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Green Alignment, Green Vocational Education and Training, Green Skills and Related Subjects: A Literature Review on Actors, Contents and Regional Contexts

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ABSTRACT

This study conducts an exploratory and integrative literature review to investigate the discourse on various concepts and terms related to the green alignment of vocational education and training (VET). The study focuses on the key actors setting the discourse, the content within it and the regional contexts in which the discourse occurs. A review of 85 international publications reveals that the discourse is predominantly shaped by the perspectives of policy and research, with international organisations playing a prominent role in the policy strand. While green skills are primarily associated with green jobs in the labour market, green VET encompasses the process of greening VET providers. This discourse appears to be especially prevalent in the Asia-Pacific region and in Africa. The results of the study provide policy and research actors with a nuanced understanding of the discourse, enabling policy actors to integrate scientific insights more effectively into their decision-making processes and foster a more constructive dialogue between policy and research.

1 | Introduction

In an era characterised by the climate crisis and ongoing ecological degradation, the concept of a green economy serves as a guiding paradigm for sustainable economic development resulting in 'improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities' (UNEP 2011, 2). The transition to a green economy is articulated in several agreements, including the Agenda 2030, the Paris Agreement and the European Green Deal. This transition has a noteworthy impact on the world of work and employment, as industries and businesses increasingly adopt sustainable and green solutions (Auktor 2020). Consequently, the demand for a skilled and environmentally responsible workforce, often referred to as green collar workers, is continuously increasing (UNEP et al. 2008). According to the ILO (2024), the transition to energy sustainability alone could create more than 25 million new jobs worldwide. This number does not account for the need to retrain and upskill workers whose existing jobs are either transforming into greener jobs or might even disappear. These changes have implications for vocational education and training (VET) systems globally as they prepare individuals for the workforce and develop skills to remain employable and responsive to the evolving needs of the economy and society. Consequently, VET faces the imperative of adopting a more environmentally sustainable and green approach, equipping learners with essential green skills.

Due to the increasing relevance and urgency for the world of work, society and individuals, this study focuses on the discourse on the green alignment of VET. To ensure an open and unbiased analysis, this study introduces the term 'green

alignment of VET' and interprets it in a general and broad manner. This generic term encompasses a variety of approaches and concepts, including green VET and green skills. To date, the literature on this topic remains relatively limited, with only a small number of publications addressing the green alignment of VET systems (Ramsarup et al. 2024). McGrath and Russon (2023) even indicate a reluctance among researchers to engage with this topic, possibly due to the perception of 'green' as a 'floating signifier' (Ramsarup et al. 2024, 6) or a 'hollowed-out buzzword' (Fuchs 2024, 6).

In light of the practical importance of the green alignment of VET systems on the one hand and the existing research gap on the other, this study undertakes a detailed examination of the discourse. To this end, an exploratory, integrative literature review is conducted with the objective of synthesising previous findings and generating new insights and perspectives on the discourse. The study is guided by three W-questions: *who* is involved in the discourse?; *what* are the contents of the discourse?; *where* and in which regional contexts is the discourse occurring? This approach facilitates a comprehensive view of the discourse by examining the actors—both groups and individuals—who influence and set it, the relevant contents it entails, and its regional embeddedness. In other studies, discourses have also been subjected to structured analyses based on guiding questions. For instance, Caves et al. (2021) considered the implementation of VET reforms by studying diverse literature sources across various locations and development contexts. Pilz and Zenner-Höffkes (2023) examined the arguments put forth by various training policy actors regarding vocational maturity and employability, analysing how these concepts have evolved over time and whether specific interest groups have dominated the debate and influenced its development.

The following section outlines the research design employed in the literature review. The findings from the literature review are presented in the third section. In the fourth section, the outcomes are synthesised and discussed. The final section highlights limitations and identifies potential areas for further research in VET.

2 | Research Design

The literature review employs an integrative approach, which is well-suited for new, emerging, and dynamic topics experiencing rapid growth. This qualitative integrative method is suitable for reviewing, critiquing and particularly synthesising existing literature in an integrated manner, thereby offering new insights and perspectives on a specific subject (Torraco 2005, 2016). Unlike systematic literature reviews, the synthesis process in integrative reviews 'weaves the streams of [literature] together to focus on core issues rather than merely reporting on previous literature' (Torraco 2005, 362). The integrative review can be conceptually structured around theories, models or perspectives, and the literature selection process is flexible and iterative. Instead of establishing rigid inclusion and exclusion criteria at the outset, the literature selection can be adjusted as the understanding of the topic deepens (Torraco 2005, 2016). In contrast, systematic literature reviews typically follow a highly structured and pre-defined procedure for identifying and selecting literature answering specific research questions, for example on methodological approaches, strengths and limitations of the identified literature (e.g., Schwendimann et al. 2018; Gessler and Siemer 2020; Toepper et al. 2022). A systematic approach may inadvertently exclude relevant literature that does not align with predefined search parameters, potentially limiting the scope and perspective of the review.

Given the exploratory nature of this study, an integrative literature review is an appropriate approach for examining the discourse on the green alignment of VET as an emerging topic. The integrative approach, with its broader and more flexible procedure, facilitates the integration of diverse literature from various countries, providing a comprehensive and state-of-the-art overview, as in the case of Li and Pilz (2023).

The main search was conducted from December 2023 to June 2024 utilising a systematic keyword search with a series of English keywords. The following terms were employed in a Boolean logic search: AB ('green' OR 'greening') AND AB ('apprenticeship' OR 'vocational education' OR 'vocational training' OR 'vocational education and training' OR 'VET'), where AB denotes that both terms are included in the search process. Given the proximity and partial synonymy of the terms 'green' and 'sustainable', it would have been logical to include both 'sustainability' and 'sustainable development' in the research. However, it was determined that exploring sustainability and sustainable development in combination with VET was beyond the scope of this study.

The two databases selected for the search were Elsevier's Scopus and Clarivate's Web of Science. Both databases have established guidelines for content selection, including peer review processes to ensure the inclusion of reliable, high-quality sources. The search in both databases focused on the presence of specific keywords within the title or abstract of publications. Additionally, Google Scholar was employed as a scientific search engine for literature searches. In contrast to Web of Science and Scopus, the inclusion criteria are not explicitly stated here. However, Google Scholar allows for the search of grey literature, such as policy papers and reports from UNESCO-UNEVOC or ILO, which are not listed in Scopus or Web of Science. These types of publications were also considered in the literature search.

In addition to this systematic search strategy, a snowball sampling technique was employed to identify relevant literature cited in previously selected documents. For handbooks or anthologies, this strategy permitted the examination of neighbouring chapters for potential relevance. The snowball strategy facilitated the inclusion of additional literature that had not been identified in the initial systematic database search.

The final selection of literature was limited to English-language publications, focusing on literature published within the last 14 years (2010–2024). Nevertheless, some highly relevant publications from earlier periods were also included, as they provide a foundation for the subsequent ongoing discourse. Following a review of the titles, abstracts and full texts, only those publications focusing on a green alignment of VET were included. This encompassed both scientific publications and grey literature. Furthermore, the review of the literature revealed numerous

scientific journal articles on the discourse originating from local and less renowned journals or conferences, which often lack international reach and high reputations. Therefore, care was taken to ensure that the selected scientific journal articles had undergone a peer review process and originated from reputable journals. This provided assurance that the publications included in the literature review are of high quality and widely disseminated, allowing readers to access the integrated publications in electronic research databases.

The literature review included a total of 85 international publications (37 journal articles, 2 anthologies, 1 monograph, 10 book chapters, 13 policy papers, 12 policy reports, 2 websites and 8 others such as brochures). The selected publications were subjected to thematic analysis (Braun and Clarke 2006), incorporating both deductive and inductive elements (Fereday and Muir-Cochrane 2006). The guiding questions introduced in the introduction served as the main orientation points for analysing the literature, specifically focusing on the actors involved in the discourse, the contents it entails and the regional contexts within which it occurs. The content aspect of the analysis entailed a comprehensive examination of existing definitions, with the initial reference point being the definitions provided by UNESCO-UNEVOC. These definitions served as a basis for the subsequent analysis, which involved the expansion of the definition to encompass those from other international organisations. A similar approach was adopted in the analysis of implementation approaches, which constituted a further component of the content aspect. In addition, in accordance with the inductive procedure to be applied, other aspects of the material were explored. The results of the analysis can be found in the following section.

3 | Findings

The review of the literature reveals the existence of two distinct strands shaping the discourse on the green alignment of VET: policy and research. The policy discourse is primarily constituted by international organisations and political decision-makers that formulate policies and guidelines. In contrast, the research discourse is primarily concerned with international research on VET and is predominantly represented by scholars who explore theoretical and empirical foundations of the green alignment of VET. Thus, two typical domains of discourse analysis are addressed.

The two concepts of 'green VET' and 'green skills' are particularly prevalent in the discourse on the green alignment of VET representing its key content areas. The following section provides a more detailed examination of both concepts from each of these perspectives, in particular their definitions and implementation approaches.

3.1 | Green VET

3.1.1 | The Policy Perspective

At the policy level, green VET has emerged as a framework that anchors sustainability and Education for Sustainable Development (ESD) within VET. During the Decade of ESD (2004–2015), the focus was on VET for sustainable development, emphasising its role as a 'master key that can alleviate poverty, promote peace, conserve the environment, improve the quality of life for all and help achieve sustainable development' (UNESCO-UNEVOC 2004, 1).

By 2010, the former head of UNESCO-UNEVOC, Majumdar (2010), identified the greening of VET[1] as an essential and overarching theme for sustainability, advocating for adaption of VET institutions and policies to support sustainable practices while defining green jobs and skills. Majumdar (2011) proposed a three-tiered approach for greening VET, which involves the formation of global alliances among countries, their governments and organisations. Simultaneously, Majumdar (2010, 2011) developed an implementation model for greening VET that focuses on VET institutions. The model includes five aspects: greening the campus, the curriculum, the community and workplace, the research and the institutional culture, along with the development of teachers and trainers (UNESCO-UNEVOC and CEDEFOP 2024).

In 2012, the Third International Congress on VET underlined a dual transformation of VET aimed at moving VET practices toward more inclusive, democratic, socially and environmentally just educational approaches. The '[advance of] the "greening VET" agenda towards low carbon and climate resilient growth and development' for future VET policies and practices was highlighted (UNESCO 2012, 7), as further conferences have shown (e.g., Gleissner 2012; Kastrup 2013; Sofroniou 2015). The concept has since evolved to encompass pre-employment education and training, workplace learning and further training with the objective of achieving economic, environmental and social sustainability. Green VET prepares individuals for green jobs and enables them to become active participants in a green economy and a sustainable, climate-resilient society (UNESCO-UNEVOC 2014). Moreover, green VET integrates entrepreneurial learning, education for sustainable consumption and lifestyles and life skills education (UNESCO 2013). UNESCO-UNEVOC's (2017) guide for greening VET institutions further encouraged a whole-institution approach, embedding sustainability into knowledge, skills and institutional practices. Similarly, the European Training Foundation (ETF) describes greening VET as a gradual process that aligns training with environmental sustainability, embedding green skills across policies, VET programmes, curricula and institutional cultures (Nielsen et al. 2023). Recently, UNESCO (2022) has broadened its scope of greening VET to address circular economy, climate action and just transitions.

The ILO (2022, 9) underlines that the greening of VET is a 'continual journey, rather than a trip where the destination is quickly reached'. This is achieved by equipping individuals with the requisite knowledge, skills and behaviours to effect transformation in workplaces and communities through lifelong learning. Consequently, the greening of VET plays a pivotal role in ensuring a fair and just transition. The ILO (2021, 2022) offers practical guidelines for greening VET implementation, distinguishing between 'light' and 'deep' greening approaches. Light greening of VET involves minor adjustments to existing curricula, particularly the addition of new technical green skills. In contrast, deep greening of VET entails a more substantial and

systematic change, also integrating innovation and digitalisation across all curricula and qualifications. This fosters critical thinking, problem-solving and adaptability, empowering learners to actively drive the green transition. Subsequently, the deep greening of VET is a normative change process that requires the adoption of clear, holistic, systematic and methodological approaches regarding sustainable development (ILO 2022). The Interagency Working Group (IWG) on greening VET and skills development, consisting of UNESCO-UNEVOC, UN, ILO, OECD, CEDEFOP, ETF and Asian Development Bank (ADB) jointly developed policy recommendations for the G20, stating that greening VET should be anchored in education and sustainability agendas (ILO et al. 2013).

At the national level, Germany's iMove (2023) initiative defines green VET as the integration of environmental and sustainability principles into VET programmes. The objective is to facilitate the acquisition of environmentally conscious technologies and practices by learners in developing countries. The Vietnamese Directorate of VET (2018, 13) frames green VET as 'a role model for eco-friendliness in the community' and as 'a trusted strategic partner for sustainable development in the region'.

3.1.2 | The Research Perspective

Existing research lacks a thorough definition of green VET. Acedo (2014) follows the definitions at policy level, including training across various stages that focuses on sustainability in environmental, economic and social aspects, preparing individuals for green jobs that promote environmental preservation and improve social equity and well-being.

Research underscores the importance of green VET for sustainable development. Dayue (2016) portrays greening VET as a beneficial measure for ESD and for the advancement of VET in developing and developed countries. Baumgarten and Kunz (2016) argue that green VET and ESD share the common goal of sustainability, deeming the distinction between them artificial, while Mertineit (2013) considers green VET a subset of ESD. Gonon (2022) views green VET as a strategy to enhance VET's appeal and to modernise VET by addressing skill gaps for the green transition.

For implementation, researchers often reference Majumdar's (2011) institutional greening framework. Beyond that, Pavlova (2017) presents a framework for the greening of formal vocational and professional education at the institutional level, highlighting the content, the pedagogy, the campus, extracurricular activities and links with the community to foster environmentally conscious attitudes. Furthermore, Pavlova (2016) identifies drivers for greening VET in the Asia-Pacific region, including international training standards, environmental regulations and governmental initiatives, with the national context influencing their impact. She highlights that policy coordination and reform are pivotal for green VET.

Lotz-Sisitka et al. (2024, 283) characterise the implementation of green VET to date as 'largely reformist rather than transformative', describing it as 'a genuine and positive set of attempts to infuse environmental concerns into a VET system'. Current reform approaches in policy and practice are minimal and may be characterised as 'bolt-ons' to existing VET structures, such as curricula, without substantial changes (Ramsarup et al. 2024, 12). Previous measures and initiatives 'are far less radical than the full vison of greening VET imagined by Majumdar (2011)' (McGrath and Ramsarup 2024, 249). As a result, Ramsarup et al. (2024) argue for more radical and transformative actions that follow a political-economy-ecology approach in the sense of a just transition, which goes beyond merely greening VET.

3.2 | Green Skills

3.2.1 | The Policy Perspective

At the policy level, green skills have emerged within the context of the green economy as a guiding principle for sustainable economic development following the financial crisis of 2008. The transition to a green economy not only creates green jobs but also necessitates green skills to effectively fulfil these jobs (UNEP et al. 2008).

Definitions of green skills vary across different organisations. According to the OECD (2010), green skills are converging skills required to adapt products, services or work processes aimed at mitigating climate change or adapting to its already-occurring effects. The ILO (2011) refers to skills necessary for green jobs, noting that 'there is little consistency in the meanings assigned to [green skills]. Sometimes it is used to refer to core skills such as environmental awareness, sometimes to technical skills relating directly to the environment, sometimes to skills in green technologies, sometimes to skills for green sectors or green processes' (ILO 2015, 34). For this reason, the ILO (2015) uses the term 'skills for green jobs', as it encompasses both core and technical skills for green jobs. Similarly, CEDEFOP (2024) equates green skills with 'skills for the green economy', 'skills for green jobs' or 'skills for the green transition' encompassing 'knowledge, abilities, values and attitudes needed to live, work and act in economies and societies seeking to reduce the impact of human activity on the environment'. A three-tiered distinction is made regarding green skills: transversal skills promote environmental awareness and sustainable thinking and action; specific green skills focus on implementing standards and processes to protect ecosystems; and highly specialised green skills pertain to green technologies. The OECD and CEDEFOP (2014) add that green skills are needed across all sectors and at all levels in the workforce. According to the European Commission (2022a) and ETF (2021), green skills refer to any skill, whether technical or transversal, that directly or indirectly supports various dimensions of the green transition. Green technical skills leverage scientific knowledge and abilities to facilitate the green transition, while green transversal skills include competencies, knowledge and skills that shape mindsets and attitudes toward this transition. Following this, the European Commission (2022b) developed the 'ESCO taxonomy of green skills', distinguishing between green skills, white skills and brown skills, which include 381 skills, 185 knowledge concepts and five transversal skills being relevant to a greener labour market. The

transversal skills are often referred to as sustainability competencies, life skills or core skills.

Reports from international organisations highlight VET's role in implementing green skills, stressing the importance of labour market orientation, stakeholder involvement and coordinated policies to address gaps such as curricula, limited partnerships and inadequate skills forecasting (ILO 2011; CEDEFOP 2012). Collaborative ecosystems involving VET providers, employers, and research institutions are vital for identifying needs and integrating innovation into green skill development (European Commission 2022a). Despite the growing demand for green jobs, most countries lack systematic approaches for developing and implementing green skills, often relying on ad hoc measures and financial incentives. Apprenticeships and work-based learning are recognised as effective for equipping individuals with green skills (CEDEFOP 2019; ILO 2019; CEDEFOP and OECD 2022; European Commission et al. 2022). Public policies remain critical for aligning skills supply with environmental regulations and market demands, necessitating better coordination and structured incentives (OECD and CEDEFOP 2014; ETF 2021).

3.2.2 | The Research Perspective

Montanari et al. (2023) identify an increasing focus on green skills research, particularly since 2012, with notable contributions from developing countries such as China, Malaysia, India and South Africa. According to the authors, green skills are primarily related to the environment and include 'technical-scientific skills related to the development of green jobs, without forgetting the impact they have on other dimensions for a just and inclusive transition' (Montanari et al. 2023, 19). This connection to green jobs is also shown by Lee (2013), who describes green skills as the abilities required to perform environmentally friendly work and produce new green products. In addition to technical abilities, green skills include the ability to understand, learn and innovate low-carbon technologies for green growth. Brown (2015) interprets green skills as those necessary for green jobs that minimise resource use, reduce greenhouse gas emissions, and protect the environment.

Vona et al. (2015) also emphasise the interdependence of green skills and green jobs, indicating that the perception of green jobs influences the definition of green skills. Green skills include analytical and technical expertise related to the design, production, management and monitoring of technologies. Bianchi (2020, 47) states that 'at the heart [...] of green skills is technology to achieve green growth'. In line with this, green skills are subject-related and encompass science, technology, engineering and mathematics (STEM) skills, particularly pertaining to higher qualifications for advances professions like engineers, especially in emerging green fields characterised by complex tasks and new technologies (McGrath and Powell 2016; Langthaler et al. 2021).

Pavlova (2017, 2018) links green skills to soft skills such as innovation, entrepreneurship, coordination, management and business skills, as well as environmental awareness and attitudes. Her typology of green skills includes, on the one hand, additional qualifications or topping-up skills for the greening of existing occupations, alongside specific technological skills for new or evolving green professions. On the other hand, the typology integrates generic green skills, which consist of cognitive, interpersonal and intrapersonal skills relevant for all workers across industries. These skills are rooted in a green mindset and a positive attitude toward sustainable development, emphasising green awareness and values alongside green knowledge and skills. Pavlova and Huang (2013) note that although skilled workers may possess green skills, they do not necessarily apply them if they lack a green attitude.

Kwauk and Casey (2022, 14) refer to the 'breadth of green skills', which includes specific skills for green jobs, generic green life skills that support greener ways of being, thinking and acting, and transformative skills that address systemic causes and individual actions exacerbating the climate crisis. Transformative skills are often equated with sustainability competences. Bianchi (2020) highlights the distinction between sustainability competences and green skills, noting that the former pertains particularly to education, while the latter is more closely associated with the application of green technologies in employment and the current and future labour force. While green skills may overlook the social aspects of jobs, sustainability competences aim to promote living and working in harmony with society and the environment. Thus, green skills exist on a continuum, similar to green jobs (Langthaler et al. 2021; Ramsarup et al. 2024; Fuchs 2024).

Ramsarup and Mohamed argue that green skills should extend beyond mere employability. McGrath and Powell (2016) criticise the insufficient comprehensiveness of green skills in policy conceptualisations, advocating for a more genuine approach that contributes to the elimination of poverty, social inequality and injustice, while fostering healthy working conditions, participation and empowerment. Furthermore, they posit a need for a more systemic and comprehensive approach to the transformation of sustainable VET at the policy level, extending beyond the concept of green skills (Rosenberg et al. 2019; Owusu-Agyeman and Aryeh-Adjei 2023; Ramsarup et al. 2024).

The implementation of green skills requires international organisations and development agencies to provide financial assistance and best practice models (Langthaler et al. 2021) as well as policy guidelines and strategies (Bianchi 2020). Research underscores the necessity of developing international training standards that integrate green skills, which encompasses the establishment of region-wide frameworks, as exemplified by those in the Association of Southeast Asian Nations (ASEAN) countries (Pavlova 2019b).

Another critical point refers to the alignment of green skills with environmental and economic policies to effectively develop these skills (Rosenberg et al. 2019). Pavlova (2016) outlines the vital role of government support in VET reform, policy coordination and the harmonisation of market requirements with green skills integration. Owusu-Agyeman and Aryeh-Adjei (2023) recommend that governments provide sufficient financial resources and adopt a proactive rather than reactive role in developing green skills through appropriate policies (Pavlova 2018; Pavlova and Askerud 2023). For

instance, India's Skill Council for Green Jobs and similar initiatives in Korea, China and Australia indicate how governmental actions can facilitate the development of green skills across sectors (Fien and Guevara 2013; Lee 2013; Dayue 2016; Pavlova 2019a; Chandrasekar et al. 2023). The effectiveness of these efforts often depends on the existing VET system; countries like Germany benefit from coordinated frameworks, while the UK faces challenges due to a lack of long-term strategy (Evans and Stroud 2016). Subsequently, the establishment of a robust VET system is conducive to achieving green skills (Jaeger 2014). In addition, stronger collaboration between government and the private sector, stricter regulations and legal frameworks are needed to promote green skills, as noted by Pavlova (2016) and Auktor (2020). Nevertheless, Pavlova and Singh (2022) illustrate that many employers are aware of environmental policies but are unfamiliar with the concept of green skills, perceiving it as a challenging endeavour to define green skills and their associated requirements (Zolkifli et al. 2016). Beyond the formal acquiring of green skills, Baumgarten and Kunz (2016) and Owusu-Agyeman and Aryeh-Adjei (2023) advocate for the flexible recognition of non-formally acquired green skills, particularly in sectors such as agriculture and manufacturing.

In regions like Hong Kong, India and Thailand, VET graduates often lack practical green skills, forcing employers to rely on supplementary training programmes (Maclean et al. 2013; Chinedu and Wan-Mohamed 2017; Maclean et al. 2018; Napathorn 2021). Conversely, successful partnerships, such as those observed in Hong Kong's hotel industry, demonstrate the advantages of collaboration between VET providers and enterprises (Pavlova 2019b). Such collaboration extends beyond the industry itself, involving universities, research centres, NGOs and associations in local cooperation networks (Chinedu and Wan-Mohamed 2017; Pavlova 2018; Owusu-Agyeman and Aryeh-Adjei 2023; Persson Thunqvist et al. 2023). Examples include Vietnamese colleges working with agricultural experts and sector-based centres of excellence (Shamzzuzoha et al. 2022; McGrath and Russon 2023). These collaborations facilitate the development of 'green skills ecosystems' (Marsden 2015), integrating green skills into existing programmes and creating new ones (Rosenberg et al. 2019). Thus, curriculum and examination reorientation is crucial (Pavlova 2019a). VET institutions in Canada have progressively integrated green skills into all programmes and curricula (Knibb and Paci 2016), linking green skills with existing vocational skills (Chinedu and Wan-Mohamed 2017; Manyati and Mutsau 2021). In addition, teacher training is equally important. Sustainability literacy, green skills frameworks and competence models have been proposed for VET educators (Diep and Hartmann 2016; Kang and Pavlova 2019; Pavlova and Chen 2019a; Chinedu et al. 2023). Moreover, VET institutions should adopt green practices themselves, requiring strong leadership and commitment from both VET principals and HR departments in companies (Napathorn 2021). Jagannathan (2013) underscores the importance of VET institutions' flexibility and adaptability to respond to changes brought about by green growth. Public institutions need more autonomy and freedom to self-manage so that they can plan and act locally (Langthaler et al. 2021).

Sack (2012) observes that while Australian apprentices possess green skills, their application in the workplace depends on the employer. A gap exists between the green skills taught and those used in the workplace, with economic skills being more prevalent. In China, the integration of green technologies in VET improves employability and problem-solving. However, teachers frequently lack the requisite expertise and face obstacles such as heavy workloads, time constraints, irrelevant courses, lack of materials, and insufficient institutional support (Pavlova 2016; Li et al. 2023). Consequently, the teaching of green skills often relies on teachers' own initiatives and external workshops (Dayue 2016). It is argued that teaching methods should be more interactive and activity-oriented to enhance the development of green skills (Brown et al. 2013; Liu et al. 2019). Digital platforms and gamification can further engage students in green topics (Zelin 2016). Pavlova and Chen (2019b) propose a problem-oriented, project-based pedagogical framework that incorporates real-life learning opportunities to develop green skills. In this framework, assessments are adapted to include presentations and reflective learning.

4 | Synthesis and Discussion

The following section presents a synthesis and discussion of the findings based on the three guiding questions of *who* shapes the discourse on the green alignment of VET, *what* are the contents of the discourse and *where* and in which regional contexts is the discourse occurring. Additionally, the evolvement of the discourse over time is considered, addressing the W-question of *when*. Figure 1 summarises the main statements related to these four W-questions concerning the discourse.

4.1 | Actors in the Discourse

The findings indicate that the discourse on the green alignment of VET is primarily characterised by the perspectives of policy and research. International organisations, in particular, play a role in the policy discourse strand. Green VET is mainly framed and defined by UNESCO-UNEVOC as the greening VET agenda and various associated guidelines show. This focus is justified, as UNESCO is one of the most important international organisations in the field of education, particularly regarding VET through UNESCO-UNEVOC. In general, UNESCO-UNEVOC views VET holistically, not merely as a tool for employability and economic growth, but as 'a preparation for responsible citizenship and an instrument for promoting sustainable development' (Hollander and Mar 2009, 43 f.). Green skills, by contrast, are characterised by organisations such as ILO and OECD focussing on the labour market and CEDEFOP concentrating on vocational training. Additionally, the ILO and OECD are dedicated to ensuring appropriate skills development and economic efficiency, with CEDEFOP supporting training reforms aimed at fostering economic growth (Melnyk 2023).

Overall, the policy perspective and the corresponding international organisations concentrate more on the discourse at the supranational- and macro-level of VET systems. Klassen (2024) posits that international organisations develop and set their own global VET agendas. For example, in addition to the greening of VET agenda, UNESCO-UNEVOC prioritises

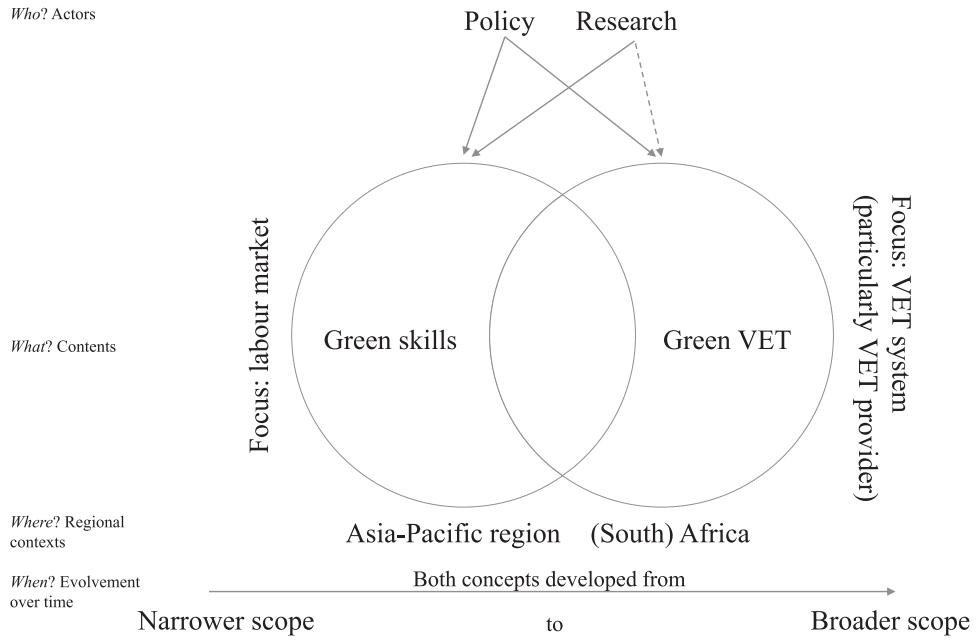

FIGURE 1 | The discourse on the green alignment of VET.

information and communication technologies in VET as a further agenda (Schröder 2020). Consequently, international organisations focus their agenda-setting on general and abstract concepts and topics that have global relevance. Despite a shared agenda, these organisations may pursue different approaches and perspectives (Vanderhoven 2023).

In the research discourse strand, it is notable that a few researchers have strongly characterised the discourse, with green skills receiving more scientific attention than green VET. Unlike the policy strand, research tends to address the meso- and micro-levels of a VET system. Among these researchers, Margarita Pavlova stands out for her substantial body of scientific papers on green skills from the Asia-Pacific region. Additionally, researchers such as Simon McGrath and Presha Ramsarup adopt a particularly critical stance towards the discourse, challenging the concepts of green VET and green skills and proposing alternative approaches. Some of the researchers have collaborated with international organisations such as UNESCO and ETF, highlighting the importance of collaboration between policy and research, where both strands can benefit from mutual learning and exchange (Stone et al. 2001).

4.2 | Contents of the Discourse

The concepts of green VET and green skills are prominent in both strands of discourse. However, these concepts are sometimes used interchangeably (e.g., McGrath and Ramsarup 2024, 248) and are not entirely distinct. Nevertheless, they differ in focus, which may be attributed to the different international organisations involved in shaping these concepts. Green VET primarily refers to the strategy of making VET systems and especially VET providers greener, while green skills pertain to abilities required for employment in green jobs that contribute to a green economy. This is why green skills are often used interchangeably with green jobs. Thus, green VET is viewed as the systemic driver, processor and frame for embedding sustainability in VET, while green skills represent a component of green VET. Green VET involves changes of an entire VET system, which can range from minor adjustments to more comprehensive transformations. Consequently, the concepts are mutually dependent and overlap, although each fulfils a distinct purpose in advancing sustainability. The orientations of the concepts are interrelated; a narrower focus of greening VET is associated with technical green skills that can be taught, for example, in short-term vocational courses, while a broader approach involves a systematic shift toward sustainable development as a kind of mentality or philosophy incorporating generic and transversal green skills. Therefore, although the concepts of green VET and green skills are related, they should not be used as synonyms.

4.3 | Regional Contexts of the Discourse

It is noteworthy that green VET and green skills are perceived as relevant topics, particularly in the Asia-Pacific region and (South) Africa. From the research literature reviewed in this study, 17 scientific articles and three books address the Asia-Pacific region, while seven scientific articles and one book focus on Africa and mainly South Africa. These findings align with those reported by Montanari et al. (2023). It should be noted, however, that the discourse is also being supported in European countries by international organisations such as CEDEFOP. Nevertheless, the review of the literature revealed a paucity of scientific studies from European countries. This finding is intriguing as it contrasts with the results of other discourse analyses, which have a different geographical focus. For example, in their literature review on VET reform implementation, Caves et al. (2021) identified that the majority of scientific studies primarily focus on European countries, with less attention given to Asian, Oceanic and African countries.

This discrepancy may be attributed to the prevalence of institutionalised VET systems in certain countries, which has led to the establishment of distinct discourses. The involvement

and relevance of international organisations in policy development may be diminished here, as national VET structures are already well-established. For instance, the German Federal Institute for VET (BIBB) has been active in promoting and implementing sustainable development in the German VET system (e.g., Hermann et al. 2024). Consequently, changes in the VET system are being driven nationally, as shown by the standard occupational profile in Germany, which stipulates that environmental protection and sustainability should be incorporated into all vocational training programmes (GOVET 2020). This suggests that countries with institutionalised VET tend to prioritise the operational and practical implementation of the discourse on the green alignment of VET, for instance, through curriculum revision and adaptation. However, this form of implementation is not reflected in the literature sources analysed here but rather in specific curricula and teaching materials at the meso- and micro-level of a VET system in concrete teaching and learning processes. In contrast, countries, where VET is not extensively institutionalised, such as many in the Asia-Pacific region and Africa, may seek guidance from international organisations, their global agendas and associated policies. This could support the incorporation of these elements into their own policy frameworks on the macro-level. Consequently, international organisations and their global agendas may exert a more dominant influence on the development of VET systems in these regions (for Asia-Pacific see e.g., UNESCO 2015; Tsironis 2023), potentially shifting the discourse toward the macro- and policy level of a VET system rather than the practical implementation level.

4.4 | Evolvement of the Discourse Over Time

The literature indicated that the discourse on green skills began to emerge in 2010 and 2011 in response to buzz words such as 'green economy' and 'green jobs'. The concept of a green economy arose following the global financial crisis, driven by the increasing prevalence of environmental issues and the need for economic growth that is environmentally sustainable. The formation of green VET occurred simultaneously, establishing a new agenda for VET in accordance with UNESCO's ESD. Green VET and green skills were present in the policy discourse from 2010 to around 2014 and then saw a resurgence in interest beginning 2022. Research on these topics developed rather later compared to the policy discourse, gaining renewed relevance in recent years, as various publications show.

Initially, the discourse surrounding both concepts was more narrowly focused. While green VET primarily concentrated on the greening of VET providers, green skills were limited to technical skills for specific occupations aimed at immediate employability within a green economy. Over time, and in response to critiques from researchers, these narrow interpretations have expanded. This is particularly true for green skills, which now encompass both generic green skills, green mindsets and attitudes. Transversal green skills extend beyond immediate economic needs, incorporating moral values and sustainable practices that address deeper societal and environmental challenges, such as social justice and equality. It is noteworthy that in both strands of discourse, this broader scope is still predominantly referred to as green skills rather than green competencies or green competences. Green competencies encompass green knowledge, skills, abilities, attitudes, behaviours and awareness related to sustainability (Cabral and Dhar 2020). Therefore, it is essential to clarify the scope in which green skills are understood.

Regarding green VET, here is now a targeted emphasis on a more comprehensive and transformative approach in the context of a just transition (Ramsarup et al. 2024). Accordingly, the greening of VET providers is considered too narrow; a profound, systemic change is necessary to challenge prevailing economic paradigms and promote holistic social changes within VET.

5 | Conclusion

This integrative literature review has provided an innovative and valuable approach to analysing the discourse on the green alignment of VET. The primary focus of the study was to determine who shapes the discourse, what content it contains and where and in which regional contexts it occurs. The findings revealed that both policy and research play pivotal roles in influencing the discourse. The policy strand is predominantly dominated by international organisations whose global agenda-setting impacts national VET systems, particularly at the policy level. The content of the discourse predominantly revolves around green VET and green skills, with a considerable number of publications analysed in this literature review originating from the Asia-Pacific region and Africa. Additionally, the study underscored the evolvement of the discourse over time, tracing its shift from a narrower to a broader scope.

The study makes a valuable contribution to understanding the divergences between policy actions and scientific findings (Oliver et al. 2019). The findings can assist policy actors in more effectively integrating scientific insights from research into their decision-making processes and fostering a more constructive dialogue between policy and research. Furthermore, the findings can facilitate a nuanced understanding of the discourse and its constituent elements among both policy and research actors.

However, it is important to note that this literature review does not provide a comprehensive account of all current developments in the discourse. The dynamic nature of the concepts of green VET and skills, along with their rapid growth and the constant stream of new literature and findings, presents a challenge in delivering a complete overview of the existing literature. Furthermore, the literature review was limited to publications in the English language. Therefore, it would be beneficial for future research to include literature in other languages, such as Spanish, Mandarin, German and French.

Future research should also examine the explanatory patterns for discrepancies and similarities between the two discourse strands of policy and research. Another avenue for exploration would be to analyse the influence of global trends, such as the greening of VET agenda, on national VET systems and their corresponding policies, with a country-specific focus. In this context, future studies may benefit from incorporating literature on practice and implementation to gain more detailed insights

into the practical realisation of policies. Analyses of the status quo should be conducted at the level of concrete learning processes in the classroom and in companies as skill-providers (Fuchs et al. 2021). This will facilitate the identification of challenges, progress and best practices for enabling mutual learning toward a sustainable and green future.

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Ethics Statement

The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered to. No ethical approval was required as this is a review article with no original research data.

Conflicts of Interest

The authors declare no conflicts of interest.

Endnotes

[1]Green VET and greening of VET are used synonymously in the following, where greening of VET refers to the process of greening.

References

Acedo, C. 2014. "Skills for Inclusive and Sustainable Development: Perspectives From the Asia Pacific Region and Beyond." *Prospects* 44, no. 2: 137–140. https://doi.org/10.1007/s11125-014-9314-1.

Auktor, G. V. 2020. *Green Industrial Skills for a Sustainable Future*. UNIDO. https://www.unido.org/sites/default/files/files/2021-02/LKDForum-2020_Green-Skills-for-a-Sustainable-Future.pdf.

Baumgarten, K., and S. Kunz. 2016. "Re-Thinking Greening TVET for Traditional Industries in Asia—The Integration of a Less-Skilled Labour Force Into Green Supply Chains." *TVET@Asia* no. 6: 1–17. https://tvet-online.asia/6/baumgarten-kunz/.

Bianchi, G. 2020. *Sustainability Competences*. European Commission. https://data.europa.eu/doi/10.2760/200956.

Braun, V., and V. Clarke. 2006. "Using Thematic Analysis in Psychology." *Qualitative Research in Psychology* 3, no. 2: 77–101. https://doi.org/10.1191/1478088706qp063oa.

Brown, M. 2015. "Developing and Using Green Skills for the Transition to a Low Carbon Economy." *Australian Journal of Adult Learning* 55, no. 2: 182–203.

Brown, M., F. Sack, and C. Piper Rodd. 2013. "Student Voice in 'Skills for Sustainability'." *International Journal of Training Research* 11, no. 3: 213–224. https://doi.org/10.5172/ijtr.2013.11.3.213.

Cabral, C., and R. L. Dhar. 2020. "Green Competencies: Insights and Recommendations From a Systematic Literature Review." *Benchmarking: An International Journal* 28, no. 1: 66–105. https://doi.org/10.1108/BIJ-11-2019-0489.

Caves, K. M., S. Baumann, and U. Renold. 2021. "Getting There From Here: A Literature Review on Vocational Education and Training Reform Implementation." *Journal of Vocational Education & Training* 73, no. 1: 95–126. https://doi.org/10.1080/13636820.2019.1698643.

CEDEFOP. 2012. "Green Skills and Environmental Awareness in Vocational Education and Training." https://data.europa.eu/doi/10.2801/78825.

CEDEFOP. 2019. "Skills for Green Jobs: European Synthesis Report." https://doi.org/10.2801/036464.

CEDEFOP. 2024. "Glossary—Skills for the Green Economy." https://www.cedefop.europa.eu/en/tools/vet-glossary/glossary.

CEDEFOP and OECD. 2022. "Apprenticeships for Greener Economies and Societies." https://data.europa.eu/doi/10.2801/628930.

Chandrasekar, B., R. R. Thakur, and D. Setyorini. 2023. "Vocational and Skill Training Systems in India and Indonesia: A Comparative Analysis With an Application to Green Sector Skills." In *Private Sector Development in an Emerging World*, edited by D. de Boer, H. Sander, K. Friz, and A. Anastasi, 143–160. De Gruyter.

Chinedu, C. C., A. Saleem, and W. H. N. Wan Muda. 2023. "Teaching and Learning Approaches: Curriculum Framework for Sustainability Literacy for Technical and Vocational Teacher Training Programmes in Malaysia." *Sustainability* 15, no. 3: 1–24. https://doi.org/10.3390/su15032543.

Chinedu, C. C., and W. A. Wan-Mohamed. 2017. "Realigning SD Goals for Industry and TVET Training Programs: A Crucial Undertaking." *TVET@Asia* no. 8: 1–13. https://tvet-online.asia/8/chinedu-wan-mohamed/

Dayue, F. 2016. "A Survey Report on Greening in Higher TVET in China." *TVET@Asia* no. 6: 1–18. https://tvet-online.asia/6/dayue/.

Diep, P. C., and M. Hartmann. 2016. "Green Skills in Vocational Teacher Education—A Model of Pedagogical Competence for a World of Sustainable Development." *TVET@Asia* 6: 1–19. https://tvet-online.asia/6/diep-hartmann/.

ETF. 2021. "Skilling for the Green Transition." https://data.europa.eu/doi/10.2801/112540.

European Commission. 2022a. "Green Skills in VET." https://sgieurope.org/files/FINAL-Green%20Skills-report.pdf.

European Commission. 2022b. "New Taxonomy of Skills for the Green Transition." https://ec.europa.eu/newsroom/empl/items/741088/en.

European Commission, ETF, CEDEFOP, OECD, ILO, and UNESCO. 2022. "Work-Based Learning and the Green Transition." https://data.europa.eu/doi/10.2801/69991.

Evans, C., and D. Stroud. 2016. "Greening Steel Work: Varieties of Capitalism and the 'Greening' of Skills." *Journal of Education and Work* 29, no. 3: 263–283. https://doi.org/10.1080/13639080.2014.907487.

Fereday, J., and E. Muir-Cochrane. 2006. "Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development." *International Journal of Qualitative Methods* 5, no. 1: 80–92. https://doi.org/10.1177/160940690600500107.

Fien, J., and J. R. Guevara. 2013. "Skills for a Green Economy: Practice, Possibilities, and Prospects." In *Skills Development for Inclusive and Sustainable Growth in Developing Asia-Pacific*, edited by R. Maclean, S. Jagannathan, and J. Sarvi, 255–263. Springer Netherlands. https://doi.org/10.1007/978-94-007-5937-4_14.

Fuchs, M. 2024. "Green Skills for Sustainability Transitions." *Geography Compass* 18, no. 10: 1–12. https://doi.org/10.1111/gec3.70003.

Fuchs, M., N. Röhrer, and B. Vogelsang. 2021. "Companies as Local Skill-Providers? The 'Skills Ecosystem' in Mexico." *Erdkunde* 75, no. 4: 295–306. https://doi.org/10.3112/erdkunde.2021.04.03.

Gessler, M., and C. Siemer. 2020. "Umbrella Review: Methodological Review of Reviews Published in Peer-Reviewed Journals With a Substantial Focus on Vocational Education and Training Research." *International Journal for Research in Vocational Education and Training* 7, no. 1: 91–125. https://doi.org/10.13152/IJRVET.7.1.5.

Gleissner, K. 2012. *Greening TVET for Sustainable Development*. UNESCO-UNEVOC. https://unevoc.unesco.org/fileadmin/user_upload/docs/e-Forum_Synthesis_report_Greening_TVET.pdf.

Gonon, P. 2022. "Introduction: Apprenticeships for Greener Economies and Societies: State of the Art and the Potential of Apprentices." In *Apprenticeships for Greener Economies and Societies*, edited by CEDEFOP & OECD, 16–24. Publications Office of the European Union. https://doi.org/10.2801/628930.

GOVET. 2020. "Cross Occupational Competencies in the German Vocational Education and Training System." https://www.govet.international/dokumente/pdf/20200829_Cross_occupational_competencies_in_Germany_2020_Web.pdf.

Hermann, R., H. Kress, and J. Olesen, eds. 2024. *Sustainability in Vocational Education and Training – National and International Experiences*. Verlag Barbara Budrich.

Hollander, A., and N. Y. Mar. 2009. "Towards Achieving TVET for All: The Role of the UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training." In *International Handbook of Education for the Changing World of Work*, edited by R. Maclean and D. Wilson, 41–57. Springer Netherlands. https://doi.org/10.1007/978-1-4020-5281-1_3.

ILO. 2011. "Skills for Green Jobs: A Global View: Synthesis Report Based on 21 Country Studies." https://www.ilo.org/publications/skills-green-jobs-global-view

ILO. 2015. "Anticipating Skill Needs for Green Jobs A Practical Guide." https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_564692.pdf

ILO. 2019. "Skills for a Greener Future: A Global View." https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_emp/documents/publication/wcms_732214.pdf

ILO. 2021. "Greening Guidelines for TVET Institutes." https://www.ilo.org/publications/greening-guidelines-tvet-institutes

ILO. 2022. "Greening TVET and Skills Development: A Practical Guidance Tool." https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_847095.pdf

ILO. 2024. *Navigating the Future: Skills and Jobs in the Green and Digital Transitions: Scenario-Based Insights*. IL. https://doi.org/10.54394/VGNR3350

ILO, OECD, UNESCO-UNEVOC, CEDEFOP, ETF, and Unitar. 2013. "Meeting Skill Needs for Green Jobs: Policy Recommendations." https://unevoc.unesco.org/fileadmin/up/iwg_recommendations_for_g20.pdf

iMove. 2023. "Promoting Sustainable Development Through Green TVET and Green Productivity in Developing Countries." https://www.imove-germany.de/en/news/Promoting-Sustainable-Development-through-Green-TVET-and-Green-Productivity-in-Developing-Countries.htm.

Jaeger, C. 2014. "Choice for China: What Role for Vocational Education in Green Growth?" *China & World Economy* 22, no. 5: 55–75. https://doi.org/10.1111/j.1749-124X.2014.12084.x.

Jagannathan, S. 2013. "Education and Skills in Asia: Responding to Greening Economies." In *Skills Development for Inclusive and Sustainable Growth in Developing Asia-Pacific*, edited by R. Maclean, S. Jagannathan, and J. Sarvi, 265–280. Springer Netherlands. https://doi.org/10.1007/978-94-007-5937-4_15.

Kang, R., and M. Pavlova. 2019. "Development of TVET Teachers' Career Identity Through Teacher Education and Training Programs for the Purposes of Including ESD in Classroom Practices." *TVET@Asia* 14: 1–11. https://tvet-online.asia/14/kang-etal/.

Kastrup, J. 2013. *Greening TVET: Qualifications Needs and Implementation Strategies*. UNESCO-UNEVOC. https://files.eric.ed.gov/fulltext/ED560501.pdf.

Klassen, J. 2024. "International Organisations in Vocational Education and Training: A Literature Review." *Journal of Vocational Education & Training*: 1–27. https://doi.org/10.1080/13636820.2024.2320895.

Knibb, H., and C. Paci. 2016. "The Greening of Canada's College Curriculum: A Pan-Canadian Survey." *TVET@Asia* 6: 1–21. https://tvet-online.asia/6/knibb-paci/.

Kwauk, C. T., and O. M. Casey. 2022. "A Green Skills Framework for Climate Action, Gender Empowerment, and Climate Justice." *Development Policy Review* 40, no. 2: 1–19. https://doi.org/10.1111/dpr.12624.

Langthaler, M., S. McGrath, and P. Ramsarup. 2021. *Skills for Green and Just Transitions: Reflecting on the Role of Vocational Education and Training for Sustainable Development*. Austrian Foundation for Development Research (ÖFSE).

Lee, N. 2013. "Redesigning of Curriculum and Training for Skills for Green Jobs in the Republic of Korea." In *Skills Development for Inclusive and Sustainable Growth in Developing Asia-Pacific*, edited by R. Maclean, S. Jagannathan, and J. Sarvi, 281–308. Springer Netherlands. https://doi.org/10.1007/978-94-007-5937-4_16.

Li, H., S. Khattak, X. Lu, and A. Khan. 2023. "Greening the Way Forward: A Qualitative Assessment of Green Technology Integration and Prospects in a Chinese Technical and Vocational Institute." *Sustainability* 15: 1–16. https://doi.org/10.3390/su15065187.

Li, J., and M. Pilz. 2023. "International Transfer of Vocational Education and Training: A Literature Review." *Journal of Vocational Education & Training* 75, no. 2: 185–218. https://doi.org/10.1080/13636820.2020.1847566.

Liu, H., M. Hartmann, D. Hariyanto, and M. Liu. 2019. "Enhancing Students' Key Competencies for Sustainable Development in Chinese Technical and Vocational Education and Training (TVET): Implications for TVET Teachers." *TVET@Asia* 14: 1–17. https://tvet-online.asia/14/liu-etal/.

Lotz-Sisitka, H., S. McGrath, and P. Ramsarup. 2024. "Oil, Transport, Water and Food: A Political-Economy-Ecology Lens on VET in a Climate Changing World." *Journal of Vocational Education & Training* 76, no. 2: 281–306. https://doi.org/10.1080/13636820.2024.2320910.

Maclean, R., S. Jagannathan, and B. Panth. 2018. *Education and Skills for Inclusive Growth, Green Jobs and the Greening of Economies in Asia*. Springer. https://doi.org/10.1007/978-981-10-6559-0.

Maclean, R., E. Tsang, and J. Fien. 2013. "Hong Kong, China Employers' Perspectives on a Carbon-Constrained Economy and How Technical and Vocational Education and Training Should Respond." In *Skills Development for Inclusive and Sustainable Growth in Developing Asia-Pacific*, edited by R. Maclean, S. Jagannathan, and J. Sarvi, 309–325. Springer. https://doi.org/10.1007/978-94-007-5937-4_17.

Majumdar, S. 2010. "Greening TVET: Connecting the Dots in TVET for Sustainable Development." In *16th IVETA-CPSC International Conference on "Education for Sustainable Development in TVET"*.

Majumdar, S. 2011. *Developing a Greening TVET Framework*. UNESCO-UNEVOC. https://unevoc.unesco.org/fileadmin/user_upload/docs/Greening_TVET_Framework-Bonn-Final_Draft.pdf.

Manyati, T. K., and M. Mutsau. 2021. "Leveraging Green Skills in Response to the COVID-19 Crisis: A Case Study of Small and Medium Enterprises in Harare, Zimbabwe." *Journal of Entrepreneurship in Emerging Economies* 13, no. 4: 673–697. https://doi.org/10.1108/JEEE-07-2020-0236.

Marsden, J. 2015. "Green Skills Ecosystems: An Integrated Approach to Human Capital Development in Greening Economies." https://www.academia.edu/65260618/Green_Skills_Ecosystems_An_integrated_approach_to_human_capital_development_in_greening_economies.

McGrath, S., and L. Powell. 2016. "Skills for Sustainable Development: Transforming Vocational Education and Training Beyond 2015." *International Journal of Educational Development* 50: 12–19. https://doi.org/10.1016/j.ijedudev.2016.05.006.

McGrath, S., and P. Ramsarup. 2024. "Towards Vocational Education and Training and Skills Development for Sustainable Futures." *Journal of Vocational Education & Training* 76, no. 2: 247–258. https://doi.org/10.1080/13636820.2024.2317574.

McGrath, S., and J.-A. Russon. 2023. "TVET SI: Towards Sustainable Vocational Education and Training: Thinking Beyond the Formal." *Southern African Journal of Environmental Education* 39: 1–18. https://doi.org/10.4314/sajee.v39.03.

Melnyk, O. 2023. "International Organisations and Policy-Making in VET Systems of Developing Countries." In *Learning, Teaching and Policy Making in VET*, edited by L. Moreno Herrera, M. Teräs, P. Gougoulakis, and J. Kontio, 370–389. Atlas.

Mertineit, K.-D. 2013. *TVET for a Green Economy*. GIZ. https://www.enterprise-development.org/wp-content/uploads/TVET_Green_Economy.pdf.

Montanari, S., E. Agostini, and D. Francesconi. 2023. "Are We Talking About Green Skills or Sustainability Competences?" *Sustainability* 15, no. 19: 1–25. https://doi.org/10.3390/su151914142.

Napathorn, C. 2021. "The Development of Green Skills Across Firms in the Institutional Context of Thailand." *Asia-Pacific Journal of Business Administration* 14, no. 4: 539–572. https://doi.org/10.1108/APJBA-10-2020-0370.

Nielsen, S. M., K. Frøhlich, and A. Lunkeit. 2023. *GRETA – Greening of Vocational Education and Training: Processes, Practices and Policies*. ETF. https://www.etf.europa.eu/sites/default/files/2023-05/GRETA_Greening%20of%20VET.pdf.

OECD. 2010. "SMEs, Entrepreneurship and Innovation." https://www.oecd-ilibrary.org/industry-and-services/smes-entrepreneurship-and-innovation_9789264080355-en.

OECD and CEDEFOP. 2014. "Greener Skills and Jobs." https://doi.org/10.1787/9789264208704-en.

Oliver, D., S. Yu, and J. Buchanan. 2019. "Political Economy of Vocational Education and Training." In *The Wiley Handbook of Vocational Education and Training*, edited by D. Guile and L. Unwin, 113–136. Wiley. https://doi.org/10.1002/9781119098713.ch7.

Owusu-Agyeman, Y., and A. A. Aryeh-Adjei. 2023. "The Development of Green Skills for the Informal Sector of Ghana: Towards Sustainable Futures." *Journal of Vocational Education & Training* 76, no. 2: 406–429. https://doi.org/10.1080/13636820.2023.2238270.

Pavlova, M. 2016. "Regional Overview: What Is the Government's Role in Greening TVET?" *TVET@Asia* 6: 1–18. https://tvet-online.asia/6/pavlova/.

Pavlova, M. 2017. "Green Skills as the Agenda for the Competence Movement in Vocational and Professional Education." In *Competence-Based Vocational and Professional Education: Bridging the Worlds of Work and Education*, edited by M. Mulder, 931–951. Springer.

Pavlova, M. 2018. "Fostering Inclusive, Sustainable Economic Growth and 'Green' Skills Development in Learning Cities Through Partnerships." *International Review of Education* 64, no. 2: 339–354. https://doi.org/10.1007/s11159-018-9718-x.

Pavlova, M. 2019a. "Emerging Environmental Industries: Impact on Required Skills and TVET Systems." *International Journal of Training Research* 17: 144–158. https://doi.org/10.1080/14480220.2019.1639276.

Pavlova, M. 2019b. "Greening of the Economy Through Partnerships: Issues and Impacts on Skills Development." In *Handbook of Vocational Education and Training: Developments in the Changing World of Work*, edited by S. McGrath, M. Mulder, J. Papier, and R. Suart, 195–218. Springer. https://doi.org/10.1007/978-3-319-94532-3_116.

Pavlova, M., and P. Askerud. 2023. "A Euro-Asian Look at Challenges to Innovation and the Greening of Industries: Implications for TVET and Strategic Policy Formulation." *Journal of Vocational Education & Training* 76, no. 2: 1–25. https://doi.org/10.1080/13636820.2023.2288055.

Pavlova, M., and C. S. Chen. 2019a. "Enhancing TVET Teachers' Capacity to Develop Students' Generic Green Skills: A Work-Based Learning Model for Professional Development of Teachers." *TVET@Asia* 14: 1–23. https://tvet-online.asia/14/pavlova-etal-2/.

Pavlova, M., and C. S. Chen. 2019b. "Facilitating the Development of Students' Generic Green Skills in TVET: An ESD Pedagogical Model." *TVET@Asia* 12: 1–19. https://tvet-online.asia/12/pavlova-etal/.

Pavlova, M., and C. L. Huang. 2013. "Advancing Employability and Green Skills Development: Values Education in TVET, the Case of the People's Republic of China." In *Skills Development for Inclusive and Sustainable Growth in Developing Asia-Pacific*, edited by R. Maclean, S. Jagannathan, and J. Sarvi, 327–343. Springer Netherlands. https://doi.org/10.1007/978-94-007-5937-4_18.

Pavlova, M. and M. Singh, eds. 2022. *Recognizing Green Skills Through Non-formal Learning: A Comparative Study in Asia*. Springer Nature Singapore. https://doi.org/10.1007/978-981-19-2072-1.

Persson Thunqvist, D., M. Gustavsson, and A. Halvarsson Lundqvist. 2023. "The Role of VET in a Green Transition of Industry: A Literature Review." *International Journal for Research in Vocational Education and Training* 10, no. 3: 361–382. https://doi.org/10.13152/IJRVET.10.3.4.

Pilz, M., and L. Zenner-Höffkes. 2023. "'There's Always Someone Else to Blame': A Comparison of the Political Discourse Surrounding 'Vocational Maturity' in Germany and 'Employability' in the UK." *Journal of Vocational Education & Training*: 1–29. https://doi.org/10.1080/13636820.2023.2229796.

Ramsarup, P., S. McGrath, and H. Lotz-Sisitka. 2024. "A Landscape View of Emerging Sustainability Responses Within VET." *Journal of Vocational Education & Training* 67, no. 2: 259–280. https://doi.org/10.1080/13636820.2024.2320911.

Rosenberg, E., P. Ramsarup, and H. Lotz-Sisitka. 2019. *Green Skills Research in South Africa: Models, Cases and Methods*. Routledge.

Sack, F. 2012. "Gen Green: Changes in Australian Apprentices' and Trainees' Experience of Skills and Sustainability From 2008 to 2011." *International Journal of Training Research* 10, no. 1: 30–42. https://doi.org/10.5172/ijtr.2012.10.1.30.

Schröder, T. 2020. "Berufsbildung aus der Sicht internationaler Organisationen." In *Handbuch Berufsbildung*, edited by R. Arnold, A. Lipsmeier, and M. Rohs, 739–752. Springer. https://doi.org/10.1007/978-3-658-19312-6_56.

Schwendimann, B. A., B. De Wever, R. Hämäläinen, and A. A. P. Cattaneo. 2018. "The State-of-the-Art of Collaborative Technologies for Initial Vocational Education: A Systematic Literature Review." *International Journal for Research in Vocational Education and Training* 5, no. 1: 19–41. https://doi.org/10.13152/IJRVET.5.1.2.

Shamzzuzoha, A., P. Cisneros Chavira, T. Kekäle, H. Kuusniemi, and B. Jovanovski. 2022. "Identified Necessary Skills to Establish a Center of Excellence in Vocational Education for Green Innovation." *Cleaner Environmental Systems* 7: 1–10. https://doi.org/10.1016/j.cesys.2022.100100.

Sofroniou, N. 2015. "Greening TVET in the Context of Climate Change Policy Developments." https://unevoc.unesco.org/up/VC_COP21.pdf.

Stone, D., S. Maxwell, and S. Keating. 2001. *Bridging Research and Policy*. Warwick University.

Toepper, M., O. Zlatkin-Troitschanskaia, and C. Kühling-Thees. 2022. "Literature Review of International Empirical Research on Transfer of Vocational Education and Training." *International Journal of Training and Development* 26, no. 4: 686–708. https://doi.org/10.1111/ijtd.12276.

Torraco, R. J. 2005. "Writing Integrative Literature Reviews: Guidelines and Examples." *Human Resource Development Review* 4, no. 3: 356–367. https://doi.org/10.1177/1534484305278283.

Torraco, R. J. 2016. "Writing Integrative Literature Reviews: Using the Past and Present to Explore the Future." *Human Resource Development Review* 15, no. 4: 404–428. https://doi.org/10.1177/1534484316671606.

Tsironis, A. 2023. *Preparing the Workforce for the Low-Carbon Economy: A Closer Look at Green Jobs and Green Skills*. ADB. https://www.adb.org/publications/workforce-low-carbon-economy-green-jobs-skills.

UNEP. 2011. "Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication—A Synthesis for Policy Makers." https://sustainabledevelopment.un.org/content/documents/126GER_synthesis_en.pdf.

UNEP, ILO, IOE, and ITUC. 2008. "Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World." https://wedocs.unep.org/bitstream/handle/20.500.11822/8825/UNEPGreenJobs_report08.pdf?sequence=3&amp%3BisAllowed.

UNESCO. 2012. "Shanghai Consensus." https://unesdoc.unesco.org/ark:/48223/pf0000217683.

UNESCO. 2013. "ESD + TVET: Promoting Skills for Sustainable Development." https://unesdoc.unesco.org/ark:/48223/pf0000216269.

UNESCO. 2015. "Kuala Lumpur Declaration—Quality Education and Skills Development for Sustainable Future." https://www.rcenetwork.org/portal/sites/default/files/AP_conference%20on%20education%20and%20training%2C%20KL%20Declaration.pdf.

UNESCO. 2022. *Transforming Technical and Vocational Education and Training for Successful and Just Transitions*. UNESCO Strategy 2022-2029. https://unesdoc.unesco.org/ark:/48223/pf0000383360.

UNESCO-UNEVOC. 2004. "The Bonn Declaration." https://unevoc.unesco.org/fileadmin/user_upload/pubs/SD_BonnDeclaration_e.pdf.

UNESCO-UNEVOC. 2014. "International Framework for Action: Greening TVET." UNESCO-UNEVOC.

UNESCO-UNEVOC. 2017. "Greening Technical and Vocational Education and Training A Practical Guide for Institutions." https://unevoc.unesco.org/up/gtg.pdf.

UNESCO-UNEVOC, and CEDEFOP. 2024. "Meeting Skill Needs for the Green Transition: Greening TVET for a Greener Future." https://doi.org/10.5281/ZENODO.14230060.

Vanderhoven, E. 2023. "Unpacking the Global Apprenticeship Agenda: A Comparative Synthesis of Literature From International Organisations in the Education Policy Field." *Globalisation, Societies and Education*: 1–18. https://doi.org/10.1080/14767724.2023.2252358.

Vietnamese Directorate of VET. 2018. "Greening TVET." https://www.tvet-vietnam.org/wp-content/uploads/2021/03/Greening-TVET-brochure.pdf.

Vona, F., G. Marin, D. Consoli, and D. Popp. 2015. "Green Skills." *National Bureau of Economic Research*. https://www.nber.org/papers/w21116.

Zelin, M. 2016. "Empowering Green Education in TVET Through International Project-Based Online Competitions." *TVET@Asia* no. 6: 1–15. https://tvet-online.asia/6/zelin/.

Zolkifli, H., Y. Kamin, A. B. A. Latib, Y. Buntat, and Z. Awang. 2016. "Generic Green Skills: Industry and Perspectives on Technical Education and Vocational Training (TVET)." *TVET@Asia* no. 6: 1–13. https://tvet-online.asia/6/zolkifli-etal/.