

CLOSING
THE SKILLS GAP:
**VOCATIONAL
EDUCATION &
TRAINING FOR
THE CIRCULAR
ECONOMY**



ABOUT THE CIRCULAR JOBS INITIATIVE

Circle Economy is an impact organisation that connects and empowers a global community to create the conditions for transformation towards the circular economy. Our mission is to accelerate the transition through practical and scalable insights and solutions that address humanity's greatest challenges.

The Circular Jobs Initiative (CJI) is a knowledge centre that aims to ensure the transition to the circular economy is positive for work and workers. We are committed to promoting this mission by working with employers, workers, governments, multilateral organisations, education institutions and research organisations to shape this future.

With the support of the Goldschmeding Foundation, the Circular Jobs Initiative develops and shares knowledge and best practices on the future of jobs for the circular economy and translates this knowledge into practical and scalable solutions.

SUPPORTED BY THE CJI ADVISORY BOARD

KARI HERLEVI
Project Director,
Circular Economy, Sitra



"Updating workers' skills is essential to ensure a just transition. In the future, every professional should be able to apply circular thinking in their work, regardless of what they do. The practical skills taught within vocational education and training are especially important in catalyzing circularity. This report provides valuable input on how we can redefine the role of vocational education and training to better prepare societies for the transition to a circular economy."

RENIERA O'DONNELL
Higher Education Lead,
Ellen MacArthur Foundation



"The success of the circular economy transition depends on individuals, teams, and organisations acquiring new knowledge and skills, and adopting a new mindset. For some time now higher education has been at the forefront of this. It is very valuable that a spotlight is now shone on the crucial role vocational education and training has to play. This paper identifies many ways in which VET can provide the knowledge and skills people need in a circular economy. I hope it serves to progress the important agenda of preparing current and future generations to participate in an economy fit for the future."

ÖDÜL BOZKURT
Senior Lecturer in
International Human Resource
Management, University of
Sussex Business School



"Vocational and technical training receives highly variable attention and support under different national employment systems, but for any realistic prospects of a circular transition that offers decent work, it has to be right in the centre of discussion. This report provides both a range of conceptual tools to enable us to consider the role of government, civil society, industry and the third sector in aligning vocational training with the needs and rewards of the circular economy and a number of vivid illustrations from around the world of what is possible."

KRIS BACHUS
Research Manager,
HIVA, KU Leuven



"The transition to a circular economy will entail many opportunities, but along the way several challenges will need to be overcome, not in the least the issue of the - already existing - skills gap. This position paper presents a valuable and timely contribution to this discussion, by setting the scene, highlighting the important role of vocational education and training, and by exploring ways forward, and the roles different stakeholders involved will need to play."

ANTONIUS SCHRÖDER
Scientist, TU Dortmund Social
Research Centre



"This important policy paper stresses the relevance of green skills not only for industry but also for policy and civil society. Increasing circular economy upskilling of the workforce, but also of society, as such is necessary - in order to lead to new social practices. Closing the skills gap can lay the groundwork for unfolding the potential of new economic and technological solutions as well as infrastructures in a better way. Appropriate vocational education and training measures and innovative learning arrangements are needed to close the skills gap immediately."

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EXECUTIVE SUMMARY

Skills development is vital for unlocking the social, economic and environmental potential of the circular economy. The solutions laid out by the circular economy framework—focused on closing material cycles and designing out waste—depend on labour and skills-intensive processes. If managed well, their adoption presents opportunities for labour markets, as well as tackling climate change, resource scarcity and closing the Emissions Gap.

To take advantage of this potential, education and training provision should adapt to and anticipate skills needs. While topics that relate to circularity are increasingly being integrated in higher education, the role of vocational education and training (VET) has been explored much less. VET represents a key mechanism for ensuring a skilled workforce for driving the circular economy transition. VET is crucial for driving the uptake of circular strategies, promoting equity and closing the skills gap. Affording increased attention to VET will be critical for labour market integration and supporting large-scale and lifelong upskilling. This need is backed by the Sustainable Development Goals—which outline skills development through VET as a pathway for decent work—as well as the International Labour Organization's decent work agenda.

Upskilling is critical to narrowing the skills gap. As greening economies, digitalisation and longer working lives are embraced—skills gaps will continue to widen. In pursuing a paradigm shift where skills are the new metric of the labour market, the development of transversal skills among workers could increase labour mobility and strengthen resilience. Designing VET systems that address the needs of the labour market must be led by a deep understanding of the key skills needed for circular strategies in different contexts. Through collaboration between industry, governments, education and civil society, this understanding can be translated into new qualifications, assessment criteria and competency frameworks, underpinned by effective policies, funding, leadership and the participation of a range of stakeholders.

This paper includes key recommendations for and considers the role of industry leaders, governments, education and training providers and civil society in closing the skills gap and championing VET for the circular economy:

- Actors in **industry** should prioritise collaboration with educators and other industry sectors, both generating new skills and developing training programmes through co-design and validation as new skills needs emerge. They can also facilitate a culture of lifelong learning, where workers, managers and team leaders are upskilled and encouraged to continuously develop in line with new innovations or technologies.
- For **governments**, advocacy for and coordination of VET policy is key: governments have the mandate to provide targeted skills development opportunities to those without ready access to training, deliver funding, coordinate actors in education and industry and encourage data-driven decision making. They must also commit to recognising the role of VET in building back better—towards a more circular, resilient economy—from the covid-19 pandemic.
- **Education and training providers** should collaborate with industry to advance knowledge on the circular economy, and accommodate the need for new skills in interdisciplinary courses. Focus should also be given to providing high-quality career guidance, facilitating adult learning possibilities as well as the take up of entry level positions in the circular economy. The creation of new digital tools—that combine online learning with on-the-job learning—will also be crucial.
- **Civil society and social partners** should seek to facilitate the co-development of new curricula, working collaboratively with industry, education and workers. Ensuring that structural changes towards sustainability are reflected in such new training programmes will be needed, along with recognising and valorising the skills of vocational workers while providing them with further access to upskilling opportunities.

1. INTRODUCTION

A means to an end, the circular economy enacted on a global scale has the potential to drive us towards a net-zero, sustainable and just future. If managed well, its adoption can generate multiple benefits for the labour market while simultaneously tackling climate change, resource scarcity and closing the Emissions Gap.¹ The circular economy's core strategies of closing material cycles and reducing waste hinge on processes that are labour and skills-intensive. However, who will implement the processes and technologies needed by the circular economy on the ground? These processes—which include repair, refurbishment, reverse logistics and advanced resource sorting—will require a joint venture of industry, policy, science and education, and civil society. They call for existing, new, or new combinations of skills to be applied for establishing new social practices. As such, the circular economy is likely to call for a general upskilling of the workforce in line with wider labour market trends.

To take advantage of and keep up with the employment and innovation potential of the circular economy, education and training provision need to both be able to adapt to and anticipate future needs. Continuous updates in teaching and training that match technological and material advances are needed to ensure they reflect current skills needs. With the right skills, workers— as experts of the workplace— can unfold the full potential of technologies and new solutions. Teachers and trainers can also proactively promote environmentally friendly strategies, business models and innovation through the skills and knowledge they teach. Adoption of the circular economy will, therefore, both shape demand for skills and be dependent on the skills that are available in the labour market. The nature of skills is two-fold: they are an inventory of human capacity to perform specific tasks and they are necessary to galvanise behavioural change on an individual and institutional level.

The risk of not investing in skills development is too great: without skills development, investment in circular strategies will not translate into employment opportunities and will see us fall short of our national and international environmental targets.² Without widespread skills development, existing skills, human capital and local jobs—just like valuable raw materials—risk being wasted or lost. Bridging the skills gap will require foresight and genuine collaboration from government, industry, civil society and education. It will require us to acknowledge that the focus on transforming material flows has, until now, held assumptions about skills use and human capital. Bridging the gap will require policies, frameworks, investments in business models and skills pathways that responsibly manage shifting industries and, with this, changing labour markets.

This paper demonstrates how vocational education and training (VET) is a key mechanism to ensure a skilled workforce that can drive the circular economy transition. It brings together thinking from skills development for green economies, innovation, sustainable development and the circular economy—all means for achieving a sustainable and just society. This paper presents examples of a range of VET pathways to illustrate how well they can align with and promote the adoption of circular strategies. This includes the role of governments, educators, civil society and industry in shaping these pathways and securing circular jobs.

1.1 THE ROLE OF VOCATIONAL EDUCATION AND TRAINING

The skills needed for the circular economy are currently nested in courses across disciplines and curricula, from business administration, to logistics, agriculture and food sciences, as well as within informal learning. Some education providers, mostly within higher education, do provide learning offerings that explicitly reference circular strategies. Most of these offerings occur in the context of sustainability studies, engineering and business. However, teaching the skills and mindsets needed to reduce waste, close material cycles and address issues such as climate change, biodiversity loss and social cohesion—whether they are badged as contributing to the circular economy or not—are not the norm.³

VOCATIONAL EDUCATION AND TRAINING (VET)

'Training in skills and teaching of knowledge related to a specific trade, occupation or vocation in which the student or employee wishes to participate. Vocational education may be undertaken at an educational institution, as part of secondary, post-secondary or tertiary education, or may be part of initial training during employment, for example as an apprentice, or as a combination of formal education and workplace learning.'⁴

VET also allows for the development of a wide range of skills, matched to national and local contexts. The development of skills in literacy and numeracy, transversal skills, and 'learning to learn' are all fundamental elements of VET.⁵

The potential of VET to be a driver of innovation and play a role in achieving societal goals is, arguably, underexplored and underappreciated, in comparison to higher education.⁶ Some stigma also surrounds VET and vocational professions, with many populations across continents viewing academic education as being more valued by society.⁷ In line with this, governments have been encouraged to implement policy changes to improve opportunities for professional and lifelong learning progression and enhance VET's permeability and quality in order to make it more attractive to learners.⁸

In fact, VET makes several vital contributions to economic activities and the proper functioning of labour markets. Through recognising this potential, there is an opportunity to redefine VET as a mechanism for driving the adoption of circular strategies, supporting equity and closing the skills gap. The role of VET in facilitating a transition to a more sustainable economy is already being recognised, with UNESCO's current strategy aiming to influence the greening process of VET.⁹ This opportunity for redefinition includes:



Higher technical skills: With rising demand for higher level technical skills in the circular economy, Technical Vocational Education and Training (TVET) will be key for achieving skills shifts. This is particularly important in low- and middle-income countries that are increasingly adopting new technologies and smart specialisation strategies calling for rapid upskilling of the workforce.^{10 11 12 13} TVET may also contribute to developing the skills and competencies needed to support a sustainable and resource-efficient society, ranging from systems thinking to collaboration to self-awareness.



Lifelong learning through upskilling: Many industries already utilise Continued Vocational Education and Training (CVET) offerings for professional and skills development. Next to this, 94% of employers in 2020 expected their workers to develop new skills on the job.¹⁴ VET is well placed to continue supporting large-scale upskilling, as well as providing infrastructure for continued and lifelong learning.



Social inclusion: VET is an important mechanism for labour market integration and its role in matching job seekers to vacancies has long been recognised. For example, Initial Vocational Training (IVET) is often central to active labour market policies (ALMPs) that aim to increase the representation of women, young people or people living with a disability in segments of the labour market.^{15 16 17}



Decent work: Developing skills through VET is identified as a pathway for decent work by Sustainable Development Goal (SDG) 4.4 and the International Labour Organization's (ILO) decent work agenda. When also combined with improvements to measures, such as working conditions and social dialogue, skills development is cited as enabling people to realise their economic, cultural and social rights.^{18 19}



Stimulating markets: In a fast-changing world of work where industries must adapt to achieve social and environmental needs, VET and its close relationship to industry and governments has an important role to play in developing entrepreneurial skills, motivating learners and helping sustainable enterprises to thrive.²⁰

CASE STUDY: RESOURCE MANAGEMENT

A competency framework for in-work learning and modern apprenticeships

The Scottish Waste Industry Training, Competency, Health & Safety (SWITCH) Forum works to promote the Scottish resource management industry as an attractive career choice in Scotland. The programme provides leadership by working collaboratively to raise health and safety standards, training, learning and development and technical competence.

The multi-partnership forum is made up of organisations across all sectors within the resource management industry. This includes Zero Waste Scotland, Chartered Institution of Wastes Management (CIWM), Scottish Environment Protection Agency (SEPA), Scottish Government, private waste management companies, advisory bodies and local authorities. It was born out of the Scottish Government's Zero Waste Plan in 2010, which tasked Zero Waste Scotland with developing 'a programme to support continual improvements in health and safety and workforce skills in the resource management sector.'²¹

SWITCH developed a [Competence Framework Tool](#) (2017)²² for managers, supervisors and team leaders within the resource management sector to assess their staff against a range of specific competences and skills applicable to their job roles.²³

The Competence Framework has been used by VET providers in Scotland, such as Albion Environmental, as part of their Sustainable Resource Management modern apprenticeship (MA). This apprenticeship provides workplace training to frontline services operatives, collection operatives, site operatives, weighbridge operatives, collection drivers and team leaders.

The benefits this common framework has provided to Albion Environmental clients include:

- The framework has streamlined MA candidates' inductions,
- Career progression planning for apprentices is now more accurate and specific to the individual,
- It helps to simplify expectations for new and inexperienced staff and builds confidence,
- It is now used to assist HR functions in managing performance, evaluations and annual reviews.



2. WHY IS THERE A SKILLS GAP?

Skills development is needed to achieve the employment and innovation potential of the circular economy. There are also global trends at play that feed into these skills demands, alongside some education systems being seen as outdated. This hampers their ability to meet the current skills demands and modern ways of learning. Below we consider three key global trends that are shaping labour markets and contributing to the skills gap: greening economies, digitalisation and longer working lives, with the impact of some of these trends now being catalysed by the impacts of the covid-19 pandemic.

2.1 THREE GLOBAL LABOUR MARKET TRENDS

As economies around the world seek to reduce resource scarcity, protect livelihoods and tackle climate change, they will increasingly prioritise environmentally sustainable practices: greening economies. These actions are guided by the SDGs and Nationally Determined Contributions (NDCs) under the Paris Agreement. This calls for green skills, made up of a combination of engineering and technical, science, operation management, monitoring and soft skills.²⁴ Yet, countries are still facing pervasive skills gaps in implementing their NDCs, which VET has the potential to reduce—especially where training and improved practices for sustainability come into play. Changing environmental conditions, national environmental policies and corresponding legislation are driving demand for green skills across global regions. This includes supporting many of the estimated 1.47 billion global jobs that depend on a stable climate.²⁵ Strengthening VET and making skills development more accessible—while also realising that skills needs will shift across different stages of the transition to a circular economy—can help speed up the adoption of new technologies that increase efficient use of natural resources and reduce waste.

As governments and businesses embark on greening economies, circular economy strategies and policies can be employed. The Circularity Gap Report 2021 found that circular economy strategies that promote efficient

resource use can cut down 39% of global emissions—thereby closing the Emissions Gap—and that a focus on renewable energy alone is not sufficient.²⁶ The movement towards greener, more circular and equitable economies comes hand in hand with a decline in capital-intensive and extractive industries.

This industrial transition is underpinned by two landscape trends: digitalisation and aging populations, that, if embraced, can have positive impacts on labour markets. Digitalisation comes with increasing advances in technology, which can result in more resource- and energy-efficient practices. Rapid adoption of these technologies by industries is making basic digital skills, lifelong learning and access to continuous training more important than ever.²⁷ People are also living and working longer. When embraced, longer working lives can encourage new models of education oriented towards lifelong learning that allow workers to re- and upskill throughout their working lives, as opposed to being limited to one occupation leading from initial education. As industries shift and governments green their economies, the deep expertise and legacy skills held by older workers should also be seen as a key asset. Workers with longstanding experience in industries will be well placed to explore avenues for those industries to be more resource-efficient and resilient, as well as teach new entrants the foundational skills that can be combined with new skills.²⁸

2.2 JUST TRANSITION FOR WORKERS

The transition towards more environmentally sustainable societies can only meet the needs of people and the planet if it is just. In a just transition, workers from sectors and regions that are undergoing major changes are supported to protect livelihoods, minimise job losses and manage their transition into decent jobs. Smart policies and investment in skills development are needed to manage this transition for workers. This includes matching workers' skills to demand in growing industries, avoiding trade-offs between social and environmental targets and ensuring the adoption of green and circular strategies do not exacerbate existing inequalities in labour markets.^{29 30}

2.3 BUILDING BACK BETTER

The covid-19 pandemic is heavily impacting industries and has already resulted in mass unemployment worldwide, with many economies facing deep recessions. Many of the changes that were forecast in the medium- to the long-term term for the labour market have been accelerated and risk widening skills gaps further. Digitalisation and servitisation, for example, have now quickly become the reality for many businesses coping with the impacts of the pandemic and increasing online service delivery. This rings particularly true for Industry 4.0 technologies, including automation and digitalisation.³¹ As governments set plans in motion to rebuild their economies following the impacts of covid-19, the circular economy and its strategies have regularly been cited, especially in Europe,³² as a means for 'building back better'—speeding up the rate at which circular strategies are being identified and applied.

SIZING THE SKILLS GAP

87% of companies surveyed globally by McKinsey in 2020 were **experiencing skills gaps**.³³

Up to **18 million** workers in the EU **will need reskilling** in one form or another due to a shift to a low-carbon economy.³⁴

In the Global North the **demand for high skilled workers has increased by 40%** in recent years.³⁵

On average, employers expect to **offer reskilling and upskilling** to just over **70%** of their employees by 2025, yet only **21%** of businesses **feel able to make use of public funds** to support their employees through retraining initiatives.³⁶

70% of young people believe they only have some of the **skills they need to succeed**.³⁷

39% of employers say a skills **shortage** is the leading reason for entry-level vacancies, while 72% of education providers believe new graduates are job-ready.³⁸

37% of workers in Europe **do not have basic digital skills**.³⁹

CASE STUDY: AGRICULTURE

Civil society and state funding for school-based learning

The Nigerian Agricultural Knowledge and Innovation System (AKIS) has introduced competency-based education and training under a National Skills Qualification Framework. Some informal training is delivered by State Agricultural Development Programmes. However, funding for agricultural development in Nigeria remains low compared to other countries within Africa.

The Leventis Foundation is a charitable company dedicated to training farmers in modern and sustainable agricultural practices and the rational use of natural resources. It is one of four Vocational Enterprise Institutions offering vocational certifications in agriculture. The Foundation has run agricultural training for young people and farmers since 1987, and currently has six schools in different agro-ecological zones of Nigeria. The schools located in the FCT, Osun, Kaduna, Kano and Gombe states are co-financed by Leventis Foundation and the respective State Governments.

All the schools offer young people comprehensive and free one-year training, which exposes the participants to several areas of agriculture and other areas of agricultural business management. The training includes modules on eco-friendly agriculture and agroforestry practices, agricultural engineering, as well as low-investment income generating schemes, such as bee keeping and vegetable gardening.^{40 41}



Photo by Anete Lusina

3. CLOSING THE SKILLS GAP: UPSKILLING IS KEY

The adoption of circular strategies calls for skills that can be applied to processes or business models that are involved in closing material cycles. This includes using by-products as feedstock for new products and creating enabling digital platforms that encourage renting or sharing models over ownership. The successful adoption of circular strategies also hinges on mindsets and behavioural change, leading to new social practices that encourage materials to be optimised, supported by company culture and processes.

Circular strategies call for increasing interdisciplinary and multidisciplinary working. In a circular construction project, for instance, a multi-skilled operative may have a wider and more adaptive skill-set than a traditional tradesperson. This might include having interpersonal skills to communicate with contractors at different stages of the value chain and the ability to easily switch between tasks.⁴² Developing transversal skills and pursuing a skills-based labour market can enable work to be approached in different ways, along with increasing labour mobility and resilience. For example, creating capacity for workers to operate across different tasks and even in different companies within a value network.⁴³

The T-Shaped skills approach provides a helpful framework for understanding how specialist and generalist, transversal, skills can be combined in an increasingly interdisciplinary labour market.⁴⁴ The T-Shaped skills approach places value on having a combination of both specialist and generalist skills. The vertical bar of the T represents the depth of the employee's specialist skills in their primary field and the horizontal bar represents their transversal skills used to collaborate across disciplines. This approach evolved in line with the growing demand for cross-disciplinary collaboration to solve complex societal issues. This comes with the need for employees that have both in-depth expertise in one field and also broad

knowledge of related fields, as well as emotional intelligence and creativity, which make them better able to work with other organisations and across disciplines.⁴⁵

Transversal, also known as transferable or generic, skills are made up of core and foundational skills, such as literacy and numeracy, and soft and digital skills, such as the ability to engage in critical, foresight and systems-thinking, communicate effectively and the skills for management, cooperation and entrepreneurship.^{46,47} These skills are generally not attached to any one job or industry.⁴⁸ In contexts where circular business models are adopted, the demand for transversal skills will often be twinned with the need for specific new (professional or technical) skills, which can be taught or acquired on-the-job in response to more specialised product and service niches.

Transversal skills can be applied to different jobs, occupations and industries. They can support cross-sectoral collaboration and labour mobility across stages of the circular economy transition, as these skills remain relevant and enable workers to access different types of employment opportunities across sectors and industries as labour market demand shifts.^{49,50} However, the promotion of occupational labour mobility must come with protection that ensures flexible labour arrangements do not make workers vulnerable, and ensures their skills can be used effectively, including employment protection and support for parents and carers.

In addition to skills, competencies—split into four categories: cognitive, functional, social and meta-oriented—play a key role in realising a successful circular economy. For circular initiatives to progress, a specific combination of competencies is needed.⁵¹

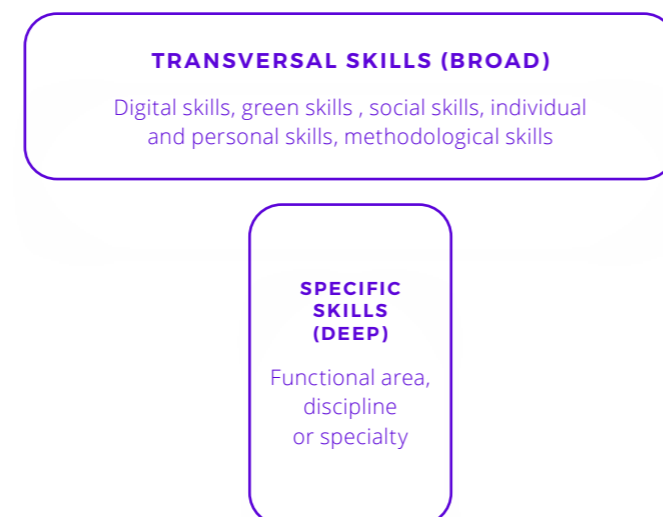


Figure: T-Shaped Skills Approach

CASE STUDY: CONSTRUCTION

Inspiring circular skills and knowledge development between learners and professionals

The Dutch Circular Construction Economy Transition Agenda describes the strategy for achieving a circular construction economy in the Netherlands by 2050. The Transition Agenda acknowledges that educational institutions will need to develop and share new knowledge and skills to deliver on targets set for the construction sector.

The Circular Skills Programme was first created by the sustainable education cooperative *Leren voor Morgen*, in collaboration with the Ministry of Infrastructure and Water Management and the Goldschmeding Foundation. The Circular Skills Programme works to bridge the gap between vocational education and professional practice in the circular economy, such as in construction. It does this by identifying skills gaps in industries adopting circular economy strategies and puts in place regional projects—while encouraging educational reform on a national level to close the gaps.⁵²

A partner of the Circular Skills Programme is TIP Circulair, run by Rotterdam University of Applied Sciences. TIP Circulair is a learning community for students and professionals that looks at how the adoption of circular economy strategies is changing occupational requirements and how best to translate this into occupational profiles.

To support the retention of young people coming into the industry and maximise the potential for innovation through knowledge exchange, leading professionals and engineers from the TIP community are paired with young interns and apprentices working within construction and installation companies. They meet once a week to discuss successes and challenges in order to jointly develop their circular knowledge. The TIP Community also comes together for ten half-days spread over 20 weeks to exchange knowledge and receive master classes on emerging approaches from the circular construction and installation field.⁵³

TIP Circulair is an example of how to facilitate mutual learning between professionals and interns or apprentices, as well as how co-creation and action-based learning can be used to overcome concrete challenges in the workplace in a timely way, as also encouraged by the Greening Technical-Vocational Education and Training (GT VET) project.⁵⁴

4. THE POWER OF VET TO CLOSE THE SKILLS GAP

Vocational training can promote 'sustainable development by empowering individuals, organisations, enterprises and communities, and fostering employment, decent work and lifelong learning so as to promote inclusive and sustainable economic growth and competitiveness, social equity and environmental sustainability'.⁵⁵ In addition it can help to narrow skills gaps.⁵⁶ With high quality teaching and learning at its core, VET can help to drive skills development for the circular economy when underpinned by effective policies, funding, leadership and the participation of a range of stakeholders.⁵⁷ Nations employ different VET systems, reflecting the different roles that industry and governments can play in shaping education and closing the skills gap. For example, the UK employs a market-oriented system, which is directly influenced by skills demand from industry, with a strong focus on on-the-job training. In comparison, dual hybrid systems, found in countries such as Germany and South Korea, combine learning in vocational schools with practical work experience. The Dutch VET system is driven by this concept of 'dualisation', where training includes both work and theoretical elements.⁵⁸ Until now, the innovation power of VET systems has arguably been underestimated and can be fragmented. Below we outline four key areas for consideration if VET systems are to be drivers of the circular economy and closing the skills gap.

Skills should be integrated at three main levels to close the skills gap.^{59 60}

At the **systemic level**: skills are introduced into transparent institutional frameworks, specialised occupations, advanced qualifications and economic, social and environmental drivers.

At the **institutional level**: skills are developed through coordination between industry and VET providers and schools, in response to industry demands. Here sustainable practices, such as using refurbished equipment for teaching, can help to encourage acceptance and mindsets that value reuse.

At the **programme level**: new skills requirements are translated into teaching and learning materials, training for teachers and foundational—including transferable and digital skills—for learners.

4.1 UNDERSTANDING AND FORECASTING SKILLS NEEDS

To design VET systems that meet the needs of current and future labour markets in the short time-framed needed, the skills for key occupations that contribute to the circular economy must be understood and translated into qualifications, assessment criteria and competency frameworks. To this end, the following steps must be taken:

- **Mapping skills and skills needs**: Mapping skills needs across entire value chains can make better use of human capital and increase the competitiveness of industries. For example, strengthening skills and VET provision in downstream services like logistics will boost the competitiveness of high-value activities in industries like remanufacturing.⁶¹ On a regional level, initiatives like SPIRE-SAIS in the EU are helping to create European-regional frameworks to also foster this for cross-sectoral improvement (see case study four on page 20).
- **Championing Industry 5.0**: Employers are well placed to judge the relevance of training and curricula. The human-centred and sustainable Industry 5.0⁶² can act as a solution-driver—better matching skill sets to industry requirements. This could include facilitating the development of training on a specific technology in parallel to the development of the new technology within industry.
- **Empowering labour unions to develop curricula for relevant skills**: Labour unions can help ensure investments in training are reflected in better quality jobs and higher salaries for workers. Together with employers, unions can also help develop curricula that include a broader range of transferable skills and identify skills that are applicable across different sectors and occupations to support occupational labour mobility.
- **Improving the collection and use of skills data**: Strengthening labour market information systems will facilitate skills forecasting, and with this support

the increasing adoption of circular strategies within industries. Improvement in the collection and use of skills data on both local and global levels will support more efficient matching and a clearer understanding of where skills gaps exist and need to be closed.

- **Working with stakeholders to match workers with circular opportunities**: Skills requirements need to be translated into high-quality career guidance, utilising data on current labour market prospects. Local public employment services can work on a continuous basis with local employers, education and training providers to ensure careers guidance can match job seekers to suitable occupations that contribute to a circular economy.

CASE STUDY: ENERGY-INTENSIVE INDUSTRIES

EU-level collaboration to address skills shortages for industrial symbiosis

Industrial symbiosis (IS) is when one company or sector uses the underutilised resources of another, with the result of keeping resources in productive use for longer.⁶³ The European Green Deal identifies IS as a tool for meeting carbon-neutral targets that can create win-win-win situations for businesses, society and the environment.⁶⁴ Alongside innovations in green technology and better data on material use, the uptake and implementation of IS requires knowledge across technical and organisational sectors, together with new management practices.

Through a consortium of about 40 organisations from across 12 EU Member States, the SPIRE-SAIS project works to identify the skills, job profiles and qualifications needed to promote IS in energy-intensive industries in the EU: steel, chemicals, minerals, non-ferrous metals, water, cement, ceramics and engineering. The project unifies stakeholders from across the SPIRE community, including industry associations, education and training providers and research and technology institutions, and aims to develop a cross-sectoral, proactive skills strategy for implementing IS across industrial sectors.⁶⁵

Importantly, a core focus is understanding how companies, training providers and VET systems and frameworks currently develop IS-related skills and how this can address and close skills gaps in the short term, spur further developments in technology and create mechanisms for and barriers to skills and training deployment.

Alongside this, INSIGHT, another European Funded project is developing new professional profiles and training for IS facilitators.⁶⁶

This project—in line with more than 20 other sectoral blueprints—is an example of how to collaborate on the development of sustainable skills alliances and blueprints that can be rolled out regionally. This approach both gives input and encourages collaborating on responses to changing skills needed in changing working and living environments.



Photo by Stephen Philipott

4.2 POLICY COORDINATION

The interdependencies between economic, environmental, skills and employment policies and strategies should be acknowledged; and with this the potential cumulative power of the relevant government agencies. In doing so, the following steps can be taken:

- **Positioning skills at the forefront of policy:** For nations pursuing a circular economy, there is an opportunity to improve coordination between agencies across the planning, design and implementation stages of new policies aimed towards supporting the nation's social, environmental and economic targets. Crucially, industrial, green or specifically circular roadmaps and policies must include skills, and be aligned with skills development and wider economic development policy. This will help to ensure investments in environmentally sustainable strategies are translated into employment opportunities for a range of people.⁶⁷
- **Prioritising political coordination in skills policy design:** Designing effective skills policies requires government, industry, education, research and civil society (a quadruple ecosystem approach) to paint a comprehensive picture of the skills needed now and in the future to reach their targets. Alongside this the weaknesses within existing education and training provision that may be leading to existing skills shortages must be understood. Policy coordination will be particularly important for nations where skills and environmental policies are already fragmented or underdeveloped.⁶⁸
- **Working with advisory partners to ensure VET's success:** Social partners have an important role to play in coordination and ensuring structural industrial changes and commitments towards sustainability are reflected in training and education provision. This can include working closely with the VET system through advisory bodies, such as the Federal Institute for Vocational Education and Training (BIBB) in Germany⁶⁹ and taking a participatory approach when designing reskilling programmes for industries undergoing changes in collaboration with current workers.
- **Securing industry involvement:** Commitment towards the circular economy and the VET system as a driver of its adoption by the government will

secure industry involvement. Their involvement is vital for ensuring work placements and on-the-job learning can close the skills gap. This commitment should be reflected at different levels, from the regional—such as supporting the European Pact for Skills—to the national and subnational regional levels through Hubs of Circularity and training ecosystems.⁷⁰

- **Making room for different perspectives:** The establishment of collaborative VET ecosystems can support the integration of different perspectives, responsibilities and decision making processes. Focusing on concrete (European, national and regional) skills demands, central actors from industry, policy, science and education, and civil society that could play a role in defining, implementing and running tailored solutions and actions (for example, via shared roadmaps and actions). Such ecosystems actors can help drive VET reforms and skills development for sustainable development by challenging, encouraging and pushing each other.

4.3 INTERDISCIPLINARY LEARNING

The circular economy calls for increasing collaboration between companies and sectors, and other stakeholders along value chains. Such an interdisciplinary and multidisciplinary approach will require people to be skilled in different ways. This will also necessitate the following actions:

- **Embracing interdisciplinary work and learning:** This will require VET offerings that can serve multiple industries, acknowledging that in a circular economy, industries can be interrelated and that there is increasing need for workers and services that can valorise materials across sectors. This need, particularly in relation to industrial symbiosis, is being explored by the SPIRE-SAIS and INSIGHT projects in the EU.
- **Introduction of assessment systems for interdisciplinary occupations:** Increasing interdisciplinary learning needs to be supported by the introduction of new qualifications and assessment systems, that allow for a blending of disciplines and lead to multi-skilled workers.
- **Provision of support for workers:** Skills and career guidance for both young learners and existing workers will be crucial in supporting the navigation of new skills pathways and sectors and access to new roles as they develop.

4.4 TARGETED & HIGH-QUALITY PROGRAMMES

The circular economy calls for increasing collaboration between companies and sectors, and other stakeholders along value chains. Such an interdisciplinary and multidisciplinary approach will require people to be skilled in different ways. This will also necessitate the following actions:

- **Effective uptake of the knowledge triangle:** VET systems that adopt new mindsets, strategies, technologies and pedagogies can maximise the potential of their labour markets. Effective utilisation of the knowledge triangle—research organisations, industry and education—can help cutting-edge circular economy knowledge be translated into VET offers aligned to current, emerging and forecasted skills needs.⁷¹ Innovative forms of learning, such as innovation centres and demonstration sites, can encourage knowledge exchange between industry and education.⁷²
- **Development of trainers, teachers and managers:** Trainers, teachers and managers also need to be upskilled so that they can adequately support learners' development. This includes enabling managers to act as coaches for the adoption of new technologies and to properly utilise the new skills being developed by their workforce, particularly where training is delivered on-the-job.⁷³ In this way, trainers, teachers and managers can direct the application of general and technical skills towards circular economy strategies.
- **Mechanisms to support SMEs and informal sectors:** SMEs create between 70 and 80% of jobs worldwide and face the largest gaps in financing the transition towards the green economy.⁷⁴ Investment in skills development for SMEs and informal sectors is crucial for the achievement of the circular economy, given the prevalence of micro enterprises and informal workers in circular value chains.⁷⁵
- **Measures that combat gender inequality:** There is generally a low representation of women in STEM disciplines and vocational professions. Targeting vocational skills development at women could help to shift this and deliver new occupations that come with circular economy business models that resist the gender barriers currently seen in different industries.⁷⁶

- **Reskilling in rural areas:** Targeted training programmes are also needed to balance urban and rural employment and ensure the right training is available in rural areas in order to attract and retain highly skilled workers.^{77 78}

CASE STUDY: AGRICULTURE AND FOOD PROCESSING

VET reforms to match national ambitions and skills qualification framework

To match India's demand for skilled human resources and aspirations towards sustainable growth, a centrally sponsored scheme of vocationalisation of secondary and higher education was introduced by the Ministry of Human Resource Development in 2012 and updated in 2018.

The Pandit Sundarlal Sharma Central Institute of Vocational Education (PSSCIVE), an affiliate unit of the National Council of Educational Research and Training (NCERT) and member of the UNEVOC Network, is a centre for research into and the development of vocational education for a range of disciplines in line with India's National Skills Qualification Framework (NSQF).

By promoting learning outcome based vocational curricula, PSSCIVE aims to improve teaching-learning processes and with this employability and vocational skills to support occupational mobility and lifelong learning of India's workforce. The National Curriculum is developed by expert groups, made up of leading academics, professionals, policymakers, partner institutions, VET experts, industry representatives and teachers.

The agri-food industry employs roughly 44% of India's workforce, the majority of which have not received formal or informal training. The Department of Agriculture at PSSCIVE has developed several Agriculture and Food Processing courses for occupations such as, Micro-irrigation Technician, Vermicompost Producer and Bamboo Growers, which are now being taught by vocational schools across different states. As well as teaching technical knowledge and the skills needed to produce good quality vermicompost using earthworms, food materials and vermicomposting techniques, the Vermicompost Producer course, for example, teaches communication, self-management and basic digital skills.⁷⁹ The PSSCIVE is also working to integrate green skills across other disciplines under a set of general employability skills applicable to all sectors.

With the introduction of courses like these, PSSCIVE intends to increase India's share of the global food trade while prioritising sustainable approaches and the opportunity for women to play a greater role in the agriculture and food processing sectors.⁸⁰



Photo by Tima Miroshnichenko

5. CLOSING THE SKILLS GAP: RECOMMENDATIONS

With high quality teaching and learning at its core, VET can help to drive skills development for the circular economy when underpinned by effective policies, funding, leadership and the participation of a range of stakeholders from economy, policy, research and education, and civil society. Key recommendations for these groups include the following:

INDUSTRY

- Use knowledge on the skills needed for circular strategies in your industry to be a solution-driver in the **co-design and validation** of new VET training and curricula that can meet industry requirements across the value chain.
- **Collaborate with education in real-time** so that new training provision can be developed in parallel with innovations coming onto the market. Industry can also play a role in identifying the skills needed in emerging industries.
- Make your **workplace a place for lifelong learning and continuous skills development**. This could include providing placements for VET students, embedding the latest VET offers and modules into existing training pathways in your company, and, where appropriate, acting as a demonstrator of innovation processes or technologies used in your workplace to encourage knowledge exchange with educators.
- Ensure **managers and team leaders are also upskilled** so that you can make the most of your workforce's skills.
- Be **transparent about the skills and job profiles** you require to implement circular strategies to help strengthen policy development, skills data and labour market information systems.
- **Collaborate with different industry sectors** to generate new skills for energy efficiency and reuse of materials together, developing and improving industrial symbiosis activities across sectors and along the value chain.

GOVERNMENT

- Be clear on the skills and labour demands of targets set, **ensuring changes in industrial policy are reflected in education** and skills development provision and their required investment.
- Advocate for **coordination between agencies** to ensure all roadmaps and policies in the pursuit of environmental goals are aligned with skills and wider economic development policy.
- Provide **targeted skills development** options for SMEs, informal workers and people experiencing long periods of unemployment who will not have as ready access to training and upskilling opportunities.
- Encourage **data driven decision making** from comprehensive datasets. Train leaders and changemakers to incorporate this into their day-to-day work.
- Establish **partnerships and funding** for data infrastructure to strengthen labour market information systems to enable more efficient matching and a clearer understanding of where skills gaps exist and need to be closed. To do this, **encourage collaboration** between **public employment services** and **private job platforms**, as done by Werk.NL in the Netherlands.
- Create the enabling environment for **high quality career guidance** through public employment services. Utilise the latest data and developments in skills to ensure the demands of the labour market are met and careers in the circular economy are accessible.
- Make commitments to **building back better** from the covid-19 pandemic, recognising the role of VET as well as the necessity of the circular economy, in ensuring a **durable, resilient recovery**.
- Provide monetary contributions that **support or stimulate VET**, including encouraging **private investment** and seek to develop **public-private partnerships** in VET.⁸¹

EDUCATION AND TRAINING PROVIDERS

- Work with **industry and research as knowledge partners** on learning for the circular economy, to improve the quality of teaching provision and ensure incremental advances in practices and technologies are reflected in new or augmented curricula and in work learning frameworks.
- Work with companies across industries where multi-skilled and interdisciplinary work is becoming the norm to understand how to accommodate this need in **interdisciplinary learning and courses**.
- **Take advantage of existing resources** developed under sectoral industry alliances and blueprints for green- and circular economy-related skills development and future education by organisations like UNESCO, the OECD and ERASMUS+.^{82 83}
- Support new VET qualifications and pathways to be translated into professions that contribute to the circular economy into **high quality careers guidance** for workers of all ages and positions along value chains.
- Utilise up-to-date skills data and labour market information systems where possible to increase the relevance of training provision to industry and forecast skills demands.
- Create **new (digital) learning arrangements and tools** that combine online learning with on-the-job and workplace-oriented learning.
- Create and support **civil society and adult learning possibilities** to ensure circular economy skills development in all societal sectors.
- Facilitate a **systems-level revisioning** of VET, ensuring that VET systems do not merely exist to satisfy economic demands, but also generate new workers and entrepreneurs with the know-how to spark a new economic model rooted in principles of sustainability.⁸⁴

CIVIL SOCIETY AND SOCIAL PARTNERS

- Approach the circular economy as a **collective endeavour with industry, policy, science and education**, the success of which will be underpinned by new mindsets and social practices that civil society can play a key role in steering and facilitating.
- Facilitate the **co-development of new qualifications and curricula** by industry and education, where possible using participatory approaches to involve workers in the design process too.
- Ensure **structural industrial changes and commitments** towards sustainability are reflected in training and education provision and the outcomes of skills development are reflected in fairer salaries and working conditions.
- Facilitate **access to training and upskilling for workers**, including targeted support for SMEs, informal workers and other groups that may miss out on training provision.
- Push for more **comprehensive and reliable labour market information systems** and utilise this data to match workers, in sectors undergoing changes or where appropriate, to new occupations that contribute to the circular economy.
- **Recognise and valorise**, both culturally and materially, the skills of VET workers, and **incentivise policies** that dedicate resources to VET training.

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