Mind the gap: Bridging the green skills divide

zero carbon academy

Introduction

‘Mind the gap’ – the green skills challenge

As concerns surrounding the usage of fossil fuels, finite resources, and climate change mount, governments are setting increasingly stringent emissions-reducing targets which ultimately require a significant upheaval of current operations and working practices. Equipping the workforce appropriately to meet demand for change is presenting a tremendous problem, analogous to converting a rural workforce to facilitate the industrial revolution as green technologies advance and the world works to achieve a sustainable future. These changes in processes and new business models will demand new or different skill sets from the workforce.

The three main ways that the shift to a green economy affects necessary skills are as follows:

- Demand for some tasks rises due to structural changes, while demand for others declines.
- New skill profiles, credentials, and training frameworks are required because new economic activity generates new jobs. Some will be government sponsored; most will be industry-led.
- Many current occupations and industries will see a change in the kind of tasks performed, making changes to the existing training and qualification frameworks for these jobs necessary.

It is crucial to understand that the availability of green jobs and skills shouldn't be seen as specialised or restricted to specific industries. Every career has the potential to become ‘green’ and there is a wide range of skills that will aid the shift to a net zero economy as the world works to improve sustainability and protect the environment.

“Simply put, green skills are the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society.” – United Nations Industrial Development Organisation

Industries in focus

Fourteen major industries define the boundaries of our full research, these are:

- Agriculture
- Energy & mining
- Construction
- Education
- Finance
- Healthcare
- Manufacturing
- Retail
- Real estate
- Travel

- Entertainment & recreation
- Transport and logistics
- Information & communication
- Professional scientific & technical
- Other

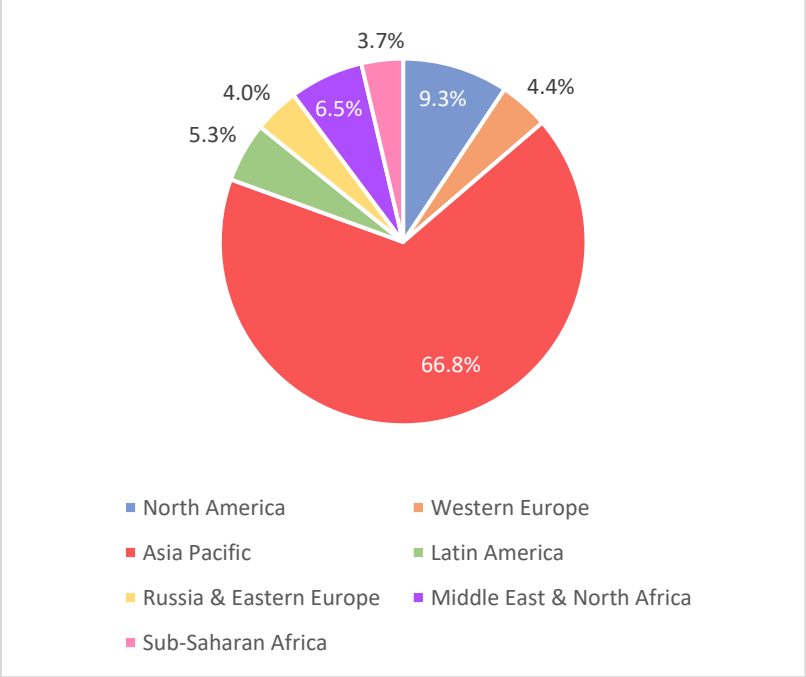
These areas define both the exploration of pressures driving the need for new green skills as well as the forecasting that calculates and predicts green skill need.

Forecast summary

ZCA forecasts that by 2031, the total number of workers with green skills to reach 159.9 million, however this is far short of total green jobs which will increase by 165% over the forecast period, from 95.1 million in 2026 to 310.9 million in 2031.

- Amongst the sectors most at risk from a high skills gap are: transport & logistics, travel entertainment and recreation, education, manufacturing, and information and communication.
- Globally, ZCA forecasts that the proportion of employees with green skills will reach 4.6% in 2031. Certain industries will see much higher averages by the same date, these include 'energy & mining' at 39.9%, 'construction' at 9.1%, 'scientific & technical' at 7.3%, and 'real estate' at 6.0%.
- Regionality will play a major part too, throughout the period we expect North America to lead in terms of green skills penetration with 16.4% of the workforce having green skills by 2031, followed by Western Europe at 8.5%.
- However, in real terms, Asia Pacific will add the greatest numbers of green skilled workers throughout the period, followed by North America. The former region will account for more than half of green skilled workers throughout the period (59% in 2026, and 66% in 2031).

Figure 1: Total green skills vacancies in 2031: 310 million, split by 7 key regions (%)



Source: Zero Carbon Academy

Green skills: Industry analysis

Agriculture

The agriculture sector (which, for the purposes of this study also includes the forestry and land activities sectors) is a significant contributor to global emissions. According to the SBTi (Science Based Targets initiative) it is responsible for just under a quarter of global GHG emissions (22%).[i] This makes it one of the main industries faced with the pressure to cut emissions fast and to adopt green practices. Further, agriculture is one of the industries most at risk from climate change – temperature increase, drought, pestilence, and changing weather patterns are all vulnerabilities of crops and livestock.

At a national level, progress on reducing emissions and greening the agricultural sector is being made – for example, within the European Green Deal which has the overall goal of a net carbon neutral European Union by 2050, and a decoupling of economic growth and resource use.[ii] In 2025 the EU released its vision for the future of agriculture and food[iii] which will address the following:

- Establish new agri-food policy partnership dialogues
- Simplify the administrative burden on farmers and food businesses
- Develop a plan to address protein supply challenges
- Pursue a stronger alignment of production standards applied to imported products
- Review the animal welfare legislation
- Develop an ambitious Unity Safety Net for the EU agri-food sector
- Call for a European risk and crisis management approach
- Adopt a climate adaptation plan
- Launch a long-term strategy on livestock

To specifically address climate challenges and future proof the sector, the EU Vision proposes to:

- Offer a voluntary benchmarking for on-farm sustainability
- Create a Water Resilience Strategy
- Accelerate access to biopesticides
- Reward through the Carbon Removal and Carbon Farming
- Launch an EU digital strategy on agriculture[iv]

Most, if not all of these areas will require further training and skilling for those operating within the agricultural sector.

Worth mentioning too is that traditionally, agriculture in many markets, sees farms run by families and passed down through generations. Skilling these current owners means that green skills can be easily passed on to future generations. The size of farm can also aid when encouraging farmers to switch to more sustainable farming practices; larger farms can absorb higher upfront costs and ultimately offer greater returns further down the road.

Contrastingly, particularly in developing countries, farms tend to be smaller in size and lack the technologies or equipment seen in larger farms in other parts of the world. For these farmers, adopting techniques which will significantly alter their practices, as well as saddle them with high initial costs, is seen as being untenable. Thus, there is a significant challenge in promoting and applying agricultural green skills across markets, as each country faces different challenges. While some can invest in new practices, many are faced with a lack of affordability, therefore government and NGO funding and education will be crucial.

It is not just policy that will help the agriculture sector meet the challenges of climate change, technology is set to play a major role in the future of farming. Agricultural technology, known as 'Agtech', will play a critical part in driving sustainability and productivity in the wider agriculture sector. This is crucial given agriculture presently accounts for 4% of global GDP according to the World Bank[v], employs a quarter of the world's workforce[vi]. Agtech currently sees a wealth of innovation, including the application of AI (Artificial Intelligence) to provide analytics and forecasting e.g. For equipment maintenance, fertilising, sowing of crop etc, the use of robotics for automation and monitoring, as well as remote sensors.

Case Study: TRIC Robotics

California-based TRIC has developed a fleet of robots that offer an alternative to traditional pesticide applications and manual labour.

The company's tractor-scale autonomous vehicle 'Luna', which can cover between 50-100 acres of farmland, uses ultraviolet (UV) light to control pests and diseases without harming the environment via the use of pesticides. The vehicle can also utilise vacuum technology to remove pests.

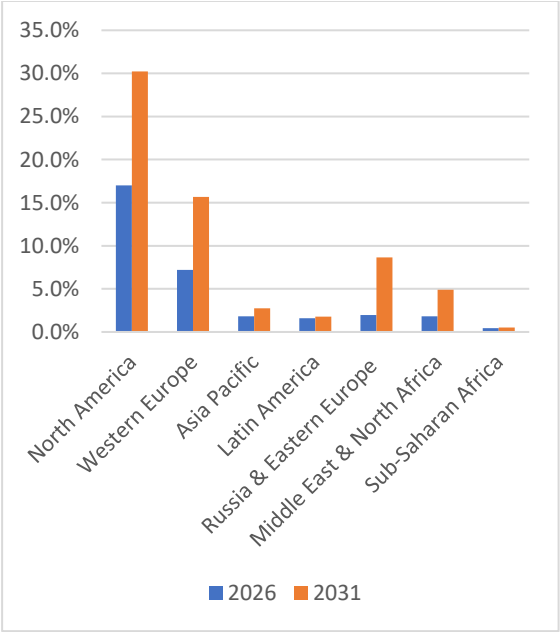
The company's Robotics-as-a-Service (RaaS) offering includes a data-driven platform with vision systems and real-time field analytics. According to TRIC, pilot programs have shown reductions in pesticide use by up to 70%.

Most recently TRIC secured $5.5 million in seed funding. The company plans to scale its autonomous robots for specialty crop farming, starting with strawberries which are one of the most labour-intensive and pesticide-reliant crops.

ZCA forecast outlook for agriculture

In ZCA's most recent forecasts we find that on a global scale, the proportion of full-time workers in the agricultural sector who have green skills will increase from 1.5% in 2026, to 2.3% by 2031.

Figure 3: Proportion of employees in full-time agriculture roles who have green skills (%), 2026 & 2031



Source: ZCA

Our data shows a significant regional disparity, with Western Europe and North America seeing a far higher share of their agricultural workers equipped with green skills than other geographic areas. We find that North America and Western Europe will see strong investment in sustainable agriculture practices, faster adoption of technologies (such as precision agriculture, soil sensors, and low-carbon machinery) supported by government incentives and sustainability targets. However, within Western Europe we will see uneven national adoption, which is the reason why the region does not perform to the same level as North America by 2031.

Russia & Eastern Europe is the surprise mover with a jump from 2% in 2026, to just under 9% by 2031, driven by mechanisation programs, subsidies for land restoration or precision agriculture, and an overarching increase in recognition and focus on the need for food security and climate resilience.

Recommendations & takeaways

The wide gap between advanced and developing agricultural systems displays a need for targeted interventions to avoid widening inequalities. Our forecast data shows that Asia Pacific, Latin America, MENA, and Sub-Saharan Africa all see growth in green skills by a few percentage points but remain significantly behind advanced economies. This underscores several areas for improvement, including barriers to accessing technology, gaps in training and knowledge, lower levels of investment, and climate vulnerability limiting technology transition readiness.

Moving forwards there are several areas which should be tackled:

- Talent availability: Hiring for green-skilled agriculture roles will be easiest in Western Europe, and North America, but more challenging elsewhere without training investments.
- Training ROI: Regions which currently have a small pool of green skilled workers present high-impact opportunities for targeted upskilling (e.g. soil health, water efficiency, precision agriculture, regenerative practices).
- Policy & incentives matter: Western Europe's growth likely reflects stronger regulation and incentives; therefore, policy changes and incentives should be considered to drive adoption in lagging regions.
- Localisation of projects: For green-ag pilots or scaling, prioritise Western Europe/North America for near-term reliability; build capability programs to unlock growth in MENA/SSA

References

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[ii] ESDN_Report_2_2020.pdf.
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[v] Agriculture Overview: Development news, research, data | World Bank
[vi] Employment in Agriculture - Our World in Data