

**Closing the institutional gap:**

**Perspectives on the circular economy  
from selected African TVET institutions**



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### Contributor

Circle Economy is a global impact organization. It empowers governments and industry with practical and scalable solutions to put the circular economy into action. Its vision is an economic system that ensures the planet and all people can thrive. Its goal is to double global circularity by 2032. The Circular Jobs Initiative aims to ensure the transition to the circular economy is favourable for work and workers.

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## Executive summary

The circular economy is a model of production and consumption that aims to minimize waste and promote the sustainable use of natural resources through innovative product design, longer use, recycling and other interventions, as well as to regenerate nature. Fundamental principles of the circular economy concern designing out waste, regenerating ecosystems and keeping items in use (European Parliament, 2023).

Transitioning to a circular economic model has gained traction as a viable long-term means to eliminate social shortfalls and avoid deepening ecological crises. With a just transition to a sustainable future for all in mind, the circular economy can, if managed well, deliver various benefits across environmental, social and economic indicators. For example, by fulfilling societal needs with fewer materials, the circular economy can bring multiple environmental benefits, such as fewer greenhouse gas emissions, less pollution, cleaner water and air, and safeguarding biodiversity and nature. Additionally, the circular economy is a labour-rich model and, therefore, will provide new work opportunities to populations around the globe. Businesses that adopt circular approaches can enjoy financial benefits, competitive advantage, access to new markets, improved customer relations and increased brand value (Circle Economy, n.d.). Research from the Ellen MacArthur Foundation (2015) estimated that a global circular economy could offer a net annual benefit of €1.8 trillion in the European Union (EU) alone.

The global workforce needs to adopt greener and more sustainable practices. While there is consensus that technical and vocational education and training (TVET) systems will play a crucial role in the circular transition, mainly by equipping and upskilling professionals in sectors such as waste management, construction, agriculture and manufacturing, and that green and circular skills need to be embedded within TVET, many TVET institutions face obstacles that limit their ability to integrate these skills appropriately and effectively.

This study, commissioned and led by UNESCO-UNEVOC, analyses the main barriers and enablers to mainstreaming aspects of the circular economy in the curricula and training of TVET institutions and developing the knowledge and skills needed to make the value chain of jobs and occupations circular. The goal is to inform and push the global discourse towards enhancing TVET's contribution to the green transition and spotlight lessons relevant to the international TVET community.

The study examined TVET curriculum planning and delivery in three countries: Ghana, Kenya and South Africa. It involved a sample size of 27 different actors, relevant bodies and institutions of TVET that helped estimate the current status quo and identify areas of future action. Based on the results gathered, the report highlights that while TVET training providers (universities, research or training centres) consider the circular economy relevant to their country's labour market and TVET training provisions, their current understanding and integration of circular economy themes in their teaching is comparatively low in relation to their perceived potential impact. A second finding is that there is a disconnect between the current perception of the impact of a circular economy on the labour market and the actions required to mainstream circularity aspects in curricula. Furthermore, despite their acknowledgement of the importance of circular economy topics within curricula, over half of TVET authorities (ministries or national bodies) recognize that current TVET regulating measures or guidance frameworks do not adequately support TVET providers to adopt practices in the delivery of curricula content that reflect circular economy principles and ideas. These findings indicate that the circular economy is still emerging as a priority within the political environment in which many TVET authorities operate.

Overall, the study brought to light the need to close the institutional gap by building the capacity of both TVET institutions and stakeholders within the enabling environment in which they operate. Specifically, industry and national governments play a critical role in terms of governance of TVET and curricular enhancements to mainstream circular economy-related skills and competencies in TVET. This extends to clearly identified and shared information on what and how occupations will be affected, the scope of skills that can enable circular approaches, the early exposure of learners to deal with work-related tasks and the curricular contents that can support learning about how economies can shift to circular models.

The study reveals four key factors that play a crucial role in driving the integration of skills and competencies for the circular economy in TVET: 1) policy and regulatory frameworks, 2) industry engagement and partnerships, 3) curriculum development and updates, and 4) TVET authorities and industry stakeholders working together to identify and encourage public and private investment in TVET. This report outlines the key factors and demonstrates the role that stakeholders and institutions can play in making the changes necessary to overcome limitations and realize TVET's capacity to react to labour market needs and, thus, deliver the upskilling required for the circular transition.

## Introduction

Globally, 100 billion tonnes of materials are consumed annually, of which nearly 90 per cent become waste (Circle Economy, 2022a). With a global population due to reach 10 billion by 2050, current production and consumption patterns are unsustainable. A major systemic shift is needed to bring economic activity in line with planetary boundaries while meeting social needs (Raworth, 2015).

There is an increased global action to achieve circular economy. Circularity is becoming an established principle driving many to improve their management of waste, pollution, resources and climate change (Lattimore, 2022). The circular economy agenda is being formulated and executed locally, which could impact employment and global value chains. Moving toward a more circular economy could increase competitiveness, stimulate innovation, boost economic growth and create jobs (700,000 jobs in the EU alone by 2030, it is estimated<sup>1</sup>). There are also clear incentives for companies and industries to move towards circularity, such as the need to increase resilience against external shocks and the growing role that sustainability and ethics play in shaping consumer demand (Circle Economy, 2020). While these are applicable globally, the circular economy is poised to play a particularly crucial role in delivering economic growth, creating jobs and driving positive environmental outcomes in countries in the Global South.<sup>2</sup>

To keep up with and take advantage of the employment and innovation potential of the circular economy, education and training provision needs to be able both to adapt to and to anticipate future needs. Continuous updates in teaching and training that match technological and material advances are required to ensure they reflect current skills needs. With the right skills, workers – as experts in 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. Therefore, adopting the circular economy will shape the demand for skills and depend on the skills available in the labour market (Circle Economy, 2021).

### Box 1: What is the circular economy?

The circular economy is an economic system where waste is designed out, everything is used at its highest possible value for as long as possible and natural systems are regenerated. The concept of circularity closely mimics nature, where there is no waste: all materials have value and are used to sustain life in a myriad of ways. If we effectively deploy these strategies, we will ultimately require fewer materials to provide for similar societal needs.<sup>3</sup> The circular economy departs from the traditional, linear economic model based on a take-make-consume-throw away pattern.

Besides helping tackle the problem of pollution, a circular economy can play a critical role in solving other complex challenges, such as climate change and biodiversity loss (ILO, 2019).

The circular economy is applicable across all sectors and industries; however, the concept may be particularly salient for fields identified as central to the green transition: energy; environmental goods and services (including water and waste management); construction; manufacturing; agriculture and forestry; transportation; tourism; and extractive industries.

1 Data retrieved from the European Parliament Website, available at: <https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits>

2 (N.d.). Retrieved from ACEA's Website, available at: <https://www.aceafrica.org/about-acea>

3 Retrieved from Circle Economy's website, available at: <https://www.circle-economy.com/circular-economy/what-is-the-circular-economy>

The circular economy is based on four fundamental principles<sup>4</sup>:

- Narrow flows – Use less resources;
- Slow flows – Use resources for longer;
- Regenerate flows – Use cleaner resources;
- Cycle flows – Use resources again.

TVET systems, comprising education, training and skills development relating to a wide range of occupational fields, production services and livelihoods (UNESCO, 2023), can play a crucial role in the circular transition by supporting the creation of a global workforce that has the knowledge and capacities for more sustainable practices (Circle Economy, 2021). There is a substantial body of literature documenting the skills required for the circular economy that need to be embedded within TVET (ILO, 2022).

**However, global research indicates that despite the generally recognized importance of green skills and skills for the circular economy, many countries have yet to integrate these concepts within their TVET curricula.** In a study by UNESCO, fewer than half of the 100 countries mentioned climate change or environmental themes in their curricula (UNESCO, 2021). Where these themes were in the process of being integrated, ensuring relevant and up-to-date curricula within the fields of study was also a key issue. **Many TVET institutions face barriers that limit their ability to incorporate circular skills into their curricula and effectively contribute to the circular transition.** The institutional gaps TVET institutions face are particularly pronounced in countries in the Global South (World Bank et al., 2023), where access to resources and funding may be limited. Addressing these gaps is essential for these countries to realize the full benefits of the circular economy.

## Purpose of the study

Through an analysis of three countries, this report seeks to contribute to existing knowledge and inform the global discourse on how to close the skills gap for the circular economy. The study focuses on institutions from Ghana, Kenya and South Africa, three countries that, according to the review of relevant literature, could benefit significantly from circular economy development. In these countries, diverse types of TVET systems incorporate efforts to upskill their educators to enable the circular transition. The unique perspectives these countries could bring to the research are highly valuable in ensuring cross-national comparability for this study. This study seeks to identify enablers and barriers that influence the ability of TVET institutions in these countries to integrate skills and competencies for the circular economy in their curricula. It also aims to discover what emerging skills and sectors for the circular economy are particularly relevant. The insights obtained from these countries are also intended to create lessons for the international TVET community.

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<sup>4</sup> Ibid.



## Methodological approach

A review of existing literature and a survey were carried out to better understand the current needs and opportunities in economic sectors, as well as the perspectives of TVET institutions on integrating the circular economy in the curricula in the selected countries. Survey questionnaires were administered to institutions in Ghana, Kenya and South Africa, comprising TVET training providers (university, research or training centre) and TVET authorities (ministry or national body). In total, 27 respondents across 17 institutions (11 training providers and 6 TVET authorities) answered the questionnaire, with a reasonably even distribution,<sup>5</sup> comprising:

- 3 training providers and 2 TVET authorities from Ghana;
- 5 training providers and 2 TVET authorities from Kenya;
- 3 training providers and 2 TVET authorities from South Africa.

The training providers were selected on the basis of their relevant engagement on the subject matter, as evidenced by the forms and orientation of their work on greening TVET and curricula. UNESCO-UNEVOC recently supported some of those institutions in strengthening their knowledge of the circular economy principles and their application.<sup>6</sup>

### Box 2: The potential benefits of the circular economy in Ghana, Kenya and South Africa

In 2020, the European Commission developed a series of studies on how cooperation between Europe and Africa can be fostered and adapted to accelerate the uptake of circular practices and promote the shift to the circular economy (Rademaekers et al., 2021).

According to the results of their studies, the transition to a circular economy can benefit the three study countries as follows:

- **In Ghana**, by 2030, the country could benefit from a 1.9 per cent increase in GDP; 61,000 new jobs could be created (+0.3 per cent compared to business as usual), and increased waste collection and recycling activities could strengthen the economic position of (informal) waste workers. By transitioning to a more circular economy, the country could benefit from reduced emissions to air (especially greenhouse gas emissions), improved air quality due to a lower degree of open burning of waste, lower influx of terrestrial waste into marine environments, water/resources/energy savings in production processes and a reduction in the amount of mismanaged waste. The most significant employment increases could occur in agriculture, education, health and other services (including waste management), financial intermediation and business activities, and post and telecommunication (Hemkhaus et al., 2020).
- **In Kenya**, the transition to the circular economy could potentially lead to a 0.5 per cent increase in GDP; 46,000 additional jobs could be created compared to business as usual, equivalent to a rise in the national level. Additionally, increased waste collection and recycling activities could strengthen the economic position of (informal) waste workers, while attention to capacity building and training could also ensure that they will benefit from the circular transition. The most significant employment increases could occur in agriculture and the construction sector, though some minor job losses could occur in petroleum, chemicals and non-metallic mineral products (Karcher et al., 2020).
- **In South Africa**, the circular economy's uptake could lead to an increase in economic activity (+0.8 per cent of GDP) and create additional jobs (226,000 additional jobs would be created, which is equivalent to an increase of 1.3 per cent), while leading, in the short term, to a slight, related growth in national CO<sub>2</sub> emissions. Most additional jobs in the circular economy scenario would be seen in the waste management and construction sectors (Potgieter et al., 2020).

<sup>5</sup> A detailed list of the names and profiles of participating institutions is provided in the acknowledgements section.

<sup>6</sup> For more information about the initiative, please check UNESCO-UNEVOC's website: <https://unevoc.unesco.org/home/Building+skills+for+the+green+and+circular+transition>

The study's findings are based on the authors' analysis of responses generated from 27 respondents who represented 17 institutions in Ghana, Kenya and South Africa. Most of the answers came from public institutions. Additional data were gathered from desk research and cross-comparison of institutional and economic contexts, drawn from the available data collected for the study of the three countries.

## Relevance of skills for the circular economy

Greening TVET involves incorporating principles of sustainability, environmental protection and green technologies into the curriculum and practices of TVET institutions. The UNESCO Strategy for TVET 2022–2029 highlights the critical importance of developing the skills needed for inclusive and sustainable economies, which is the foundation of advancing the agenda for greening TVET and promoting education for sustainable development (ESD). Green mindsets and skills must be fostered directly in the classroom, and this requires an investment in resources, such as suitable training equipment, teacher training, resource libraries and more.

One critical pathway to greening TVET is developing and promoting skills for the circular economy. The skills needed for the complementary green and circular economy transition cover a range of shared competencies and are oriented toward realizing equitable, sustainable futures. However, for this report, skills for the circular economy denote a narrower domain of capacities, namely, skills that can be applied directly or indirectly to processes or business models involved in closing material production and consumption loops. Therefore, skills for the circular economy include technical expertise and the transversal skills that enable interdisciplinary working and promote the qualitative mindset changes and behavioural shifts needed for industries and institutions to operate in ways that design out waste, regenerate ecosystems and keep items in use. These skills are necessary for the long-term transformation of social practices, encouraging the longevity and optimization of resources and re-framing prosperity in line with sufficiency.

As part of this study's questionnaire, the current level of awareness of the impact, relevance and importance of the circular economy was assessed in the three countries. The responses indicate that most TVET providers anticipate that the circular economy will have a significant impact on their country's labour market (Figure 1) and expect TVET training provision to be substantially affected by the circular transition (Figure 2). However, TVET providers assessed their current understanding (Figure 3) and integration (Figure 4) of circular economy themes in their teaching as comparatively low. These data are also confirmed by the fact that two-thirds of the surveyed TVET providers were unsure whether there is a national policy, strategy or guidelines on TVET and the circular economy in their countries.

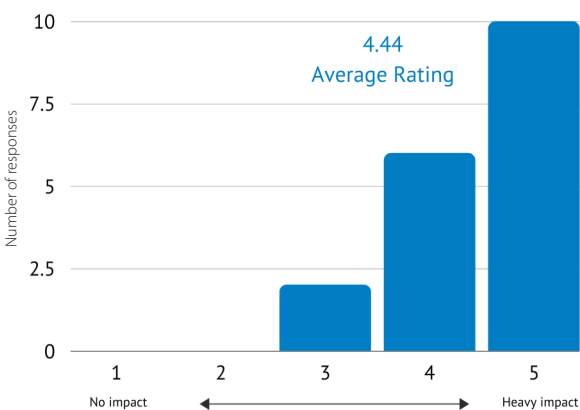


Figure 1: Perceived impact of the circular economy on the countries' labour market (aggregate), TVET institutions' perspective

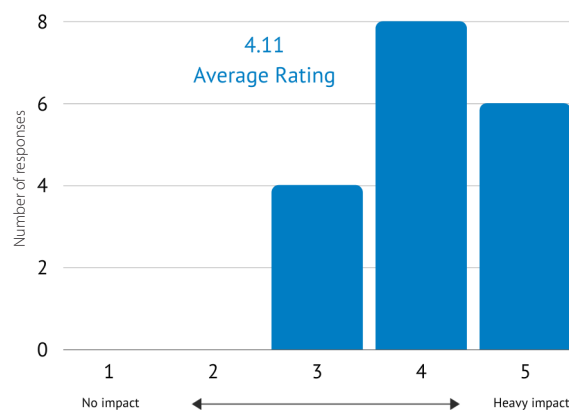


Figure 2: Perceived impact of the circular economy on the countries' TVET training provision (aggregate), TVET institutions' perspective

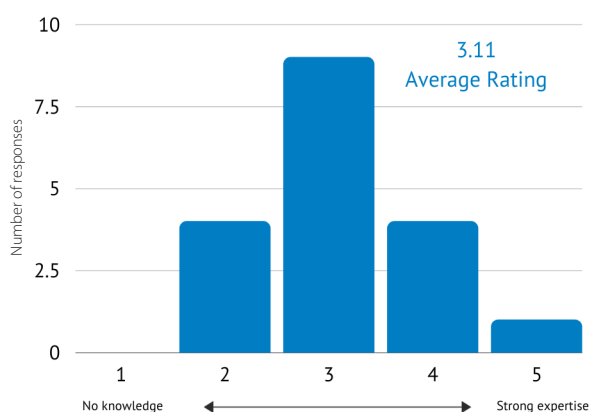


Figure 3: Perceived level of knowledge of circular economy principles and concepts (aggregate), TVET institutions' perspective

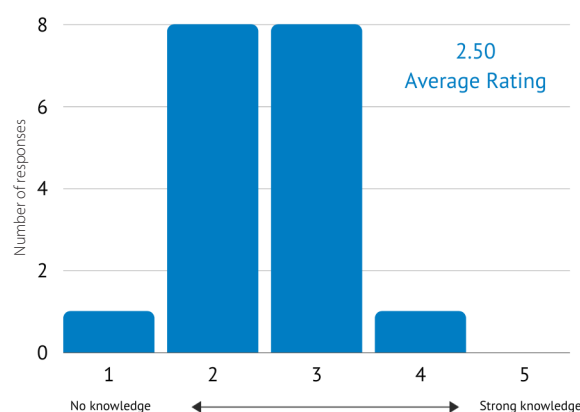


Figure 4: Perceived level of integration of circular economy in teaching and learning (aggregate), TVET institutions' perspective

### Box 3: Skills for the green transition

Managing the green transition requires not only skills and competencies but also the knowledge, abilities, values and attitudes needed to live, work and act in resource-efficient and sustainable economies and societies. They are:

- technical: required to adapt or implement standards, processes, services, products and technologies to protect ecosystems and biodiversity and to reduce energy, materials and water consumption. Technical skills can be occupation-specific or cross-sectoral;
- transversal: linked to sustainable thinking and acting, relevant to work (in all economic sectors and occupations) and life. Alternatively referred to as 'sustainability competencies', 'life skills', 'soft skills' or 'core skills'.<sup>7</sup>

Circularity is one of the key skills for the green transition, as it aims to close production and consumption loops, aligning economic activity with environmental sustainability and social equity.

According to the data gathered from the survey, there is a significant disconnect between the perceived impact of the circular economy on the labour market and the actions that are being taken to integrate circularity within curricula, as well as to expand the level of knowledge and competence on circular economy application among TVET providers. The disconnect may be explained by certain inhibitors, such as those revealed in a study of cases in the Netherlands (Hamida et al., 2023) that highlighted the low adoption of the circularity approach in spite of the perceived needs and their importance. A lack of information, the technical complexities associated with the required action, low levels of expertise on the subject matter and conditions unconducive to innovative solutions were among the observed common barriers to implementation. Such barriers could be present in institutional environments, particularly where adoption involves new and emerging topics that have neither been fully explored nor dealt with. This finding also highlights the need to close the institutional gap by building the capacity of TVET institutions and changing the ecosystem in which they operate. The main takeaway is that although interviewed TVET institutions appear not to have a full understanding of the circular economy and its principles, they still believe that it will play a relevant role in their respective economies and that it would be worth investing in preparing for the circular transition at institution level.

<sup>7</sup> Source: Based on the definitions of the members of the IAG-TVET working group on work-based learning, as agreed in 2022. Available at: <https://www.cedefop.europa.eu/en/publications/2232>

As for TVET authorities, most of those surveyed believe that the circular economy is currently not relevant in their country’s labour market (Figure 5), but that it will have a significant impact in the future (Figure 9). Nevertheless, it is essential to highlight that, in some cases, there are differing perspectives as to the relevance of the circular economy among TVET stakeholders within the same institutions. For instance, one TVET authority stated, ‘It seems a bit like a “first world problem” that needs to be addressed more in the US and Europe than in a developing context ... which is already quite frugal in many ways’. However, another respondent within the same institution pointed out that they ‘definitely see the relevance of the circular economy’ in their context.

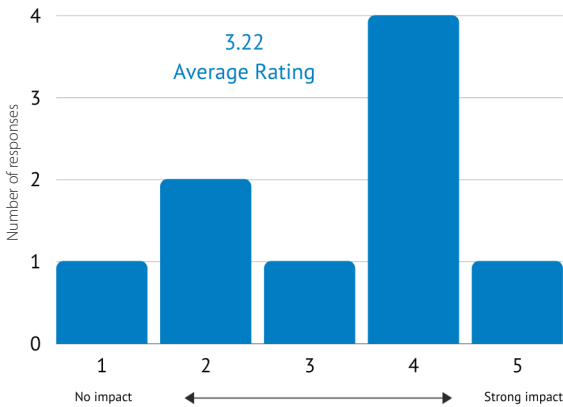


Figure 5: Perceived impact of the circular economy on the countries' labour market (aggregate), TVET authorities' perspective

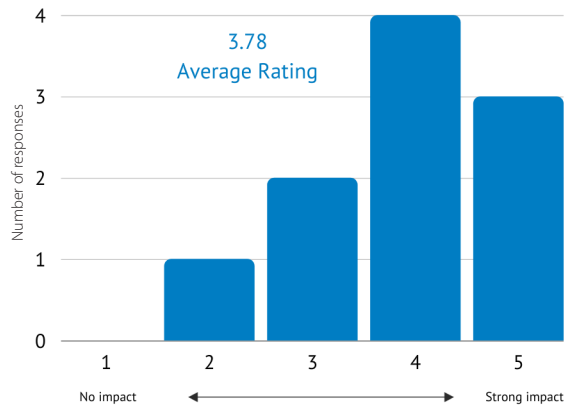


Figure 6: Perceived impact of the circular economy on the countries' TVET training provision (aggregate), TVET authorities' perspective

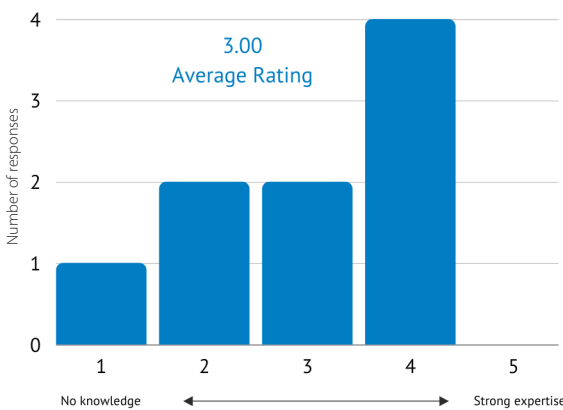


Figure 7: Perceived level of knowledge of circular economy principles and concepts (aggregate), TVET authorities' perspective

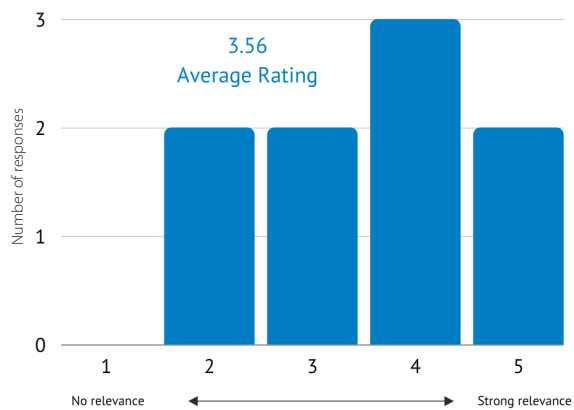


Figure 8: Perceived current relevance of the circular economy on the countries' economies (aggregate), TVET authorities' perspective

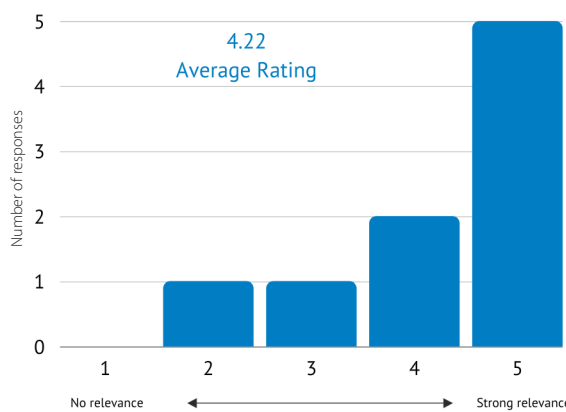


Figure 9: Perceived future relevance (within the next 5 years) of the circular economy on the countries' economies (aggregate), TVET authorities' perspective

Although TVET authorities in Ghana, Kenya and South Africa felt it was important for TVET providers within their countries to teach about the circular economy, not all authorities have a complete or sufficient overview of the number of TVET providers that have incorporated circular economy contents in their curricula or the range of curricula or standards that are implemented. This finding highlights a limitation in TVET authorities' knowledge of the coverage of curricula for the different fields of study offered in TVET institutions. Furthermore, despite their acknowledgement of the importance of circular economy topics within curricula, over half of TVET authorities surveyed recognize that current TVET regulating measures or guidance frameworks still do not adequately support TVET providers to adopt changes in the existing curricula, including topics linked to teaching circular economy principles. So far, the primary support from authorities to TVET institutions has been via training and awareness-raising (seminars, events and training to promote the idea of the circular economy). Responses indicate that efforts are also limited on the policy development and regulatory fronts, for example, in training regulations, national policy and relevant supporting guidelines, suggesting that the circular economy is still emerging as a priority within the political environment in which many TVET authorities operate.

## Emerging skills and competencies for the circular economy – overall and within sectors

### *Skills and competencies for the circular economy*

Based on the data collected, the relevance of circular practices across different industries is deemed a key driver for TVET institutions in integrating circularity into their curriculum. The transversal nature of the circular economy and the importance of putting transversal skills into practice are underpinned by this perspective. Transversal skills are 'skills that are typically considered as not specifically related to a particular job, task, academic discipline or area of knowledge and that can be used in various situations and work settings' (UNESCO, 2014). They may include digital skills, social skills, personal skills and methodological skills, which 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. Transversal skills are considered the 'magic glue', as they connect, reinforce and develop other skills (UNICEF, 2019). Closely related to transversality, the study revealed that most survey participants consider adaptability – the ability to transfer new technologies and processes to different environments – the most critical competency for a TVET learner. This finding corroborates the results of other research, which found adaptability and skills transferability as essential for raising the employability of workers in different sectors and increasing labour mobility and the rate of labour market recovery after a period of shock (Circle Economy, 2021).

The transition towards a circular economy requires diverse skills and new combinations, including transversal and technical or specialist skills. In light of this, the T-shaped skills approach (Figure 10), introduced in this context by Circle Economy in 2022, provides a helpful framework for illustrating how specialist and transversal skills can be combined in an interdisciplinary labour market. The vertical bar of the T represents deep specialist skills, while the horizontal bar represents the transversal skills used to collaborate across disciplines. Examples of sector-specific specialist skills, in agriculture, for instance, include the design, managerial and technological capacities to apply new technologies and the specialist knowledge required by agricultural meteorologists (ILO, 2019).

Examples of transversal skills in a circular context include creativity and interpersonal and communication skills, which may foster behavioural and cultural shifts towards circular principles, as embodied in the 10R and key elements framework<sup>8</sup> (Circle Economy, 2019).

<sup>8</sup> The 10R framework is one of several frameworks that are commonly used in circular economy. It includes Refuse, Reduce, Rethink, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle and Recover. The key elements framework, as described by Circle Economy is a conceptual framework of eight elements of circularity that can be applied at different intervention levels.

Responses from the survey reinforce this vision. As figures 11 and 12 show, when asked about the most critical competencies for a circular learner, apart from adaptability, TVET providers mainly highlighted the importance of transversal skills, such as entrepreneurial skills to seize the opportunities of low-carbon technologies, innovation skills to identify opportunities and create new strategies to respond to green challenges, strategic and leadership skills, environmental awareness and willingness to learn about sustainable development and networking, IT and language skills. TVET authorities, on the other hand, mainly underlined the importance of technical skills, such as repairing, remanufacturing and maintaining competencies, knowledge of resource utilization and recycling, and mastery in specific areas (e.g. waste management or renewable energy).

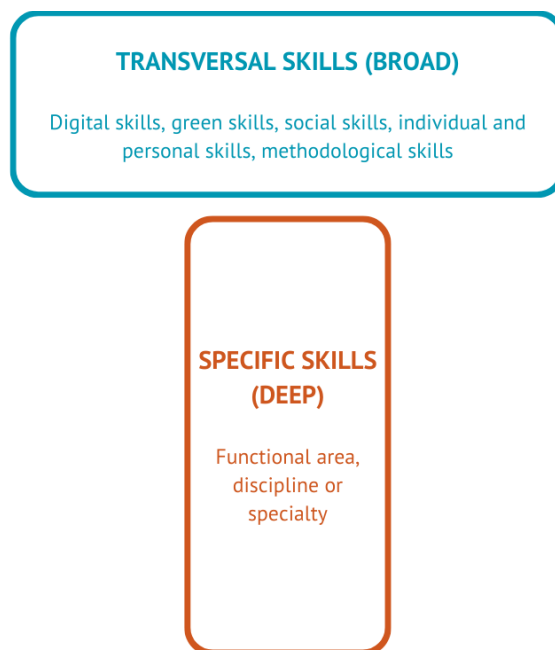


Figure 10: T-shaped skills approach

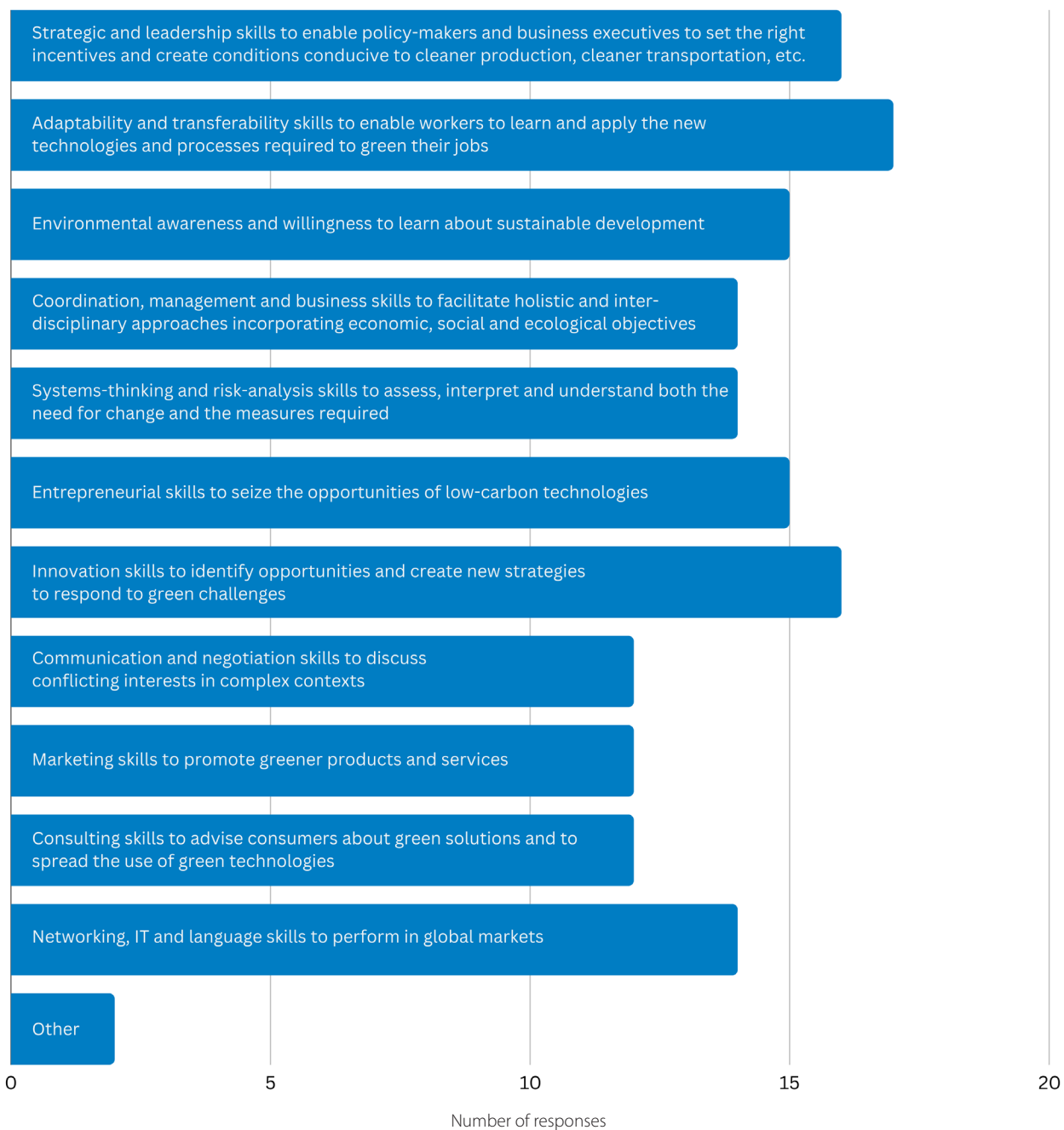


Figure 11: Critical skills, competencies and new qualifications that need to be developed and embedded in the design or delivery of more circular TVET curricula, TVET authorities' perspective.

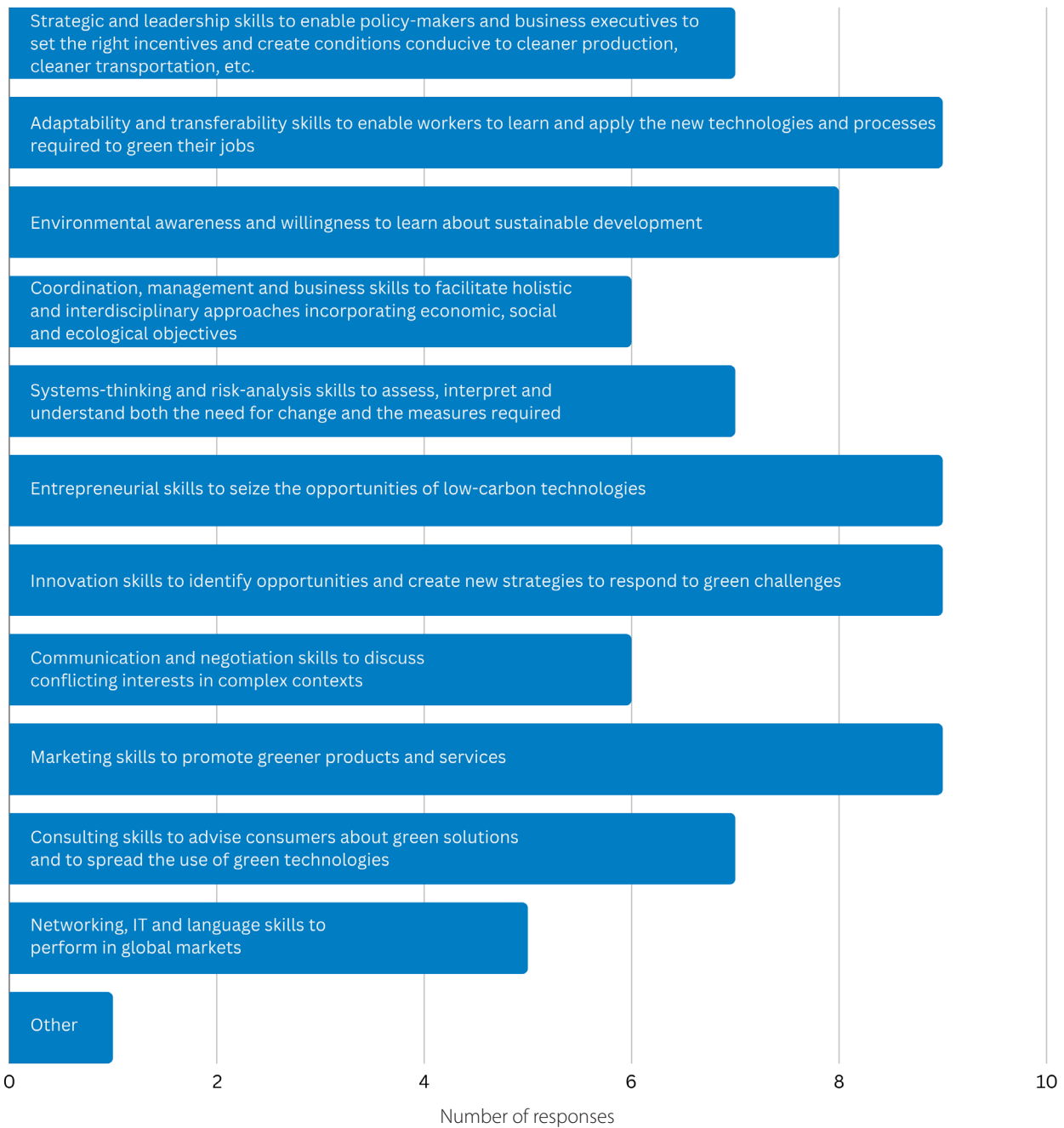


Figure 12: Critical skills, competencies and new qualifications that need to be developed and embedded in the design or delivery of more circular TVET curricula, TVET institutions’ perspective



## Emerging sectors and disciplines relevant to the circular economy

This section provides an overview of the sectors and disciplines that are key in the selected countries to the transition to the circular economy: agriculture, construction, manufacturing and transportation (Circle Economy, 2023). The importance placed on adaptability by the questionnaire respondents is also highly relevant because the transition to the circular economy will cause the transformation of many jobs and, consequently, require workers to adapt to new demands in the labour market. TVET can play a significant role in the sectors that will change, as it can support the upskilling of professionals in green job sectors and the re-skilling of those affected by job losses due to the green and circular transition, as well as equipping students with the competencies and mindset requested by the future labour market.

### Agriculture

Agriculture is a highly critical sector – globally and within the three countries on which this study focuses. It employs more than 40 per cent of Kenya’s population, contributes 54 per cent of Ghana’s GDP and represents a significant share of South Africa’s national exports.<sup>9</sup> Dominant linear value chain agricultural practices such as monoculture cultivation, as are high emissions and soil degeneration threaten biodiversity and ecosystem functions (Rosenberg et al., 2016). However, global agricultural production must increase by 70 per cent by 2050 to meet food demand, posing a key challenge for sustainable resource management and land use. The circular economy could play a role in mitigating these impacts and promoting food security and economic development. The circular economy can positively impact people, the planet and businesses by applying three principles in the agri-food industry: elimination of waste through food loss reduction, preservation of materials in use through food waste valorization and regeneration of natural systems through regenerative food production. A fundamental circular economy principle for the sector is to maximize efficiency in material loops, thereby eliminating negative environmental externalities. In an agricultural context, this principle could guide practices to prevent soil and water contamination driven by the inappropriate use of chemical fertilizers and the overexploitation of water bodies (Christensen et al., 2020). In addition, the circular economy’s focus on regeneration is highly relevant to agriculture and is already reflected in regenerative agriculture practices aimed at enabling natural ecosystem reciprocities (Colley et al., 2020).

Acknowledging the vital role that the agri-food sectors play in their countries’ economies, a significant proportion of the TVET providers participating in this study indicated that they are already integrating circular economy principles in their agriculture courses. For example, South Africa significantly focuses on hydroponics and aquaponics to respond to changing water availability. TVET authorities also highlighted agriculture as one of the fields where the circular economy can have a substantial impact and should be prioritized. TVET training providers and authorities agree that agriculture will be one of the main sectors in which transitioning to a more circular production model can foster women’s entry to the labour market in the three countries surveyed.

With regard to its role in fostering circular skills and knowledge for the agriculture sector, TVET can promote adaptability and related transversal skills, fostering a culture of openness to adopting new technologies and organic farming techniques. TVET must also update curricula to include the technical proficiency required for crop diversification (ILO, 2019). The FAO (2018) emphasizes that to build more circular economies, technological integration in agriculture is a fundamental principle, as it can support farmers in finding ways of producing more food in a manner that is more profitable while also having a less detrimental impact on the natural environment. TVET systems can respond to these needs through greater integration of new technologies and by teaching precision farming, micro-irrigation, vertical farming and the use of digital technologies, such as mobile phone apps which are commonly touted as potential solutions to pressing challenges facing agriculture (Brown and Majumdar, 2020).

<sup>9</sup> Data retrieved from FAO (Food and Agriculture Organization of the United Nations) country profile database available at: <https://www.fao.org/countryprofiles/en/>

#### Box 4: Agriculture and the circular economy in Ghana

Agriculture is one of the key sectors in Ghana and is critical in supporting the economy and livelihoods of a significant population (World Bank, 2018). Currently, the sector contributes 18.8 per cent of the national GDP, employing 39 per cent of the Ghanaian workforce (World Bank et al., 2023).

The circular economy can offer an excellent opportunity to develop the country's agricultural potential. For example, more circular approaches in agriculture could be achieved by optimizing and expanding the use of organic fertilizers, biodynamic farming or permaculture, which would help close nutrient cycles, thus reducing the need for mineral fertilizers (Hemkhaus et al., 2020).

In the first place, the circular economy could support an increased diversity of agriculture and complementary approaches to traditional farming methods, including those that have been handed down over generations and are compatible with the local ecosystem. Support for traditional skills and knowledge further demonstrates that the circular economy is not a new concept but has already been embedded in some Ghanaian societal practices for a long time (ibid.).

Furthermore, with its low yields, Ghana could benefit from opportunities that explore the use of agricultural residues and waste generated in agri-food processing as organic fertilizers and alternatives to chemical fertilizers or as part of energy-recovery solutions. Agriculture waste is conventionally and minimally reused on farms using traditional knowledge without a specific programme or initiative (ibid.).

#### Construction

The built environment – comprising the buildings, roads, infrastructure and other human-made features of our surroundings – uses almost half the materials extracted globally every year and is a significant contributor to greenhouse gas emissions. Current projections estimate that between now and 2060, across the world, the equivalent of the city of Paris will be built each week. How we design, construct and eventually demolish our built environment is entrenched in the linear take-make-waste economy.<sup>10</sup>

By applying the principles of the circular economy to the way we design buildings, infrastructure and other elements of the built environment, we can reduce greenhouse gas emissions while creating urban areas that are more liveable, productive and convenient. A circular economy could reduce global CO<sub>2</sub> emissions from building materials by 38 per cent in 2050 by reducing demand for steel, aluminium, cement and plastic. It could also make the sector more resilient to supply chain disruptions and price volatility of raw materials.<sup>11</sup>

TVET providers participating in this study indicated that they have either already started integrating circular principles in construction and civil engineering (including wood construction) or have plans to integrate circular economy in this field of study. TVET authorities agree on the importance of the construction sector (including wood construction), identifying it (in 80 per cent of responses) as one of the main sectors where the circular economy can significantly impact their respective countries.

The circular economy is very relevant in the construction industry, as it can provide new approaches to creating resource-efficient growth. Circularity in this sector is particularly useful for dealing responsibly with construction and demolition waste (C&DW). Landfilling is still the most common disposal method for this waste category, which comprises approximately one-third of the world's overall waste generation and at least 40 per cent of carbon emissions. There is significant potential for circular economy strategies

<sup>10</sup> Retrieved from the article 'Circular economy in Africa: examples and opportunities. Built environment', from Ellen MacArthur Foundation. Available at: [https://emf.thirdlight.com/file/24/asYhQ-dass1\\_gpBas6Ulatks7Et/%5BEN%5D%20Circular%20economy%20in%20Africa%3A%20Built%20Environment.pdf](https://emf.thirdlight.com/file/24/asYhQ-dass1_gpBas6Ulatks7Et/%5BEN%5D%20Circular%20economy%20in%20Africa%3A%20Built%20Environment.pdf)

<sup>11</sup> Ibid

regarding recycling and closed-loop circulation of resources, which would also capture higher economic value from C&DW (Silva et al., 2016). Despite this potential, technical, behavioural and legal barriers must be addressed (Christensen et al., 2020). TVET may be able to play a role in targeting both technical and behavioural barriers. For example, a key barrier is user preferences due to uncertainty about the performance of recirculated materials. Integrating knowledge about these materials' functionality into TVET construction curricula could promote the confidence needed. In addition, an essential strategy for the green transition and increased circularity in construction is the development of local networks for adequate resource circulation. TVET institutions are well positioned to play a role in developing these challenges, given their close links to different industries.

#### **Box 5: The circular economy and the construction sector in Kenya**

In Kenya, the circular economy has yet to be entrenched as a widespread business driver in the construction industry. To date, a significant amount of waste is generated from the construction, refurbishment, and demolition of buildings. The Kenyan construction sector suffers from significant knowledge gaps when it comes to applying circular economy principles (Karcher et al., 2020).

Fortunately, some recently introduced policy regulations, such as the building code and greening standards, represent progress toward circular economy inclusion (World Bank, 2019).

Despite all the challenges, some construction-related circular economy products and related services are already emerging on the free market. One of these products is the Interlocking Stabilised Soil Block (ISSB), through which Kenya's small-scale builders have found ways to work both crushed glass and shredded plastic waste, as well as agricultural residues, into bricks that are otherwise made mostly from soil and, therefore, provide an attractive alternative to conventional building materials. These building blocks have the advantage that they are cheaper than many conventional construction materials and simultaneously create local employment for companies involved in processing waste materials and manufacturing ISSBs (Karcher et al., 2020).

### **Manufacturing**

The manufacturing sector is probably the one that first comes to mind when talking about the circular economy, as circularity principles can support this field by better using natural resources, increasing resource efficiency and waste prevention, and minimalizing end-of-life disposal of materials (Ekins et al., 2019). This sector is often associated with the idea of recycling (meaning converting [parts of ] products at the end of their lives into new raw materials and feeding them back into the manufacturing value chain of the original product). Nevertheless, other essential circularity principles can lead to a more circular and sustainable manufacturing sector, such as reduce (reducing the number of resources and raw materials required to manufacture the same product with the same level of quality), refurbish/reuse (used products can be refurbished and/or reused as a whole or in part to generate new products as a means of reducing raw material consumption) and recover (when the reuse or recycling of materials or products is not possible, it is essential at least to recover energy directly from the manufacturing process or by incinerating the products) (Kutschera et al., 2021). Challenges and opportunities are likely to vary significantly from one industry to another. Individual assessments and concepts are necessary as there is no one-size-fits-all solution to implementing the circular economy across the manufacturing industry (Ibid.).

TVET providers participating in this study indicated that they integrate circular principles in manufacturing curricula, specifically within the textile sector (42 per cent). One key advantage of applying circular principles in manufacturing is enhancing resource supply security within value chains. Dependency on raw material suppliers will be reduced, increasing resilience and sustainability. Using the example of textiles, minimizing and valorizing post-industrial waste represents another critical area for transformation. TVET curricula can promote this by emphasizing eco-design skills, such as on-demand production. Circular skills are complementary: eco-design would be complemented by extending the lifetime of manufacturing

equipment, which can be fostered by re-framing engineering, maintenance and repair skills. Recycling of post-industrial waste also plays a key role; there are commercially available technologies for post-industrial cotton recycling, which could be highlighted and explored through TVET curricula.

A couple of interesting cases concern refrigeration and air conditioning, and the chemical sector. While TVET authorities envisage that these two sectors will be highly relevant in the future in the three countries, none of the surveyed TVET institutions currently integrates circular economy principles into their chemistry or refrigeration and air conditioning curricula. Additionally, only two institutions have plans to include circularity in refrigeration curricula, while the chemistry sector was never mentioned. These data show that, especially in specific sectors, TVET providers have limited knowledge about the potential application of the circular economy, further confirming their self-assessment.

### Box 6: The plastics recycling industry in South Africa

The plastics recycling industry in South Africa is well-developed. Data from 2020 (Potgieter et al., 2020) show that:

- the plastics recycling industry provides direct employment to more than 7,800 people and creates a further 58,500 income-generating jobs; and
- ZAR 3 billion was injected into the informal sector by purchasing recyclable plastic waste in 2018.

The plastics industry contributes to developing a circular economy in South Africa by mitigating climate change and creating an enabling environment that invests in infrastructure and structural transformation. However, the industry faces challenges in scaling up circular approaches, including operational problems related to energy access (unstable national grid and load shedding) and water scarcity (Ibid.).

Successful examples of enterprises embracing circular approaches are:

- Corruseal, a national manufacturer and supplier of packaging to a wide range of industries across South Africa, uses only recycled PolyEthylene Terephthalate (PET) strapping on their products.
- PALLETPLAST has introduced a lightweight PET pallet made from as much as 97 per cent recycled PET.
- Fair Cape Dairies changed their packaging from a white opaque PET bottle to a clear PET bottle. They also shifted to 100 per cent recycled packaging with little to no impact on the quality of the product or consumer expectations.

Overall, informal waste reclaimers contribute 90 per cent to South Africa's recycling output. Policies and strategies, such as the for *Waste Picker Integration Guideline for South Africa*, underscore how circular economy approaches can build the recycling economy and improve the livelihoods and working conditions of the informal waste sector and better integrate pickers into the country's waste economy (Department of Environment, Forestry and Fisheries and Department of Science and Innovation, 2020). In December 2022, the government of South Africa with the International Alliance of Waste Pickers and other key stakeholders announced the launch of the Just Transition initiative, intended to create decent work opportunities for waste pickers and other workers in the plastic value chain. The initiative aims to guarantee better and decent work, social protection, more training opportunities, and greater job security for workers across all stages of the plastic value chain, including workers in informal and cooperative settings (International Alliance of Waste Pickers, 2022).<sup>12</sup>

<sup>12</sup> Retrieve from "Kenya and South Africa Announce Just Transition Initiative For Waste-pickers & Other Workers in the Plastic Value Chain" from International Alliance of Waste Pickers, available at: [https://globalrec.org/2022/12/02/kenya-south-africa-just-transition\\_wastepickers\\_plastic/](https://globalrec.org/2022/12/02/kenya-south-africa-just-transition_wastepickers_plastic/)

## Transportation

Transportation is a critical sector, with current transport systems accounting for approximately a quarter of global CO<sub>2</sub> emissions. A circular system for the automotive industry could be characterized by five innovations: sharing, electrification, automation, materials evolution and system-level integration of transport modes. Leveraging a combination of these approaches would mean fewer and better-utilized vehicles, reduced congestion, decreased land and investment in parking and roads, and less air pollution. (Ellen MacArthur Foundation, n.d.b.)<sup>13</sup> Circularity within mobility and transport encompasses a range of strategies across both dimensions of the T-skills framework. For example, TVET must integrate new 'deep' technical skills in electric vehicle manufacture and maintenance. Equally important will be the inclusion in the curricula of transversal personal-reflective skills that encourage lifestyle changes, embrace public transport use and reduce air travel.

Africa's automotive industry is not new to the principles of the circular economy, as the market is dominated by used vehicles imported from Europe, North America and Japan. Africa has a thriving culture of repair and refurbishment, aimed at keeping cars in use for as long as possible. Applying circular economy principles to the automotive remanufacturing industry can improve material management strategies, increase resource recovery, and minimize pollution and waste generation.

Investing in the creation of formal automotive refurbishment and repurposing clusters will enhance the recovery rate of materials from end-of-life vehicles (ELVs) and enable local material feed-in mechanisms to prolong the lifespan of vehicles and remanufacture spare parts. These clusters also play a vital role in transferring technical knowledge for repairing, maintaining and repurposing vehicles within the African automotive industry.<sup>14</sup>

The transportation sectors in the three countries face a situation similar to that of the chemistry and refrigeration industries regarding the integration of circular principles. On the one hand, TVET authorities from the three study countries consider the transportation sectors, especially the automotive industry, as one of those sectors that will most likely become particularly relevant for the circular economy in the future. On the other hand, TVET providers participating in this study indicated limited integration of circular principles in transportation and minimal plans for future integration.

## Mapping skills, sectors and job profiles relevant to the circular economy and emerging sectors

The framework of eight key elements developed by Circle Economy (2019) demonstrates how the circular economy is relevant across multiple sectors. The framework outlines three core elements that relate directly to product, material and energy flows – to cycle them to decouple value creation from resource use – and five enabling elements (those that remove obstacles to the implementation of core strategies).

The classification of jobs developed by Circle Economy (2022b) describes three types of circular jobs: core, enabling and indirect circular jobs.

- 1. Core circular jobs are all jobs that ensure the closure of raw material cycles, including jobs in repair, renewable energy, waste and resource management. They form the core of the circular economy.**
- 2. Enabling circular jobs are those that remove barriers for and enable the acceleration and upscaling of core circular activities, including jobs that arise in leasing, education, design and digital technology. They form the supporting shell of the circular economy.**
- 3. Indirect circular jobs are jobs that indirectly uphold the circular economy. These jobs occur in other sectors that do not play a direct role in furthering the transition to the circular economy but can still adopt circular strategies. They include jobs that provide services to core circular strategies.**

<sup>13</sup> Retrieved from the article "Circular economy in Africa: examples and opportunities. Automotives" from Ellen MacArthur Foundation. Available at: <https://emf.thirdlight.com/file/24/neVTuDFne.xQO.GneRm0nd2lyGu/%5BEN%5D%20Circular%20economy%20in%20Africa%3A%20Automotives.pdf>

<sup>14</sup> Ibid.

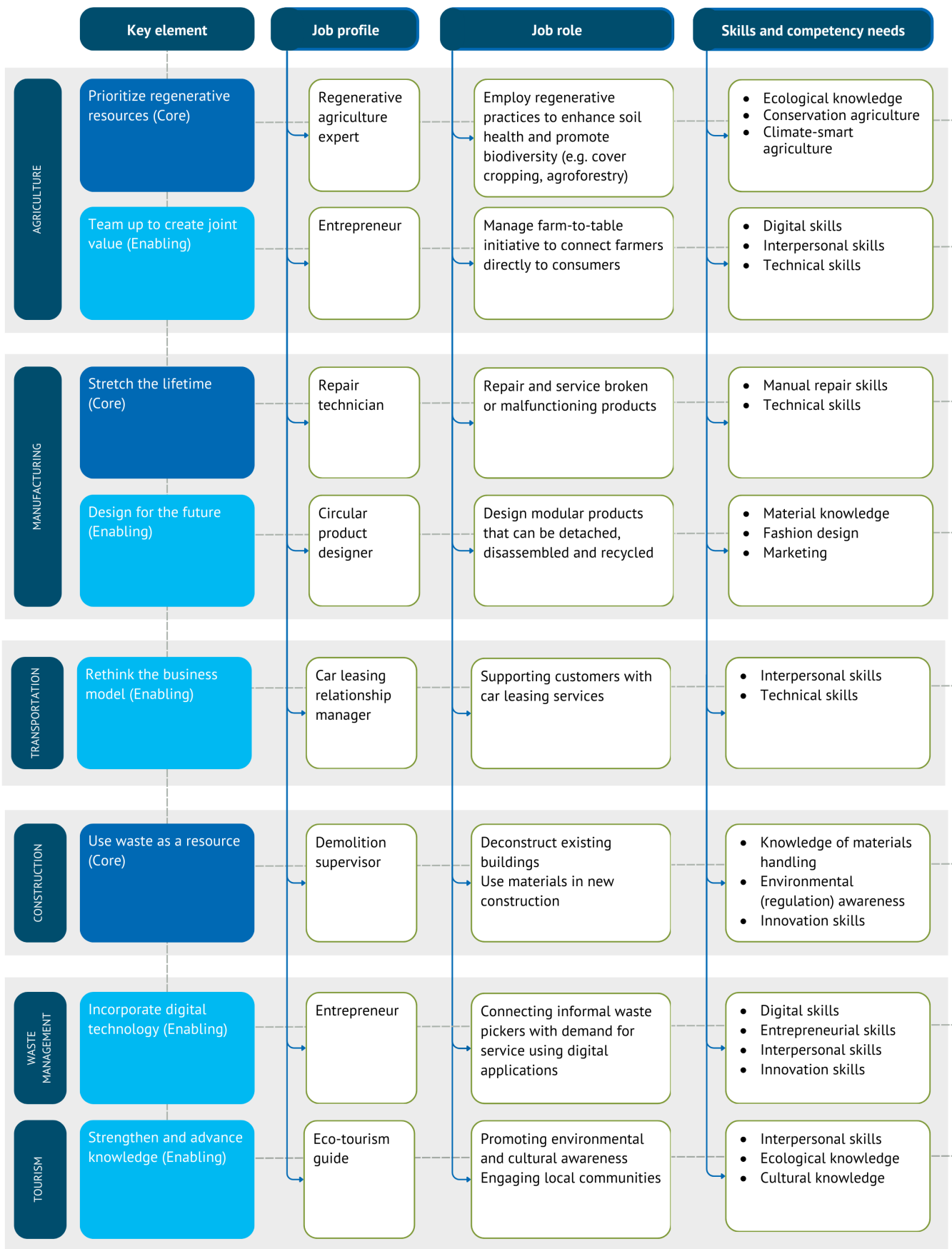


Figure 13: Circular jobs and their classification (Source: Dufourmont and Brown, 2020)

## Measures to integrate skills for the circular economy in TVET

As outlined in the findings of this study, there are two key measures that TVET providers have undertaken to integrate skills for the circular economy in TVET curricula:

- Adapted existing courses to integrate circular approaches across the whole curriculum.
- Developed the skills of teachers and trainers to prepare them to teach about the circular economy.

For instance, within the University of Cape Coast in Ghana, all new TVET programmes include a course on circular economy. In addition, some existing TVET programmes are being modified to include a unit on circular economy. The development of specific training materials and the possibility of workplace learning were also tools employed by TVET authorities for the integration of circularity in TVET curricula.

The actions taken by TVET authorities to support the inclusion of the circular economy in TVET mirror those of the training providers. The main line of action has been to hold seminars, lessons and events to raise awareness among teachers regarding the circular economy, as well as to develop short courses and training materials to enhance the skills of teachers and trainers in the circular economy. In most cases (60 per cent), TVET authorities also directly modified curricula so that TVET institutions could include circular economy principles in their educational offer.

In Africa, there are already promising examples of institutions integrating circular knowledge and skills through different types of resources.

### Box 7: Equipping TVET institutions with the relevant resources to integrate circular knowledge and skills – examples from South Africa

In South Africa, the Department of Higher Education and Training and the Department of Fishery, Forestry and Environment have collaborated with GIZ, the German development organization, to develop a training manual on the 'Greening of Colleges Initiative'. The manual is used to train colleges on the recycling of paper, steel and many other reusable materials.

## Enablers and barriers to integrating skills and competencies for the circular economy in TVET

### *TVET providers: Enablers and barriers to integrating the circular economy*

This section presents an overview of the enablers and barriers to developing and strengthening new circular qualifications and competencies in TVET curricula from the perspective of TVET training providers. To set the context, the vision of a TVET system with an enabling environment that is embedded in promoting circular skills and competencies is first outlined.

### *A vision of a TVET system rooted in promoting circular skills and competencies*

In an ideal scenario, TVET is demand-driven, flexible and relevant to the circular economy. TVET providers are capable and have the autonomy to integrate relevant skills in collaboration with TVET authorities. Relevant circular skills are determined through robust sector-specific employment and skill forecasting mechanisms in partnership with industry stakeholders. There are supportive governance, policy and regulatory structures to support the flexibility and continuous update of TVET curricula to embed relevant circular skills while ensuring quality is upheld through monitoring mechanisms. TVET stakeholders, including educators, managers, staff and representatives from the informal sector and Indigenous communities, collaborate to deliver circular skills and competencies within TVET. TVET institutions have

access to the necessary resources and equipment to provide quality training programmes. Students in TVET have access to circular-oriented apprenticeships and work-based learning opportunities, which equip them with the relevant skills to gain employment. TVET systems are inclusive and accessible for persons from all backgrounds, and active mechanisms are in place to promote the inclusion of all groups in TVET. TVET systems have sustainable and diverse financing mechanisms through private and public sector investments. TVET is perceived to be highly relevant and is considered a key mechanism for unlocking the human capital potential within the labour market and a necessary force to drive the circular transition.

To realize this vision, it is critical to ensure that TVET systems have the relevant capacity to support the circular transition. The key factors that need to be addressed in developing and strengthening new circular qualifications and competencies in TVET curricula from the perspective of TVET training providers are shown in Figure 14.

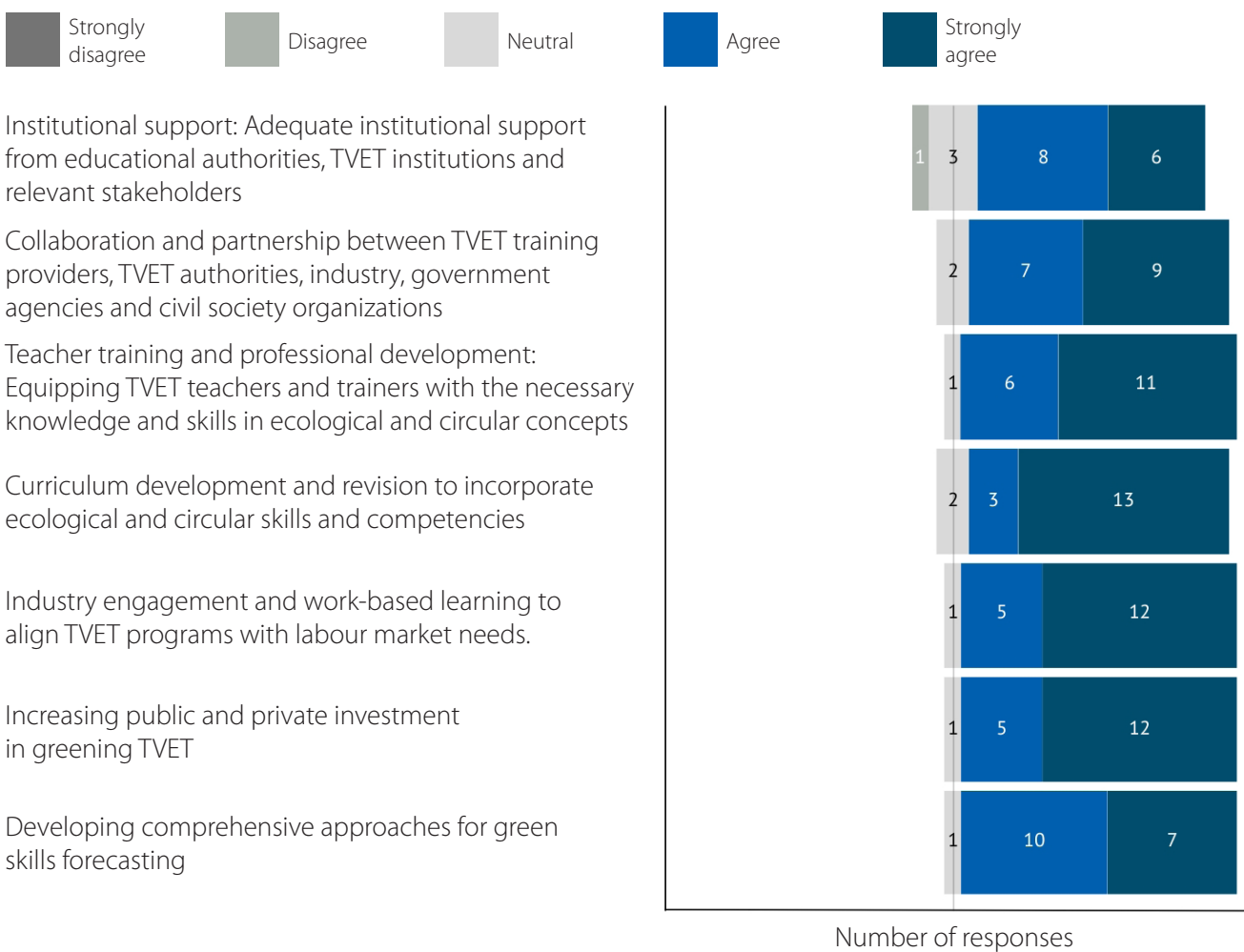


Figure 14: Main enabling factors for TVET systems to develop and strengthen new circular qualifications and competencies in existing TVET curricula (aggregate), TVET institutions' perspective



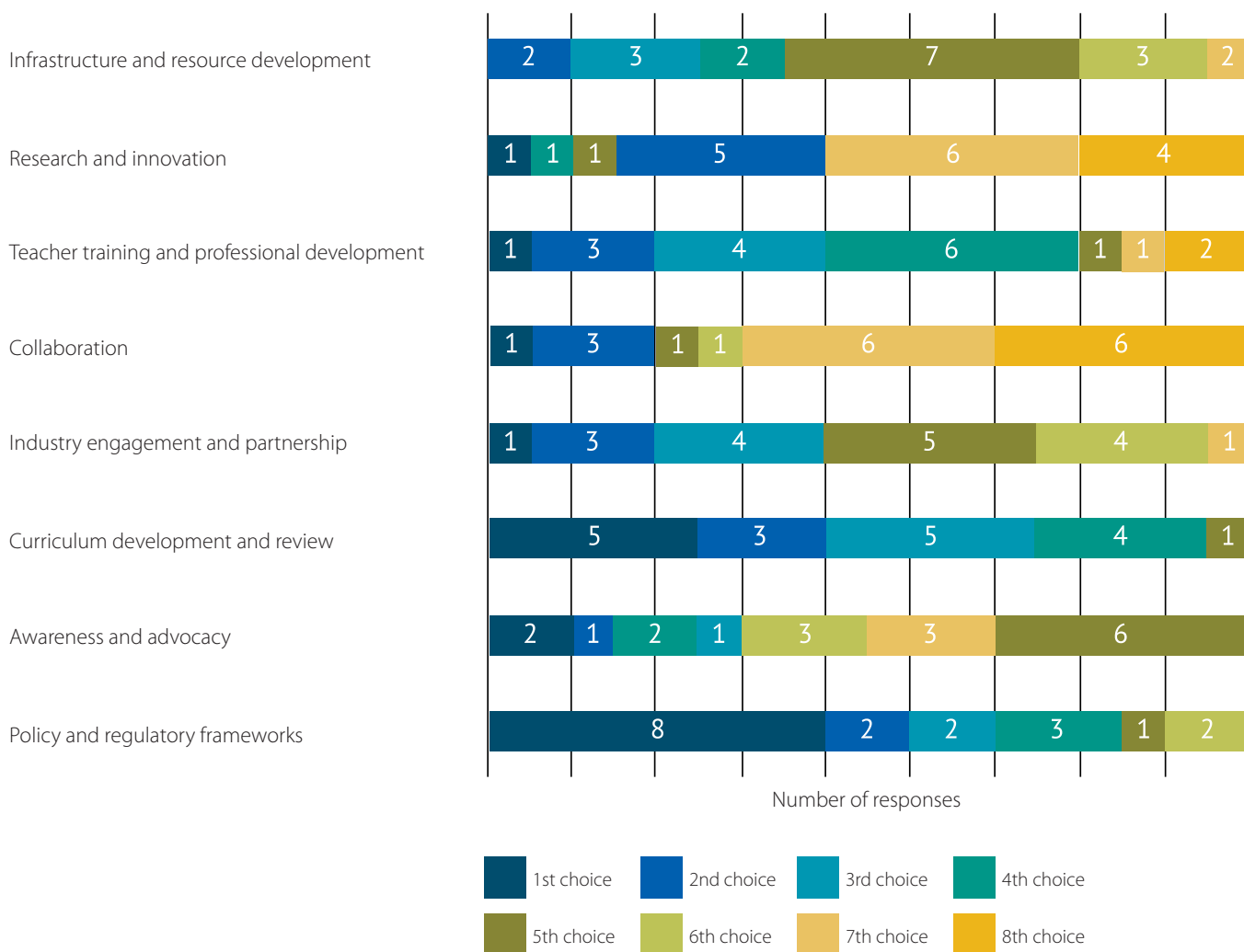


Figure 15: Main barriers to the development of new circular qualifications and competencies in existing TVET curricula (aggregate), TVET institutions’ insights

### Curriculum development and updates

As employment and skills profiles shift with the circular transition, skills and competencies within TVET must be dynamically updated to reflect the reality of labour markets. The TVET institutions surveyed recognized that curriculum development is critical to integrating the new circular economy and related concepts.

This integration can occur through the revision or updating of existing curricula or the development of new curricula. Conversely, the same factor can be considered a barrier when curricula are not updated regularly to reflect current and emerging demands. As stated by one of the respondents, ‘It is quite common that several TVET colleges offer imposed kinds of curricula which do not speak to the needs of the industry (misalignment), and students will struggle to get employment on completion of the qualification.’

This insight suggests that curricula design, particularly in a fast-emerging space such as the circular economy, should focus on integrating the skills and competencies required for graduates to enter circular careers.

Timing is another essential factor to consider when discussing curricula development and updates. The circular economy will impact future jobs and careers. However, it is currently not considered a priority by many of the interviewed TVET authorities, which acknowledge that they should support more TVET institutions on this topic.

The current lack of support can be highly problematic and a significant barrier to training and upskilling students and workers for the circular economy. TVET institutions and authorities should, ideally, start developing tools and strategies to create the circular skills development plans needed to make the changes in the curricula in advance. Only by developing these tools and procedures in time will it be possible to create that solid pipeline of skills and competencies required for a successful circular transition.

### *Policy and regulatory frameworks*

A conducive policy and regulatory environment is a crucial factor influencing the integration of circular competencies in TVET curricula. For instance, in most of the three countries in this study, policy and regulatory frameworks often influence revising or updating TVET curricula to include relevant skills and competencies. However, countries where the curriculum provided by TVET institutions is strongly influenced by the direction of national policy and the ministry of education might face limitations if the government does not prioritize agendas such as the circular economy and green economies. This lack of prioritization can cause time lags (due to approval rounds) in updating skills, undermining the effectiveness of TVET in delivering relevant curricula that meet the needs of labour markets. Examples of this challenge are provided in the context of TVET development in Ghana and Kenya in Box 8.

#### **Box 8: Update of TVET curricula based on policy and regulatory frameworks – examples from Ghana and Kenya**

In Ghana, the TVET system operates under the joint governance of the Ministry of Education and the National Council for Tertiary Education, which focuses on a competency-based approach. All academic programmes require national accreditation, which is renewed every five years. Thus, TVET institutions can only make significant changes to curricula every five years. Only minor changes can be made during this interval, if courses are being modified. In cases where new curricula are developed, this can take two to three years as approval by the internal academic board is required, following which it is submitted for national accreditation. The process also differs based on the type of TVET institution. While tertiary TVET institutions can develop their own curricula, subject to approval and accreditation as described above, pre-tertiary institutions operate within the national curriculum's boundaries and cannot modify curricula.

Similarly, in Kenya, the Curriculum Development Assessment and Certification Council (CDACC) is responsible for developing and updating quality TVET curricula, which limits TVET providers' flexibility in modifying and updating curricula in response to dynamic industry needs. However, polytechnics are outside the mandate of CDACC and can develop and update their curricula.

Source: Respondents from the questionnaire

### *Industry engagement and partnership*

Another key factor is industry engagement and partnerships to align TVET programmes with labour market needs. Most TVET providers highlight the importance of collaboration with government as well as industry associations to develop and update curricula relevant to circularity. The ability to effectively engage with industries is key to timely and effectively supportive relevant updates to the curricula, as well as influencing curricula development to make it more relevant to labour market needs. Industry engagement and partnership can be a real challenge in some contexts. In Kenya, for example, responses indicate that although TVET providers recognize the importance of collaboration across sectors, they face practical difficulties in implementation. Stakeholders from industry are often not open to cooperation with stakeholders in TVET, a finding also supported by literature that points to the lack of dynamic industry–

TVET collaboration (Jahonga et al., 2016). The absence of industry engagement in shaping TVET curricula might represent a key barring factor in ensuring the relevance of TVET, as already discussed in relation to curriculum development and revision in the paragraph above.

### Financing and investment

Finally, financing and investment in TVET are key enabling factors to enhance the competencies of TVET staff and ensure access to the necessary resources, infrastructure and equipment. Assessments of TVET systems at a global level routinely document gaps in infrastructure and, especially important for TVET, equipment and materials (World Bank et al., 2023). Without adequate resources and financing, TVET institutions can lack the capacity to equip people with the proper knowledge and competencies for the circular economy, as circular jobs often require specific skills that can be trained only through specific equipment and infrastructure (for some examples, see Figure 13).

### TVET authorities: Enablers and barriers to integrating the circular economy

The questionnaire responses from TVET authorities closely reflect the perspective of TVET training providers outlined above. TVET authorities emphasized policy and regulatory frameworks as a barring factor: 'TVETs can be quite bureaucratic unless policy mandates curriculum change'. The responses also reveal that while TVET authorities are aware of the challenge in policy and regulation, their capacities must be developed to introduce reforms to the system and their own processes. TVET authorities also recognize that strong collaboration between TVET institutions and industry partners is crucial for developing qualifications and capabilities for circular occupations. Insufficient industry engagement can hinder skill identification and validation and cause a mismatch between skills taught and skills needed within the labour market context.

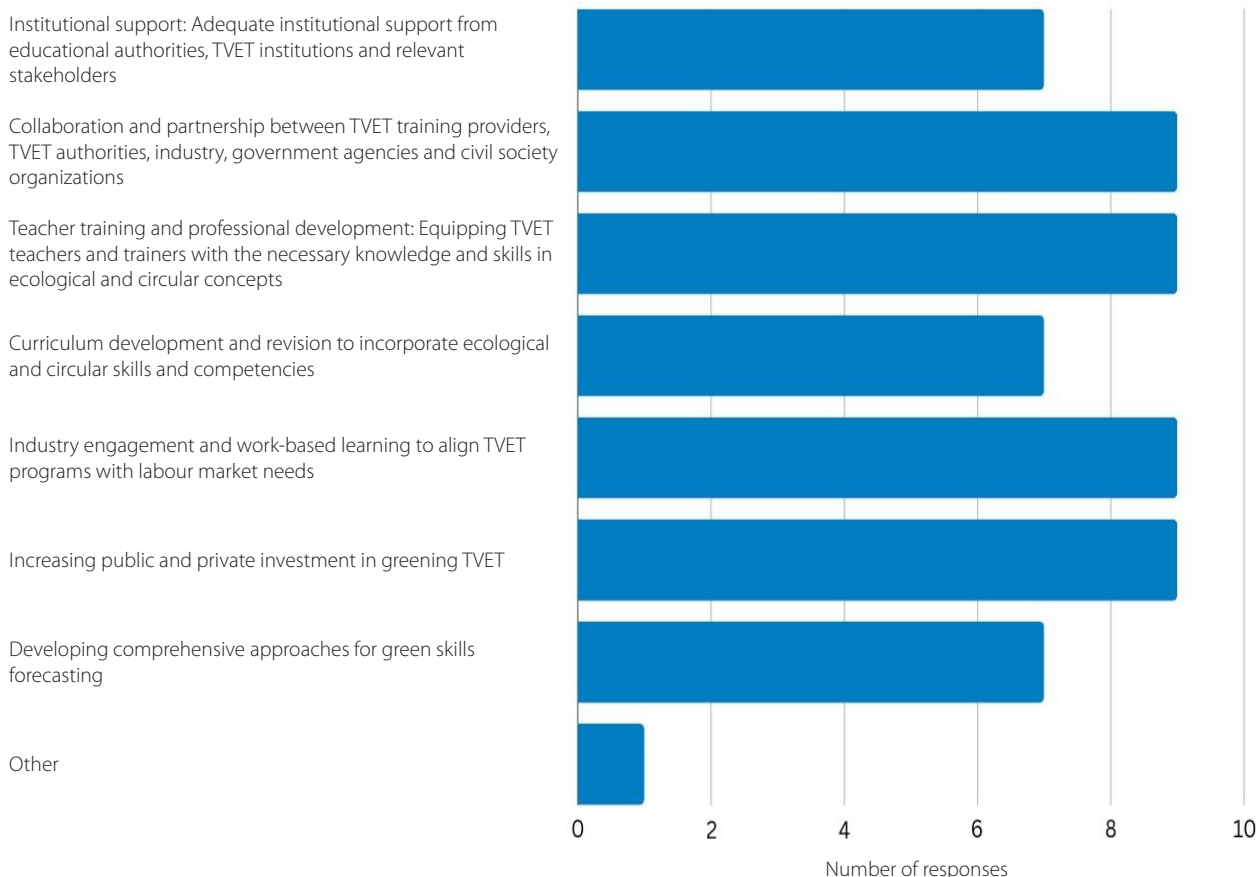


Figure 16: Main enabling factors for TVET systems to develop and strengthen new circular qualifications and competencies in existing curricula (aggregate), TVET authorities' perspective

Demand: There is a low demand for circular economy and green skills

Policy and regulatory environment: There is an absence of policies, regulations and standards relating to green and circular economy practices

Partnerships and collaboration: There is limited collaboration between TVET training providers, TVET authorities, industry, government agencies and civil society organizations

Investment: There is low public and private investment in greening TVET

Skills forecasting: There are no comprehensive approaches for green skills forecasting

Government drive: Introducing circular economy and greening TVET is not part of the government's current agenda/priority

Involvement of education authorities: Introducing circular economy and greening TVET is not part of the education authorities' current agenda/priority

Other

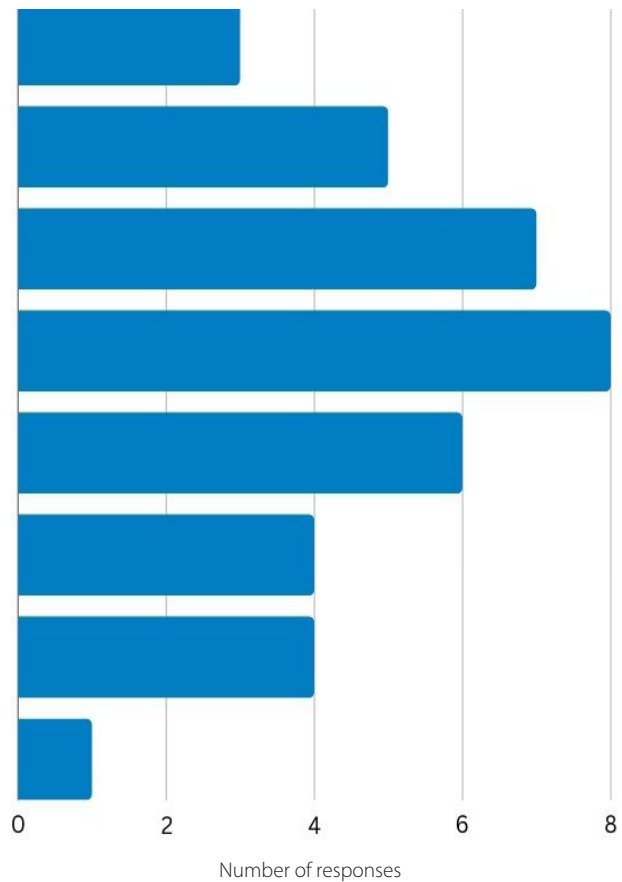


Figure 17: Main barriers to the development of new circular qualifications and competencies in existing TVET curricula (aggregate), training authorities' insights

## TVET institutions: Contributions to women's empowerment

The importance of the circular economy in contributing to women's social and economic empowerment was raised by all TVET institutions, both training providers and authorities. Participants agreed that the transition to the circular economy will most likely increase the number of women participating in TVET in the three countries. Respondents considered agriculture (88 per cent), tourism and hospitality (70 per cent) and health services (66 per cent) as the three main sectors that will offer additional opportunities for women's access to the labour market, followed by education and pedagogy, and textiles (both at 62 per cent).

Gender disparities in TVET are most striking in specific fields of study. For instance, research indicates that the male-to-female enrolment ratio within technical colleges in Nigeria is four to one. The gender gap is particularly pronounced in architecture, information and communications

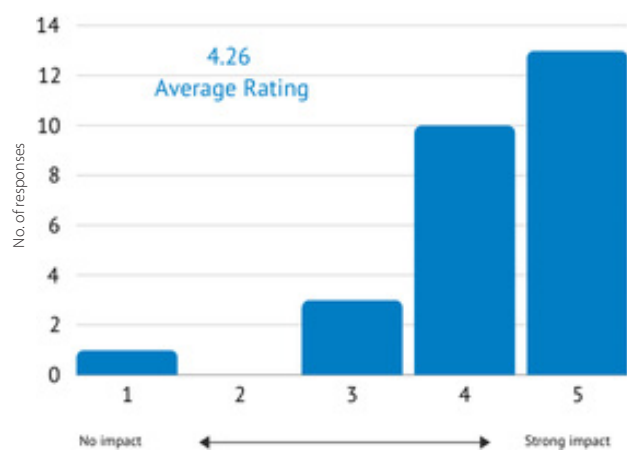


Figure 18: Perceived impact of the circular economy on women's participation in TVET (aggregate), TVET authorities' and institutions' perspectives

technology (ICT), accommodation and food services, and mechanics – which tend to be male-dominated fields. Additionally, female TVET students are often severely underrepresented in science, technology, engineering and mathematics (STEM) (World Bank et al., 2023).

Disadvantaged and vulnerable groups in the existing labour market, including women, youth, and people with disabilities, require targeted interventions to develop the knowledge and skills for the transition to a circular economy (ILO, 2019).

The positive news is that most of the participating institutions (72 per cent) are already implementing or planning activities specifically addressing women in the circular economy. Some of the most common strategies include the creation of dedicated programmes for female TVET students (such as in ICT and electrical engineering in Ghana) or of new courses in fields that tend to attract more female students (e.g. cosmetology), campaigns to encourage female enrolment in TVET and the development of more short-term and easy-to-access training.

### Box 9: Gender mainstreaming in TVET in Ghana

The Basic Education Division in the Ghana Education Service has a Girls' Education Unit (GEU), which is focused on removing barriers to girls' education. The GEU facilitates, networks, influences, focuses, plans, evaluates and collects/distributes information and good practices. In addition, the GEU works with a group of community facilitators who conduct mobilization and sensitization activities in communities and provide follow-up with families to support girls' education.

In addition, the Gender Responsive Skills and Community Development Project (GRSCDP), the Women in Technical Education Department (WITED) and the Tech Needs Girls projects help ensure equitable access and promote gender mainstreaming within TVET (Farm Radio International, 2021).

### *Examining factors that influence TVET systems in promoting skills and competencies for the circular economy: Two sides of the same coin*

In conclusion, participating TVET institutions and authorities both recognized the importance and impact of the circular economy in their respective countries. The increased relevance of the circular economy will be accompanied by increased demand for specific skills and competencies, especially in certain sectors. Nevertheless, due to some capacity gaps, most of the TVET institutions feel constrained in their capacity to equip students and workers with the skills needed for the circular economy. On the side of TVET authorities, the consensus is that working on the circular economy is not a priority, and this is reflected in a lack of adequate support for TVET institutions on this topic.

When asked to identify the main barriers and enablers to equip TVET personnel and students with the knowledge and capacity needed for the circular economy, both TVET institutions and authorities pointed to four factors that can play a crucial role, namely:

- Policy and regulatory frameworks;
- Industry engagement and partnership;
- Curriculum development and updates;
- Financing and investment.

The survey responses from both TVET providers and authorities indicate that enablers and barriers almost entirely overlap, and it is difficult to distinguish clearly between them. For example, a lack of engagement with industry to support timely and relevant updates to curricula can be a significant barrier to the introduction of circular economy principles in a TVET institution, whereas deep connections between TVET

institutions and industries can support skills development plans that are needed to make the changes to curricula in advance. All the elements above can move in either direction, mainly depending on the attitude of the regulatory and governing bodies. Thus, the same key factor can be either an enabler or a barrier depending on the context in which it is applied, which can, in turn, ultimately support or undermine the capacity of the TVET system to respond to the needs of the growing circular economy. For example, as noted above, the University of Cape Coast, Ghana, has made provision to ensure that all new TVET programmes include a course on the circular economy, while the institution is considering how existing courses might include modules on the circular economy. This insight demonstrates the role that TVET stakeholders and institutions can play in shifting factors from limiting to enabling the uptake of circular skills. Overall, the study's results highlight the need for closing the institutional gap by building the capacity of both TVET institutions and stakeholders within the enabling environment in which they operate.

Other elements also emerged from the survey as playing an essential role in equipping students and TVET personnel with relevant skills for the circular economy, such as training staff and access to knowledge resources, forecasting and social inclusion mechanisms, apprenticeship and work-based learning. As for the 'key factors', all these additional elements can either help TVET institutions adopt circular approaches or add barriers to them, depending on the context and the reality of a specific country or region.

Table 1: Key enabling and barring factors to adoption of circular approaches

Key factors		
	Barrier	Enabler
Policy and regulatory frameworks	Lack of supportive policy and regulatory framework	An enabling policy and regulatory environment
Industry engagement and partnership	Low industry engagement in TVET undermining TVET's relevance	High engagement and ownership from the industry in developing and shaping TVET
Curriculum development and updates	Bureaucratic processes to develop and update TVET curricula	Demand-driven TVET curricula that are shaped by industry input
Financing and investment	Low financing and investment in integrating circularity in TVET	Diversification of funding mechanisms and adequate financing and investments in integrating circularity in TVET
Other factors		
Training of staff	Inadequately trained staff	Well trained staff
Access to resources	Lack of access to resources and equipment undermining the quality of TVET	Access to necessary resources and equipment
Capacity of institutions	Low capacity of institutions to embed circular skills	High capacity of institutions in integrating circular skills
Employment and skills forecasting mechanisms	Lack of employment and skills forecasting mechanisms to determine priority sectors and trends that inform skills	Robust employment and skills forecasting mechanisms to determine priority sectors and trends to inform skills
Apprenticeships and work-based learning	Little to no access to apprenticeships and work-based learning opportunities	Access to apprenticeships and work-based learning opportunities
Social inclusion	Exclusion of vulnerable groups, including women, youth, persons with disabilities and other minority groups	Inclusive and accessible TVET systems
Perception of TVET	Poor perception of TVET and low trust in TVET systems	Recognition of the importance of TVET

## Recommendations

According to the study's main findings, although TVET institutions are aware of the importance of skills for the circular economy within the context of their labour markets, they lack awareness and know-how when it comes to what and how these skills need to be integrated, and often do not have access to best practice within specific sectors. At the same time, the enabling environment and the foci of the TVET policy agenda do not include circular economy learning. Thus, developing the capacity of TVET institutions to include circular economy learning is a crucial requirement for national and international institutions interested in advancing the circular economy agenda with and for people. The recommendations below target TVET authorities, training providers and stakeholders within the enabling environment surrounding TVET institutions, such as industry and national government, which all play direct and indirect roles in enhancing support, improving structures of coordination mechanisms, and making available the needed resources that can result in the successful embedding of skills and competencies for the circular economy in TVET curricula and training.

Among the recommendations that can be addressed by authorities with direct roles are the following:

### A. Restructure governance, policy and regulatory mechanisms and widen stakeholders' engagement in TVET

- Supportive governance, policy and regulatory arrangements are some of the critical factors influencing TVET's ability to integrate skills for the circular economy into curricula. As evidenced by the study, bureaucratic governing structures within TVET can often delay the updating of curricula, which undermines the ability of TVET to respond to labour market needs.
- The lack of separation of TVET regulation and provision can often make it more challenging to ensure accountability. Hence, TVET authorities must set up appropriate governance and policy frameworks at national, regional, sectoral and local levels to ensure effective coordination among these stakeholders and alignment with national priorities.
- Coherent cooperation mechanisms and coordination arrangements can drastically reduce the turnaround time to approve changes within TVET curricula, increasing the responsiveness of TVET. TVET authorities can set up appropriate regulatory mechanisms to involve industry stakeholders in shaping TVET, such as including industry representatives on TVET boards, co-designing programmes with industry stakeholders and establishing apprenticeships and work-based learning programmes. In addition, TVET authorities, in collaboration with providers, can explore arrangements to decentralize decision-making power to support TVET providers in being more responsive to the shifts in employment and skill profiles necessary for the circular transition.<sup>15</sup>
- There must be a balance between flexibility and accountability to ensure that TVET providers are responsive while upholding relevant standards. TVET authorities can set up accountability mechanisms by developing relevant performance indicators. Such accountability mechanisms should measure administrative factors and graduates' labour market outcomes. The latter is significant as most TVET systems that use performance indicators focus on the former.

<sup>15</sup> UNESCO. (2021). Learn for Our Planet: A Global Review of How Environmental Issues Are Integrated in Education. Retrieved from: UNESCO's Website



## B. Support TVET institutions with resources and tools to integrate skills and competencies for the circular economy within TVET curricula

- TVET providers need access to information regarding the current and future profile of jobs and skills within critical sectors impacted by the circular transition in the countries and regions in which they operate. This will influence the knowledge, skills and competencies embedded within TVET curricula and prepare graduates for work in the circular economy.
- Some key sectors relevant to the circular transition are renewable energy, environmental goods and services, construction, manufacturing, agriculture, transportation, tourism and extractive industries. Industry stakeholders and TVET providers must collaborate closely to align and share their insights on occupational and skill profiles relevant to the circular economy, considering the dynamic influence of local trends.
- There is a need to foster and expand work-based training and apprenticeships for emerging and priority sectors to promote skills development for the circular economy within TVET.
- TVET institutions, industry stakeholders and educational institutions must work together to create toolkits that provide 'how-to' guidance on designing competency standards and curricula for circular jobs, adapting curricula, training delivery and assessment.

Similarly, there are a number of indirect measures that are critical in making the enabling environments more conducive to attracting support and engagement on the topic:

## C. Revisit TVET funding and enhance efficiency

- TVET authorities and industry stakeholders need to work together to identify a diverse range of funding mechanisms for TVET providers by exploring how public and private investment in TVET can be encouraged and utilized.
- Public financing can support equitable access to TVET, increasing enrolment in critical fields, promoting social inclusion and strengthening the development of key transversal and specialized skills within TVET curricula. Private funding can encourage workplace apprenticeship development and include additional resources in TVET (such as equipment and relevant infrastructure).

## D. Tackle social exclusion and nurture a gender-responsive approach to TVET

- The Sustainable Development Goals (SDGs) outline skills development through TVET as a pathway to decent work. TVET can promote sustainable development by supporting decent work and lifelong learning, contributing to inclusive and sustainable economic growth and competitiveness, social equity and environmental sustainability.
- TVET authorities, in collaboration with TVET providers, need to develop active measures to ensure inclusion and promote the participation of women while addressing the structural barriers they face. This includes developing gender-specific business development programmes and encouraging the participation of female students in STEM. In addition, the measures need to address social norms and perceptions, as well as barriers, such as access to finance and technology and gender segregation in labour markets, in order to further boost women's participation in TVET.

## Conclusion

The capacity of TVET systems to contribute to sustainable and inclusive development is based on their ability to provide access, equity, quality and relevance in curricula and training. This relies on collaboration and engagement with stakeholders, including TVET institutions, government and industry stakeholders. The capacity also depends on solid foundations in policy and regulatory frameworks, governance and funding mechanisms. Successful reforms will adopt targeted mechanisms while recognizing the interdependence between these factors.

This report aims to present a clear picture of the barriers to effective TVET institutional implementation of circular approaches and to inform policy and management decisions to ensure their effective contribution to the green transition. This is in line with the UNESCO-UNEVOC strategy of supporting TVET institutions in the development and implementation of green and circular approaches to transform their learning and training environments, upskill professionals in green job sectors, re-skill those affected by job losses due to the green transition and the COVID-19 pandemic, and seize opportunities for multi-stakeholder partnerships.

In summary, three key insights can be drawn.

First, the main findings from this study show that the challenges are multi-layered, and there is still a long road ahead to mainstream circularity in TVET.

Second, while TVET providers (universities, research or training centres) recognize the importance of circularity and its impact on labour markets, they are constrained by their capacity to effectively integrate circular skills within TVET curricula. Furthermore, despite their acknowledgement of the importance of circular economy topics within curricula, over half of TVET authorities (ministries or national bodies) recognize that they are not adequately supporting TVET providers. This highlights the need to build the capacities of TVET providers and TVET authorities to embed circular skills and competencies within TVET effectively.

Finally, alongside recognizing the critical circular skills that need to be embedded in TVET, it is necessary to focus on developing the enabling environment surrounding TVET and, with this, the capacity of TVET institutions. Addressing current gaps and promoting the development of a supportive enabling environment is crucial in realizing the full benefits of the circular transition, including job creation and sustainable and inclusive development.

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## Closing the institutional gap


# Perspectives on the circular economy from selected African TVET institutions

There is consensus that education and TVET systems have a crucial role to play in the green transition, as they can equip learners with the skills, knowledge and expertise needed to thrive in more sustainable societies. Most of the literature has focused on the requirements for transition to a greener and circular economy in terms of new skills, qualifications, and competencies, and how different jobs can become greener. Little research has been conducted on how TVET institutions can implement recommendations for a green and circular transition, on the challenges they are facing or on the capacities they need to support such a transition.


This report presents the results of research by UNESCO-UNEVOC on gaps that limit TVET institutions' ability to contribute to the green transition effectively. The research focused on the enablers and barriers to effective implementation of circular approaches. This preliminary assessment was conducted in three sub-Saharan African countries: Ghana, Kenya, and South Africa.

The study's findings – in terms of data, policy trends and the role of different actors – offer guidance to governments and TVET institutions that wish to improve teachers' and trainers' acquisition of circular skills, as well as their capacity and propensity to apply tools, services and technologies to deliver quality, learner-centred education and training for the circular economy.

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