributable to business growth, while staff turnover for the low-carbon sector was lower than the survey average. The survey also showed that 38% of businesses had vacancies that were hard to fill, compared to the survey average of 27%, with the most frequently cited reason being low numbers of applicants with the required skills (63% of businesses). While there were challenges in filling posts at all occupational levels, businesses had higher-than-average difficulties hiring chief executives and senior officials, skilled tradespeople and process and machine operatives. Further analysis by the City Region looks at the supply side, in terms of education, training and also migration through the pathways created by the UK government’s shortage occupation list, which defines occupations where immigrants are needed to support labour gaps.

Source: Liverpool City Region (2015)

3 (Re)skilling workers to meet the needs of the transition

As the skills needs of the transition are provisionally and progressively identified, the question will be how best to meet them. As outlined above, the pace of decarbonisation required to meet climate goals means that all options to address labour and skill gaps have to be explored. Education, training and skills development, based on anticipated needs, is clearly important – for reskilling existing, in situ workforces, or skilling new, young workforces. In both cases, this should include people who have already migrated, so as to help address existing inequalities faced by migrant communities. Specific consideration should also be given to how to offer skills development in ways that facilitate migration, given that migrant workers – both domestically and internationally – could fill employment gaps, and even support further training and skills development.

When considering skills development for all these groups, it will be important to focus, not only on positions traditionally labelled as ‘high-skill’ (such as engineering or senior technology roles), but also across different levels. As highlighted in chapter 2, the transition to clean economies will require a multitude of skills and levels of expertise, including in construction, manufacturing and installation.

This chapter discusses in more detail the challenges for (re)skilling in situ and migrant workers. When thinking about how migration could contribute to the low-carbon transition by filling skill and labour gaps, in situ communities cannot be ignored. As discussed above, the transformation of high-carbon industries will result in job losses for many. Training and

other support for in situ workers is therefore a prerequisite for a just transition. Where industries are on the decline, and new ones are growing, the political and ethical importance of ‘fairness’ – both perceived and actual – in the treatment of in situ and migrant workers increases. If local workers are already being displaced within the labour market by structural changes and innovations, they need to feel confident that migrants are not being offered privileged access to any substitute opportunities. Migrants, in turn, must be offered attractive jobs and associated pay, good working conditions and an overall positive experience, including in new and fast-growing industries in which labour rights and relations may still be evolving.

3.1 (Re)skilling in situ workers

3.1.1 Skills development: adaptiveness and equity

Questions of migration aside, there is clearly a need for more work on green skills policies. In Europe, many countries’ policies have so far been ‘uncertain and fragmented’ (OECD, 2014; Balch, 2015). The same skills challenges also exist, often to a greater extent, in many middle- and low-income countries (e.g. South Africa – see Pophiwa and Ntombela, 2016). It is not only employers but also workers who feel unprepared for the transition: 48% of power sector workers in the world believe their industry is not doing enough to equip staff with the skills they need to adapt to a decarbonised, digitised energy system (George, 2019; Global Energy Talent Index, 2019).

As with the challenge of anticipating skills needs, many of the difficulties around skilling and training in low-carbon sectors arise from the rapid growth in employment and technological developments, which accelerate skills obsolescence. Therefore, skills in the labour force must constantly be updated or realigned to adjust to changing tasks and technologies, and shifting demand (Cedefop, 2013). It is important to maintain the quality and relevance of training, for example by ensuring that courses contain the right information and have been industry-assessed and approved (*ibid.*). However, this can take time, at odds with the need to build flexible and adaptive systems that can respond to innovation.

A study of skills gaps and training for low-carbon energy industries in the UK recommends the creation of a new, more adaptable framework for master's-level energy education that can effectively meet the growing need for such skills domestically and beyond. It calls for flexibility in the curriculum content and delivery mode across both technical and non-technical disciplines, and greater agility to rapidly develop new courses in evolving engineering specialisations. The authors recognise the many challenges to achieving this, including 'the somewhat sclerotic nature of UK institutions' accredited course approval procedures' (Rowley and Walker, 2020: 16). Rowley and Walker (*ibid.*) point to the 'learning by contract' approaches developed by the UK Engineering Council, in which academic supervisors collaborate with employers and individuals to design work-based pathways to advanced degrees, but recognise that these are unfamiliar to both employers and educational institutions.

The inertia inherent in training and education systems (and, indeed, the separation which often exists between them) is a challenge for all fast-evolving sectors. There are, however, some lessons from other major industrial restructuring which may hold true for the low-carbon transition. For example, diversification of training providers, and integrating job search and counselling alongside training, appear to have been helpful in China's efforts to restructure its heavy industries. The Flanders government in Belgium has used

'green experience' certificates to recognise prior learning, and included green skills in its regional database on job profiles and qualifications. Federations for the chemical and construction sectors have increased collaboration with universities on curricula development. Canada and Scotland have used grants and vouchers to introduce some market competitiveness to training provision, allowing workers to choose the training most relevant to their needs (see Botta (2019) for more detailed case studies). These approaches are not a panacea, however, and all can take considerable time and incur significant costs – Box 5 considers briefly how these costs could be met.

Skills development for the low-carbon transition will also need to consider how to address inequalities in access and opportunity, across a spectrum of potential disadvantages including age, gender and class, as well as migration status. Indeed, those arguing for a greater role for labour migration to facilitate the just transition may need to consider how to build alliances with other disadvantaged communities and groups. The technology sector has some examples of reskilling and upskilling opportunities for disadvantaged groups, although they tend to be funded by grants or philanthropy. For example, NGOs Jijenge and CareerLAB provide subsidised technological training to increase the employability and earning potential of disadvantaged individuals (EdTech Hub, 2020). The Grace Hopper Program, a charity wing of the Fullstack Academy, teaches women software engineering skills with no upfront tuition cost. Tuition is paid in instalments upon securing employment after graduation (Fullstack Academy, 2020).

3.1.2 Beyond skilling: managing phase-out where necessary

Reskilling of the labour force will not always be easy, or even possible, especially for those in the later stages of their careers and whose skillsets (often acquired decades ago) are very different to those compatible with today's technological advances. Compensation, early retirement and managed phase-out schemes are therefore important complements to training and skills development. Germany's

experience with managing the contraction of the coal and steel industries of the Ruhr valley in the 1960s is instructive. The approach was long-term (culminating in a 2007 agreement to phase out subsidies to underground hard coal mining by 2018) and multi-stakeholder, engaging the federal and state governments and firms. Crucially, it incorporated social protection and early retirement for redundant workers, alongside vocational training, as well as the regeneration of industrial sites for tourism (Botta, 2019). Germany also provides an illustration of future policy challenges in balancing the needs of older and younger workers: the government has set a deadline of 2038 to end all coal-fired power generation (Oei et al., 2020). However, this is likely to be far off enough that some new workers will need to be trained within coal-related industries, even if they know their chosen career faces a cliff-edge in a few years.

3.2 (Re)skilling migrant workers

3.2.1 Practical and political considerations

The question of how to improve training and skills development for those who are in a position to move to fill gaps is still more complicated: who should receive training and who should pay, given that costs and benefits would be distributed even more widely, often across borders? In principle there are win-wins: a wealthy country, knowing that it faces skills shortages in an area such as retrofitting for green buildings, could fund training in the required specialisms in low-income countries via official development assistance (ODA). It could simultaneously reform its migration policies to make it easier for trainees to undertake short- or medium-term contracts as migrant workers, and gain top-up training on the job, returning to their country of origin with further skills to support the low-carbon transition there.

Box 5 Who should pay for (re)skilling for the low-carbon transition?

Significant public finance has had to be mobilised in the face of previous economic and industrial restructuring. For example, closures of UK coal mines involved commitments of over £1 billion over the course of three national programmes.

In the case of the low-carbon transition, there is potential to raise revenue from carbon pricing (e.g. through taxes or tradeable permits). Carbon prices provide an incentive for polluters to reduce emissions and do so without government needing to prescribe particular processes and technologies.

Attention is also turning to the role of carbon pricing revenue recycling. The EU's Emissions Trading Scheme (EU ETS) requires that half of the revenues raised from auctions to allocate emissions allowances should be used for climate and energy purposes. Since 2015, the Canadian province of Alberta has used revenues from carbon levies to fund training, as well as top-ups to employment insurance benefits and relocation grants for workers affected by the phase-out of coal-fired power generation (accounting for 55% of total electricity generation and more than 3,000 jobs). There are debates as to how to do this most efficiently from an economic standpoint, for example the extent to which revenues should be strongly earmarked (as opposed to 'soft earmarking', i.e. statements of policy intent).

The potential for carbon revenue recycling to support retraining does not answer all of the many challenges with funding training and skills development, and the other components of active labour market policy. For example, governments will need to consider carefully how far public support for skills should be directed only to workers affected by the low-carbon transition, versus workers in other economically disadvantaged sectors. Governments will also need to calibrate the extent to which benefits captured by firms and workers should be paid by those parties – and find ways to incentivise them to contribute.

Sources: European Commission (2016); Beiser-McGrath and Bernauer (2019); Botta (2019)

Of course, this will be much more complicated in practice. A significant proportion of the global workforce (61%) is engaged in informal employment. This is especially the case in low- and middle-income countries, which account for 82% of total employment, but 93% of the world's informal employment. In sub-Saharan Africa 86% of employment is informal. Being female, young or old increases the likelihood of being in informal employment. Informality is more common in agriculture than in industry or services, and, as seen in chapter 2 (Figure 4), agriculture, including forestry, may be an important source of low-carbon jobs, particularly for low-skilled workers in non-OECD countries. Training and education will therefore need to be made accessible, not only to people who have completed a formal education, but also to those in the informal sector. Training and skills development are, of course, essential for people to transition to the formal economy, which in turn produces benefits including workers' rights, financially sustainable enterprise and public revenue (Bonnet et al., 2019). The opportunities for low-skill migrants to fill gaps in the low-carbon economy in richer countries may, however, be limited if the modelling depicted in Figure 4 is correct, and there is expected to be a large share of lower-skilled workers displaced in these countries who may be looking for jobs without having to upskill.

There are also political economy considerations at all levels – from whether countries will seek to prevent migrants from working in frontier sectors to maintain competitive advantage in advanced technologies to the possibility that training and skills development will encourage people to migrate through irregular routes or on a long-term basis, both of which might then be exploited by anti-migrant forces in destination countries. There is clearly scope for further research to better understand these political economy considerations. On the latter example, research into technical and vocational education and training programmes for young people in the Horn of Africa found that participants were more likely to develop plans to migrate in search of better jobs. However, it was much more likely that those plans involved migrating internally or to a neighbouring country, rather than travelling

further afield (Bakewell and Sturridge, 2019). Clearly, better understanding is needed on how providing education and training – including in skills for low-carbon jobs – changes young people's migration aspirations and behaviours, and what this means for both domestic and international migration.

3.2.2 Entry points to skills development for migrants

Despite the structural challenges described above, there may be initiatives that international (including regional) organisations and governments – both local and national – can take to foster skilling for migrants, either before or after they move.

Student mobility and exchange programmes can strengthen innovation and learning in novel sectors, in both host and origin countries (De Moortel and Crispeels, 2018). This may be additionally valuable where students are given opportunities to gain work experience after they complete their studies. Germany, for example, allows foreign students from outside the European Economic Area 18 months of residency after graduation (Aydin, 2016).

Regional organisations have particular relevance given that members and partners will include both origin and destination countries for migrants. With regard to migration within Africa, for example, the African Union works at policy level with member states, the ILO, the International Organization for Migration (IOM) and the Economic Commission for Africa on a Joint Labour Migration Programme. The Programme actively promotes skills development via its youth-targeted '1 Million by 2021' initiative, which aims to catalyse youth development by providing one million young people in Africa with opportunities in education and skills development, employment, entrepreneurship and engagement. Priorities include scholarships, teacher development, internships, apprenticeships, skills transfer hubs, digital skilling and exchange programmes (African Union, 2019). Initiatives such as this provide an opportunity for understanding, and managing, the potential implications of training for labour mobility – including in specific areas such as the low-carbon transition and 'green jobs'.

National and local governments may be able to encourage their own partnerships to facilitate skills development. For example, the Mediterranean Network for Training Orientation to Regular Migration (MENTOR) programme is promoted by the municipalities of Milan and Torino in Italy, in partnership with the Piemonte Job Agency and the migrant association ANOLF Piemonte. The initiative encourages circular migration between the Maghreb and Italy to meet complementary needs for professional experience among non-EU youth, and the need for regional and linguistic expertise in supporting Italian business expansion in North Africa (Dall'Amico, 2018).

Within their own borders, countries may wish to investigate the potential of 'place-based' green industrial policy (Grillitsch and Hansen, 2019). 'Green economic zones', for example, could be used to foster skills development in ways that could be relevant to both domestic and international migrants. Evidence on the

benefits of special economic zones, in general, is mixed. However, there are instances of skills transfer from foreign to domestic firms within export processing zones. In the Philippines, eco-zones (focused on agro-industry, tourism, recreation, commerce and financial services) have been used to improve skill levels, as in-country activities have shifted from production to design and research and development (Zeng, 2016). There is wider interest in using green economic zones to encourage green production, test policy innovations and develop green supply chains (Vivid Economics, 2019). There may also be scope for green economic zones to support skills development and transfer, not only for in situ communities but also for labour migrants. The benefits for international migrants are, however, likely to be limited. Special economic zones can attract foreign firms, as they often aim to attract foreign direct investment or promote exports, but there will be political pressure on those firms to engage workers from within the country.

4 Facilitating labour mobility

Due to the pace and unpredictable nature of low-carbon transition pathways, emphasis is likely to shift towards more immediate or remedial responses to emerging skills needs. Thus, the recruitment of migrant workers – from within and across borders – who can fill employment gaps will play a critical role.

In leveraging migration to meet low-carbon skill shortages, it will be important to build adaptive and flexible frameworks that take into account the multitude of possible arrangements. This will include exploring labour migration domestically and internationally, across different levels of skills, and for varying durations (e.g. seasonal migration or short-term migration of 2–3 years). By ensuring that migratory routes and frameworks are in place to secure mutually beneficial solutions for migrants, host countries and countries of origin can play a key role in changing societies for the better (see Box 6). This chapter reviews policies that facilitate labour flexibility by removing barriers to migration such as information, cost and bureaucratic obstacles, and integrating and protecting migrant workers socially, politically and economically.

4.1 Removing barriers to migration

In order to allow labour to flow efficiently and productively, as is necessary for the needs of the low-carbon transition, the migration and labour communities need to address three key barriers to migration: first, the information barriers that hinder employers trying to recruit from eligible populations, and candidates looking for employment that best matches their skill profile; second, the up-front costs that prevent would-be migrants from moving for better employment;

and third, the bureaucratic barriers that prevent or slow the movement of skills and labour across borders. Examples from previous efforts to facilitate migration point to some of the solutions, but it should be noted that few of these, as yet, speak to the low-carbon transition itself.

4.1.1 Information barriers

To avoid the ‘brain waste’ of unrecognised skills and qualifications, programmes need to identify skills, recognise certifications and provide tools for matching job-seekers with appropriate employment. As noted, this is a component of ‘active labour market policies’, aiming to improve the likelihood that unemployed people will find a job by helping to match skills with vacancies.

One tool for identifying eligible populations and advertising roles is tapping into and empowering informal and formal diaspora networks. Earlier immigrants create formal and informal networks that facilitate immigrant job search, information exchange and access to capital and managerial know-how, based on shared ethnic and national identities (Kalam, 2017). One example is the Indus Entrepreneurs, a professional organisation for migrants founded in 1992 as a forum for networking and assisting young South Asian entrepreneurs (Saxenian, 1999). Migrants can also be supported to identify and articulate their skill-set and match their skills to job vacancies. In some cases, this may require quantifying soft skills which otherwise may be difficult to measure in the hiring process. The IOM’s 2019 LINK IT Skills Profiling programme mapped skill sets of Syrian refugees in Germany, Portugal, Romania and the UK. The programme used a pre-departure questionnaire to collect information

Box 6 Migration and economic benefits for destination and origin communities

Migration can have significant economic benefits for both destination and origin communities. On the one hand, immigration can grow a destination economy, for instance by filling labour market gaps, contributing to Gross Domestic Product (GDP), creating companies and spurring jobs growth. Immigration can fill labour market gaps in a destination community. According to the OECD, migrants accounted for 47% and 70% of the increase in workforce between 2004 and 2014 in the US and Europe respectively. Immigration can also generate positive effects on GDP and the job market of a destination community by boosting the working age population and encouraging innovation. For example, in 1998 Chinese and Indian immigrants ran a quarter of the high-tech businesses in Silicon Valley, collectively accounting for more than \$16.8 billion in sales and over 58,000 jobs. In 1999, Lebanese nationals constituted less than 1% of the Ivorian population, but operated 17% of consumer retail businesses. In 2016, Lebanese-Ivorians claimed that their diaspora was responsible for 40% of Côte d'Ivoire's economy.

On the other hand, emigration can improve an origin economy by reducing unemployment, while increasing skills, cashflow through remittances, and re-investment. Emigration can reduce unemployment in origin communities. For example, the 1961 'guest worker' programme fed the German economy while alleviating high unemployment in Turkey. In the case of circular migration, seasonal workers develop valuable skills that they import back to their communities. In longer-term migration, research suggests that migration aspirations incentivise education and skills, leading to a net rise in skills in sending countries as a cohort of skilled individuals ultimately remain rather than leave. One of the most tangible links between migration and development is remittances. The Indian diaspora in the US sends nearly \$12 billion annually back to India. The Australian government estimates that its Seasonal Workers Programme increases the average income of participants more than four-fold. A World Bank evaluation of the programme found that participating households were significantly more likely to have made improvements to their homes and have children enrolled and attending school. Emigrants can support origin communities by reinvesting in them. For example, migration has led to the development of ICT in the Indian cities of Hyderabad and Bangalore, with deep links to Silicon Valley. At one point, 95% of corporate foreign investors in Bangalore's software technology park were headed by returned Indians.

Sources: Bierwirth (1999); Saxenian (1999); The Economist (2016); Wyeth (2017); Gelb and Krishnan (2018); OECD (2014); World Bank (2018); Pew Research Center (2019)

on education history, work experience, personal skills, digital skills, linguistic abilities, aspirations and health/caring considerations to create a Skills Profile (similar to a CV) that could be shared with potential employers (IOM, 2019).

Governments, social agencies, diaspora organisations and the private sector can all provide tools for job matching. This can come in the form of physical job centres, training centres, university employment offices and online matching platforms. Job search training can also enable job-seekers to find work that matches their qualifications and skills. For example, the UK government plans to launch a web-based tool called 'Skills connect' to help displaced workers

in the oil and gas industry, which is anticipating a major restructuring, to identify occupations in other sectors that require similar skills and training (Botta, 2019). Similar online platforms have been created in the migration space as part of the global Covid-19 response. For example, Germany and the Canadian province of Ontario have launched online platforms which match internationally qualified healthcare professionals with employers in areas of high demand (ODI, 2020).

Recognising certifications allows training and expertise gained in one country to be leveraged in another. In response to the need for medical workers in light of the Covid-19 pandemic, countries including the US, Spain, France and

Germany have enacted measures to licence foreign-trained healthcare workers (ODI, 2020).

4.1.2 Cost barriers

Reducing the cost of migration can contribute to more efficient labour markets, as higher mobility enables workers to broaden the geographical area of their job search, potentially increasing the chances of finding jobs that better match their skills (McGowan and Andrews, 2017). Such programmes can include employer policies (e.g. relocation grants) as well as government initiatives (e.g. low-cost housing and guarantee schemes for temporary workers or those still in their ‘probationary period’ (Botta, 2019)). One example, in the context of the low-carbon transition, are the relocation grants, paid for by a carbon tax, given to workers in Alberta’s coal communities (Botta, 2019).

4.1.3 Bureaucratic barriers

Migration reform can streamline immigration pathways, facilitating the movement of workers. Examples include the recruitment of high-skilled immigrants through the H-1B visa (created in 1990), and Turkish ‘guest workers’ in Germany for the past 60 years. The H-1B visa enables the global recruitment of immigrants with specialised knowledge and training. The visa, which allows temporary migrants to work in the US for up to six years, was heavily utilised by Silicon Valley companies seeking to attract top talent from around the globe (Strangel, 2019). Meanwhile, a 1961 labour recruitment agreement between Turkey and West Germany for ‘guest workers’ from Turkey was intended to satisfy Germany’s post-war economic needs. Current German immigration policies have shifted to prioritise maintaining a small but steady stream of low-skilled migration and encouraging high-skilled migration. In supporting this policy, Germany has lowered entry requirements for ‘shortage’ occupations (Aydin, 2016), a measure similar to the UK’s Shortage Occupation List.

Migration reform to enable matching and recruitment can also involve cooperation between two (or more) countries. One example is the Seasonal Worker Programme (SWP) and the Pacific Labour Scheme (PLS) in Australia. These aid initiatives are intended to contribute to the

development of Pacific island nations, while also meeting the seasonal labour needs of Australia’s agriculture, hospitality and tourism sectors (Australian Government, 2020). The programmes allow temporary migrants to work for seven months and three years, respectively (Collins, 2016). The Australian government estimates that the SWP generated \$93.4 million in income for the Pacific region between 2012 and 2017 (Australian Government, n.d.). It also created a more flexible Australian workforce, and counteracted labour shortages in rural regions due to the Millennium Drought and urbanisation (World Bank, 2018; Australian Government, 2020).

In developing sustainable migration programmes, it is important that governments cooperate with all stakeholders involved. During the development of a circular migration programme between the Pacific islands and New Zealand, similar to Australia’s SWP and PLS programmes, workers were initially limited to one work cycle per individual in order to make the opportunity available to as many individuals as possible. However, during a review of the programme, private sector employers argued for the return of individual seasonal workers, to build up training and institutional memory (World Bank, 2006).

4.2 Integrating and protecting migrant workers

In order to make migration related to the low-carbon transition sustainable and beneficial for both immigrants and destination communities in the long term, stakeholders must integrate and protect immigrants politically, economically and socially. The cooperation of destination and origin communities is crucial in creating migrant organisations, streamlining policy and putting in place integration plans to capitalise on cultural exchange and reduce the risk of tensions between local and migrant populations.

4.2.1 Political integration and protection

Political integration affords migrants a sense of power, ownership and civic responsibility in their host communities. Political representation for immigrants, in the long term, can be achieved by creating clear paths to citizenship. In the medium

and short term, cities can create organisations representing migrant communities, such as elected migrant councils and migrant citizenship forums (ECCAR, 2017), and origin countries can provide the right to vote by absentee ballot.

Migrants are particularly vulnerable in terms of political representation, access to services, eligibility for government aid and legal status. Access to services, especially healthcare, is essential to the health and well-being of immigrants and their destination communities. Many states, regions and municipalities grant healthcare access to all, regardless of immigration status, through free and universal healthcare programmes. In light of Covid-19, several countries have granted immigrants access to healthcare for the sake of public health (ODI, 2020). Immigrants are often not included in government aid programmes. This too has been highlighted in the wake of Covid-19, which, in some localities, has hit immigrant workers especially hard (Fasani and Mazza, 2020). In response, several governments (national and regional; in Ireland, California and Chicago) have provided aid specifically for especially for migrant groups not included in government stimulus packages (ODI, 2020). Finally, many migrants are unable or afraid to access city services (including the police) due to their irregular status. Some leaders have taken steps to address this by creating forms of urban citizenship, such as Madrid's City ID card for residents without valid identification documents (Delvino, 2017). As noted above, the Covid-19 pandemic has prompted the regularisation of irregular immigrants in Portugal and Italy (ODI, 2020).

4.2.2 Economic integration and protection

Migrant workers are especially vulnerable to workplace exploitation due to factors such as language and cultural barriers, concerns about visa status and ignorance of workplace rights. Exploitation not only negatively affects migrants, but can also create tensions between migrants and their destination community and jeopardise future migration (Collins, 2016).

Australia's 2013–18 Harvest Trail Inquiry of agricultural businesses, most of which employed migrants, found exploitative and illegal practices including deliberate underpaying, falsifying

records, withholding payslips and unauthorised deductions (Fair Work Ombudsman, 2018a). In response to the findings, the Fair Work Ombudsman recovered unpaid wages for workers, took legal action against corporations and created a working group to coordinate education, engagement and compliance activities for both growers and employees (Fair Work Ombudsman, 2018b). The Fair Work Ombudsman will also be monitoring the impact of the Modern Slavery Bill 2018 (ibid.), which requires large businesses to report annually on efforts to address modern slavery risks in their operations (Parliament of Australia, 2018).

Other policy measures can help migrant workers, and their countries of origin, to share in the economic benefits. Portable social benefits allow foreign workers the option of returning home without forfeiting benefits. Germany's Foreigners Repatriation Incentives Law of 1983 covered returnees' relocation costs and made accrued social benefits (including pensions) portable. This law is considered highly effective; the year after its enactment saw a significant increase in Turkish nationals voluntarily returning to Turkey from Germany (Aydin, 2016). Remittance systems can be further digitalised and reformed to make payments cheaper and more secure (Nicoli et al., 2018).

4.2.3 Social integration and protection

One major risk around the recruitment of migrant workers is the possibility of social tensions between locals and migrants, especially if the latter are seen to get privileged access to training and employment. Policies can be put in place to remedy this, such as integration policies and programmes to help prepare and support both the destination population and immigrants.

Migrant associations can provide a sense of 'home' and instant community to new immigrants. Public awareness campaigns can increase the receptiveness of destination communities to immigrants. This includes 'soft' measures to make clear the economic and social contribution of migrant workers to both destination countries and countries of origin.

For example, a 2006 study of Turkish immigrants in Germany found that, due to cultural and religious marginalisation, a

significant migrant population in Germany lives in a ‘parallel society’ with restricted educational achievements and low socioeconomic status (Mueller, 2006). In response, the German Federal Home Office, along with representatives of the Turkish migrant community, developed the 2006 ‘National Integration Plan’, which includes provisions such as integration courses, language courses, education, apprenticeships, local integration activities and activities to strengthen civil society (Amelina and Faist, 2008). The plan has been criticised as merely ‘symbolic’ and ineffective due to the non-binding nature of its measures (Bither and Ziebarth, 2016). However, integration is a long-term process that develops over time, as political and public attitudes shift. In the case of Germany, one longitudinal study finds that attitudes in Germany have become increasingly optimistic regarding migration and integration, especially among the younger generation (Kober and Kösemen, 2019). An IPPR study published in 2014 gives examples and recommendations of integration measures enacted and proposed in the UK, including improving data on local diversity, combating

exploitative housing and employment, improving community conflict resolution, making education more inclusive, funding settlement support and incentivising migrants to volunteer in the community (Sachrajda and Griffith, 2014).

It is important to note the differing needs of long-term versus short-term integration. If a worker is only migrating for a short, circular visit, they will not need the settlement planning or paths to citizenship of a worker moving permanently, for an extended period of time, or with their family. However, circular and temporary workers still benefit from some forms of integration into a community. For example, temporary workers in Australia’s SWP and PLS schemes often return to the same farms, or are paired with other workers from their community. One World Bank study found that seasonal workers paired with workers from their origin country tended to have good ‘teamwork abilities’, linked to increased productivity (World Bank, 2018). In some cases, seasonal migrants have been able to return to the same farm for multiple seasons, enabling increased integration and skills development (Pacific Labour Scheme, n.d.).

5 Next steps

5.1 Key conclusions and recommendations

Given the urgency of mitigating climate change, intensified by the Covid-19 pandemic, more innovative and flexible approaches to skills development and migration are needed to support the employment needs of a rapid low-carbon transition. Predicting the skills, task and job needs of the low-carbon economy, and providing appropriate training and skills development, is a challenge as these are often ‘moving targets’ due to rapid innovation. This is compounded by broader uncertainties around the low-carbon transition, such as mixed policy signals and the availability of financing for new projects.

Given the unpredictability and required rapidity of the transition, as well as the spatial divergence between declining and emergent industries and opportunities, migration needs to be considered proactively as part of the solution. Migration of workers both within and between countries can offer a way to adaptively manage the labour market needs of the transition – alongside appropriate skills development for those in situ, including workers in displaced, high-emissions industries. To allow this, there is a need for active labour market policy to address three key challenges, anticipating skills needs, (re)skilling workers and facilitating migration, all of which are inherently political. There is also a need for three policy and practice communities working on the low-carbon transition – migration, skills development and labour markets – to collaborate much more closely. To provide more specificity, we offer initial suggestions of priorities for each policy and practice community below, but first it is worth taking a step back to set out key implications from our analysis.

First, the aggregate impact of the low-carbon transition on new jobs is likely to be modest at global level, with recent projections suggesting

new jobs equivalent to 2% of the global labour force in 2019, and net additional jobs equating to between approximately 0.5–1%. However, job creation, and job losses, will be much more profound in certain geographies and sectors. Decarbonising our energy systems will play a large part in determining the sectoral and geographic patterns of job losses and gains – making the extent of dependence on fossil fuels and opportunities for renewable energy generation important considerations. But decarbonisation in other systems is also crucial, including transport, buildings and food and land use. Both (re)skilling for in situ populations, and the use of migration to fill skill and labour gaps, can be focused accordingly on geographies and sectors where demand is likely to exceed supply. However, there is also a case for looking beyond these narrow geographies, with an eye to the benefits of long-term economic development and collaboration – for example via student exchanges and skills partnerships.

Second, there is an important role for collaboration across different levels – from global to local – and between stakeholder groups, to identify where and how labour migration can support the low-carbon transition, and to reshape policies to this end. This includes city and other local governments and regional/international organisations, as well as national governments. Countries or cities could come together in broader development partnerships in the ‘green economy’ in which skills development and mobility are part of the joint endeavour, alongside objectives like technology development and transfer. Beyond government, collaboration must also include individual firms, workers and migrant organisations, as well as organisations representing their interests from subnational to supranational scales.

Third, given that the low-carbon transition, and its implications for jobs, tasks and skills, is

characterised by uncertainty, there is a need for anticipatory planning and adaptive and flexible systems. Historically, meeting labour needs through migration during economic transitions has been ad hoc. Looking forward, we have an opportunity to put in place the frameworks and institutions to provide a more planned and flexible approach.

Fourth, the political economy challenges of each of the climate, migration and labour market agendas are substantial, and may sometimes be even greater in combination. The low-carbon transition is itself a policy-driven disruption to our economies and societies – more so than previous industrial restructuring and economic transformation processes. This could increase resistance, where decarbonisation is perceived as a deliberate choice rather than an accident of history (Botta, 2019). But this also provides more scope for forethought and consultation, to reconcile different interests. In addition, the scale and pace of change required to accelerate reform across the three sectors can also create windows of opportunity to nurture coalitions, disrupt ineffective siloes and unlock the potential to do climate, labour and migration differently.

Fifth, the low-carbon transition, via its impact on labour markets, will have differential impacts on different categories of worker – of which migrants are one. For migrants and the migration policy community to build a coalition with the ‘just transition’ agenda – the political bargain already struck between climate and labour communities – it must uphold the rights and opportunities afforded to all, including female, young and older workers.

5.2 Policy priorities

The analysis did not reveal compelling examples where the three policy issues of migration, the low-carbon transition and skills development and labour supply are being tackled together. However, based on our mapping of the challenges, as well as historical examples where two of the policy domains have been tackled in

an integrated way, we can tentatively point to a set of priorities for each policy and practice community (Figure 5).

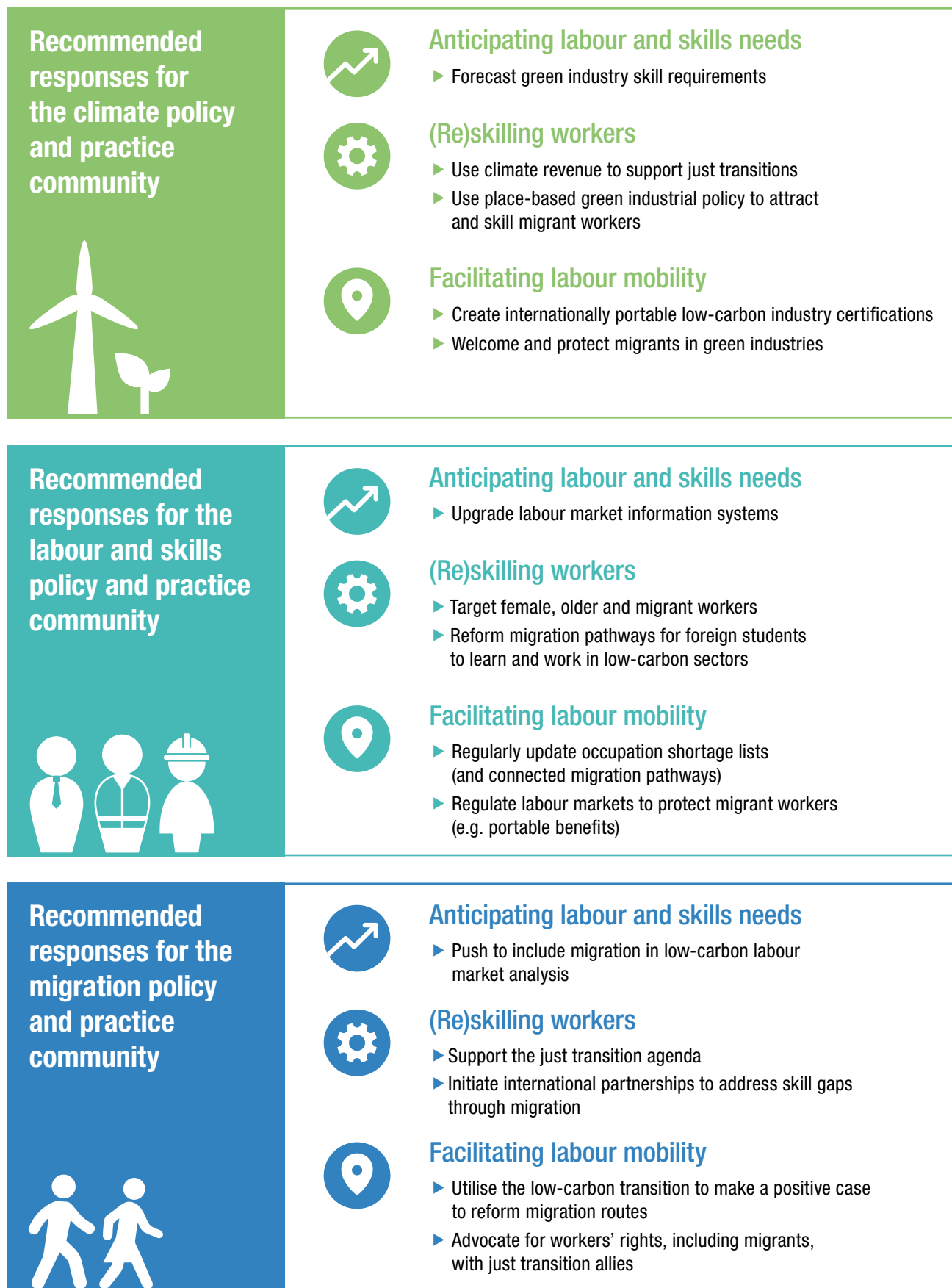
5.3 Areas for further research

As a first attempt to connect these three policy agendas, this paper has offered a framework for thinking through issues and challenges, but has not been able to answer all the questions posed. As such, there is much scope for further research and dialogue. Key themes include:

- Disaggregating the analysis for different types of migrant and migration – domestic and international; between areas/countries at different levels of development; of people with different skill levels; and for periods of different duration.
- Identifying and engaging jurisdictions that offer fertile ground for exploring the issues, because of their existing low-carbon transition needs and/or attitudes and policies regarding labour migration.
- Building out the analysis to include the labour market implications of related elements of the transition to environmental sustainability, besides climate change mitigation. For example, moving to a circular economy, protecting biodiversity and enhancing resilience.
- Deepening understanding of the costs and benefits involved in utilising labour migration to support the low-carbon transition, especially with a view to designing equitable financing arrangements.

Finally, it is worth again underlining the urgency. Climate science has shown that countries must speed up their decarbonisation efforts to avoid dangerous levels of climate change and to keep the world to the globally agreed target maximum of 2 °C warming compared to pre-industrial levels. To ensure we have the skills and labour force to get us there, all options should be on the table, and explored without delay.

Figure 5 Recommended responses for policy and practice communities



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